



उत्तर प्रदेश बेसिक शिक्षा परिषद्

विज्ञान

(कक्षा8)

ई-पुस्तक

कृत

शिवाली जायसवाल



अध्यापिका

(यू.पी.एस. भतसार, आराजी लाइन्स वाराणसी)

[back](#)

fṯāšāfĀ -1



ṯāšā°āĀḞā ṯāšāè „'āāāÔ©āāā|ā ý

ṯāšā°āĀḞā ṯāñŠ ,ā'āÀĀ'ā ý

ṯāšā°āĀāḞāṯāš ÀÔāā¼āḞā ṯāšā 'āāāÀPā³ā ý

'āñ>ÈāñāāĒā³ā½ā-fĀ£āḞā |ā©āā ,āḞ¼ā „'āā° ṯāšā 'āÆ½āiĒā
Ôāāñ|ā ý

°ÖḞā ṯāñŠ āāĒā† ,āāùṯā<Ôāāè•āḞā ṯāšāè ,āāiāi³¼āṯāš|āā ý

ṯṯāš āā°Ḟā ,āā'āṯāñŠ āāiāāṯāš ÔṯāiŠ>À Ô>ā>Ā ṯāšÀ ÀÖñ ©āñý ṯāšfĀ
āā ṯāš ṯāš ĒāÔāāḞāñ ṯāñŠ °āā ¼āāè ÔṯāiŠ>À Ô>ā>Ā ḞāÔāé Ôi,āāý
āāiāāṯāš ṯāš Ḟāñ ṯāiŠce ÔāāñPāā ,āāōÀ āāĀāPā ṯāšāè ÔāÔā³¼ā|āā Ôāñ
ÔṯāiŠ>À ṯāšā 'ĒāÔā āāḞā ṯāšāĒā ṯāšÀ °ñĒāā ,āāōÀ °āāñĒāñ 'ĒāÔā
½āō ṯāšā°āĀḞā•ā½āā Ôāñ Ôā³¼āā Ööý ceāāāō ½āō ṯāšāō|āiÔĒā •āÔāā
ṯāšā°āĀḞā ṯāš¼āā Ôāñ|āā Öö ? °ñĒāḞāñ ṯāñŠ āāĒā† çāi¥| °āḞāṯāšÀ ceāā
āāiāāṯāš ṯāš ṯāñŠ Ôā½āāè'ā ,āā Ôā³āñý āāiāāṯāš Ḟāñ 'ĒāÔā ṯāñŠ ṯṯāš
£āā|āi ṯāñŠ °āḞāñ ¼āāÔā 'āÀ ṯāšāĒā 'ā°ā©āĀ •ā½āā Ôi,āā āā°Ēāā³¼āā
,āāōÀ °āāñĒāñ °ñĒāāñ ¾āÔāè ṯāšā°āĀḞā Ööý,ā°ā |āṯāš —āā|ā ĒāÔā¼āÔā
111 |ā|Iāāō ½āō Ôāñ 'āÆṯāā|ā ½āō 'āÆā'|ā 92 |ā|Iāāō ½āō ṯāšā°āĀḞā
ṯṯāš ½āÔ|Iā'āi¥āĀ |ā|Iā Öö •āāñ ÔāāÔāāÀ ½āō 'āā³āñ •āḞāñ IāāĒāñ
Ôā¼āāè Ôā•āāèIāāō ('āāō£āāō ṯāā •āḞāi,āāō) |ā©āā ĒāÔā¼āÔā Ôā¼āāè
¼āāñ•¼ā 'ā°ā©āāō ½āō „'āāāÔ©ā|ā Ôāñ|āā Ööý ṯāšā°āĀḞā ṯāšā
'āÆ|āāèṯāš ``C" Öö ý ṯāšā°āĀḞā Íā°ā Ēāōāā>Ḟā ¼āāÔāā ṯāñŠ ṯāšā°āāó Íā°ā
Ôāñ °āḞāā Öö ý ṯāšā°āāó ṯāšā ,ā©āĀ ṯāšāñĒā Ôāñ|āā Öö ý

ṯāšā°āĀḞā ṯāšāè „'āāāÔ©āāā|ā :

,āāf³āñ āāiāPāāÀ ṯāšÀō,'āñāāḞāÔāĒā Ôāñ ṯāšāÔā•ā 'āÀ āāĒāĒāḞāñ 'āÀ
ṯāšāĒāā āāḞāiāāḞā °āḞāḞāñ IāāĒāā 'ā°ā©āĀ (āāPā°ā 1.1), ĒāāĒāñḞā /
Ēāō½ā •āĒāḞāñ 'āÀ ṯāšāúPā ṯāšāè āāPā½āḞāāè 'āÀ •ā½āāè ṯāšāāāĒāĒā
|ā©āā ,āāúĒā ½āō ĒāÔāāḞāñ IāāĒāā ṯāšā•āĒā, Ēā ṯāšū|āè ṯāšāñ
,āāāāiāṯāš Ā'ā Ôāñ •āĒāḞāñ 'āÀ 'āÆā'|ā ṯāšāĒā 'ā°ā©āĀ ṯāšā°āĀḞā Öö ?
,, 'ā¼āĀi ṯā<ā Ôā¼āāè ṯāšāĒāñ 'ā°ā©āĀ ṯāšā°āĀḞā |ā|Iā ṯāñŠ Ā'ā Öö ý
ṯāšā°āĀḞā ṯṯāš ṯñÔāā |ā|Iā Öö •āāñ ṯṯāš ,āāñÀ 'āñāāḞāÔāĒā ½āō ĒāÔāñ

OāÆn'āŠāf> ‡āñŠ Â'ā ½āò ‡āŠāñ½āÊā |ā©āā ÖāèÀñ(āāPā"ā 1.02) ‡āñŠ Â'ā
 ½āò ,ā|¾ā¶ā ‡āŠŸāñÀ ,āāòÀ ,ā¼āî|ā'āîlāĀ Pā½ā ‡āŠ lāāÊāā Öō |āāñ
 lāÖāé Êā‡āŠü;āè ‡āñŠ ‡āŠāñ¾āÊāñ ‡āñŠ Â'ā ½āò ‡āŠāÊāāý¾āÖāé ¶āÖāé
 ‡āŠā°āĀ¶ā Ōā¼āāè Ōā•āāèlāāò (•ā¶āî,āāò †lāā lā¶āŌ'āāā|ā¾āāò) |ā©āā
 °ōāā¶ā ‡āŠ •āāèlā¶ā ½āò 'āÆ¾āî ‡ā<|ā Öāñ¶āñ lāāÊāñ 'ā°ā©āāô •āôŌāñ
 - ‡āŠāŌā•ā, Êā ‡āŠü;āè, À°āÀ, >ā¾āĀ, ‡āŠ'āü;ñ, |āñÊā, Ōāā°āî¶ā †lāā
 fĀfā¶ā ½āò ¾āāōāāŌā ‡āŠ ‡āñŠ Â'ā ½āò „āāāŌ©ā|ā Öāñ|āā
 Öōý āā¶ā•āāèlā lāŌ|āî,āāò ½āò ¼āāè ‡āŠā°āĀ¶ā ½āî‡ā<|ā Â'ā (|ālā) †lāā
 ¾āāōāāŌā ‡āŠ °āñ¶āāò Öāè Â'āāò ½āò „āāāŌ©ā|ā Öāñ Ōā ‡āŠ|āā Öō
 ý ½āî‡ā<|ā Â'ā ½āò ‡āŠā°āĀ¶ā ,ā'ā¶āñ āālāāā¼ā¶āĀ Â'āāò ½āò 'āā¾āā
 •āā|āā Öōý Ōāā¾āî ‡ā<|ā ,ālāŌ©āā ½āò ‡āŠā°āĀ¶ā °āŌi|ā Ōāñ
 ¾āāōāāŌā ‡āŠāò ½āò 'āā¾āā •āā|āā Öō ý ,āāf¾āñ ‡āŠā°āĀ¶ā ‡āŠāè
 „āāāŌ©āā|ā ‡āñŠ °āāÀñ ½āò āālāŌ|āð|ā PāPāĀ ‡āŠÀòý



āāPā"ā Ōāāâ0 1.1 'āñā¶āŌāÊā ½āò ÊāŌāā ŌāÆn'āŠāf>



āāPā"ā Ōāāâ0 1.2 ÖāèÀñ ‡āŠā †‡āŠ >|‡āŠü;ā

‡āŠā°āĀ¶ā ‡āŠāè „āāāŌ©āā|ā ¾āāōāāŌā‡āŠ ‡āñŠ Â'ā ½āò :
 ,āā'ā °ōāā¶ā‡āŠ •āāèlā¶ā ½āò †ñŌāñ °āŌi|ā Ōāñ 'ā°ā©āāô ‡āŠā „ā¾āāñŌā
 ‡āŠĀ|āñ Öō āā•ā¶ā ‡āñŠ ĀāŌā¾āā¶ā ‡āŠ Ōāî"ā •ā¶ā|āñ Öōý ,ā¶¾ā
 †ñŌāñ °āŌi|ā lš ¾āāōāāŌā‡āŠ Öō āā•ā¶ā‡āñŠ ĀāŌā¾āā¶ā‡āŠ Ōāî"ā Ōāñ
 ,āā'ā 'āāāĀāPā|ā ¶āÖāé Öōý ,āāf¾āñ °ōāā¶ā ‡āŠ •āāèlā¶ā ½āò
 'āÆ¾āî‡ā<|ā ‡āîŠœ †ñŌāñ 'ā°ā©āāô ‡āñŠ ĀāŌā¾āā¶ā‡āŠ Ōāî"āāò ‡āŠā
 ,ālāÊāāñ ‡āŠ¶ā |āāāāÊā ‡āŠā 1.1 ½āò ‡āŠÀò, āā•ā¶ā½āò ‡āŠā°āĀ¶ā
 „āāāŌ©āā|ā Öōý

!āāāāÊā‡āŠā 1.1

पदार्थ का नाम	रसायनिक नाम	रसायनिक सूत्र
चूना पत्थर/खड़िया/संगमरमर खाने का सोडा घाघन सोडा कार्बन डाई ऑक्साइड	कैल्शियम कार्बोनेट सोडियम बाई कार्बोनेट सोडियम कार्बोनेट कार्बन डाईऑक्साइड	CaCO_3 NaHCO_3 Na_2CO_3 CO_2

,ãã'ã¶ãñ ‡ã<¾ãã 'ñŒEãã ?

f¶ã Ôã¼ããè ¾ããõããŒã ‡ãŠãò ½ãò ‡ãŠã°ãÃ¶ã „ãããÔ©ã|ã Öö ý
'ãÆã ‡ãõŠãã|ã ‡ãŠ ŒãõŒã, ‡ãìŠãã ‡ããŠŒã ŒãõŒã (†Êãû'ããèû•ããèû),
'ãñ>ÈãñÊã, |ãè•ãÊã, ãã½ã>á>ãè ‡ãŠã |ãñÊã, 'ãõÀããã'ãŠ¶ã ½ãñ½ã †Ìãã
‡ãŠãñÊã|ããÀ „ãããã ½ãò ‡ãŠã°ãÃ¶ã , ‡ãŠã°ãÃ¶ã Öãf|Èãñ•ã¶ã ‡ãñŠ
¾ããõããŒã ‡ãŠ ‡ãñŠ Â'ã ½ãò Öãñ|ãã Öö ãã•ã¶Œö Öãf|Èãñ ‡ãŠã°ãÃ¶ã
‡ãŠÖ|ãñ Ööý ¼ããñ•ã¶ã ½ãò „ãããÔ©ã|ã 'ãÆ½ãìŒEã Üã> ‡ãŠ
‡ãŠã°ããõŒãf|Èñ>, ÌãŒãã, 'ãÆãñ>ãè¶ã, ããÌã>ããã½ã¶ã „ãããã ‡ãŠã°ãÃ¶ã ‡ãñŠ
½ãÖ|Ìã'ãìŸãÃ ¾ããõããŒã ‡ãŠ Öö, ãã•ã¶ãŒãŒã ÌãÀãèÀ ‡ãŠãñ ‡ãŠã¾ãÃ
‡ãŠÃ¶ãñ ‡ãñŠ ããÊã† ...ããÃ 'ãÆã'ã Öãñ|ããè Öö ,ããõÀ ¾ãñ ÌãÀãèÀ
‡ãŠãè 'ãñããÌã¾ããò, Â‡ã<ã, ...|ã‡ãŠãò Ìã Öãã|ã¾ããò ‡ãñŠ ãã¶ã½ããŸã
½ãò ÔãŒã¾ã ‡ãŠ Öãñ|ãñ Öö ý ÌãÀãèÀ ‡ãŠãè ‡ãŠãñããÌã ‡ãŠã,ããò ½ãò
‡ãŠã°ãÃ¶ã ãã‡ãŠŒããè ¶ã ãã‡ãŠŒããè Â'ã ½ãò ,ãÌãÌ¾ã „ãããÔ©ã|ã Öãñ|ãã
Öö ý Ôã•ããèÌã ÔããŒããÀ ‡ãŠãè ÔããÀPã¶ãã ½ãò ‡ãŠã°ãÃ¶ã ‡ãñŠ¶ãè¾ã
|ã|Ìã ‡ãŠãè ¼ãããã½ã‡ãŠã ½ãò Öãñ|ãã Öö ý

**Ôã¼ããè Ôã•ããèÌããò ½ãò ‡ãŠã°ãÃ¶ã „ããõÀ „Ôã‡ãñŠ ¾ããõããŒã ‡ãŠ
'ãã¾ãñ •ãã|ãñ Öö ý**

**‡ãìŠŒe ãã¶ã•ããèÌã 'ãããããô ½ãò ‡ãŠã°ãÃ¶ã ½ãì ‡ã<ã ¾ãã
¾ããõããŒã‡ãŠ ‡ãñŠ Â'ã ½ãò „ãããÔ©ã|ã Öãñ|ãã Öö ý**

‡ãìŠŒe „ããõÀ ¼ããè •ãã¶ãñ:

•ãã „ããã °ããè½ããÀ 'ãü|ãñ Öö ¾ãã °ã¶ã ½ãò ããÃ Öãñ|ãã Öö |ã°ã „ããã
|ãü‡ã>À ‡ãŠãñ ããŒEãã‡ãŠÀ 'ãã ‡ãŠãè ŒããñããÊã¾ããü ¾ãã 'ããè¶ãñ ‡ãñŠ
ããŒãÀ'ã ‡ãŠã 'ãÆ¾ããñŒã ‡ãŠÀ|ãñ Ööý ‡ãŠ¼ããè- ‡ãŠ¼ããè
ÔÊ‡ãñŠ efŒãÀ ããÃ ½ãò „ããã‡ãŠãè ½ããü „ããã‡ãñŠ ½ããããñ ½ãò °ãã½ã
ÊãŒãã ãñ|ããè Öö ãã•ãŒãŒãñ „ããã‡ãŠãñ „ããã½ã Öãñ •ãããã Ööý †ñŒãñ
‡ãŠãñfÃ ¼ããè 'ããããã •ããñ ãã‡ãŠŒããè ÀãñŒã ‡ãñŠ Àãñ‡ãŠ¶ãñ, „ããã½ã
'ãÖíüPãã¶ãñ ¾ãã „ãPããÀ ‡ãñŠ „ã¾ããñŒã ½ãò „ãããã Öö, „ããõŒããããã

‡ aŠÖÊã|ã Ööý ,ãããã ‡ aŠãããã ,ããöÖããããããã ‡ aŠã°ãÃ¶ã ‡ aňŠ
 ¾ããöããÖã‡aŠ Öö ý ‡ãìŠœ ¹ãÆ½ãìÊã ,ããöÖããããããã¾ããö ‡aŠñ ¶ãã½ã †Ìãã
 ,,¹ã¾ããñÖã ,ãããããããÊãããÊãã Öö -

ããããÊã‡aŠã -1.2

क्रम संख्या	सेगों के नाम	प्रयोग में बाने वाली बीजधि
1	बुखार	एन्टीपायरेटिक (ज्वरनाशक)
2	पेट दर्द	एन्टीस्पस्मोडिक
3	सर दर्द	एनालजिसिक
4	घाघ	सेगायुनाशक घोल
5	पेचिसा, कालस	एन्टी बायोटिक (प्रतिजीविक)

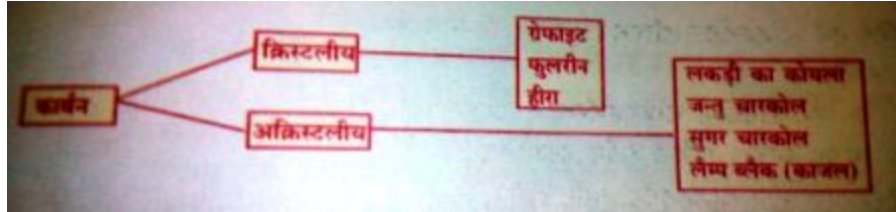
Pãñ¹ããÌã¶ããè - ãã‡aŠÖããè ¼ããè ,ããöÖããããããã ‡aŠã ¹ãÆ¾ããñÖã |ãù‡ã<¹À
 ‡aŠãè ÖãÊããÖ Öãñ Öãè ‡aŠã¶ãã PããããÖ† ý

½ãì‡ã<¹À Â¹ã ½ãö ‡aŠã°ãÃ¶ã ‡aŠãè ,,¹ãããÖ©ããã|ã :

•ãöÖãã ãã‡aŠ Ö½ã¶ãñ ¹ãüã ãã‡aŠ ‡aŠã°ãÃ¶ã ¾ããöããÖã‡aŠãö ‡ãñŠ Â¹ã
 ½ãö Ö½ãñã ¹ãÆã¹ã Öãñ|ãã Ööý Öãã©ã Öãè ‡aŠã°ãÃ¶ã ‡aŠãñ¾ãÊãã,
 ‡aŠãããÊãÊã, ÖãÆñ¹ãŠãf>, ÖãèÀã, ,ãããããããã½ã¶ã¶ã Â¹ããö ½ãö ¼ããè
 ½ãì ‡ã<¹ã ,ãìãÖ©ãã ½ãö ¹ãÆã¹ã Öãñ|ãã Ööý ¾ãñ Öã½ããè ¹ãã©ãÃ
 ‡aŠã°ãÃ¶ã |ãÌã ‡ãñŠ ãããããã½ã¶ã¶ã Â¹ã Öö ããã¶Öö Ö½ã ‡aŠã°ãÃ¶ã ‡ãñŠ
 ,ã¹ãÀÂ¹ã ‡aŠÖ|ãñ Ööý ‡aŠã°ãÃ¶ã ‡ãñŠ f¶ã ãããããã½ãã,ã Â¹ããö ‡ãñŠ
 Öã½ããè ÀãÖãã¾ããã¶ã‡aŠ Öãì¶ã |ããñ †‡aŠ Öã½ãã¶ã Öãñ|ãñ Öö ¹ãÀ¶ãì
 ¼ããöãã|ã‡aŠ Öãì¶ã ãã½ãã,ã ãã½ãã,ã Öãñ|ãñ Ööý ¹ãã©ãÃ ‡ãñŠ fÖã Öãì¶ã
 ‡aŠãñ ,ã¹ãÀÂ¹ã|ãã ‡aŠÖ|ãñ Ööý
 ‡aŠã°ãÃ¶ã ‡ãñŠ ãããããã½ã¶ã¶ã ,ã¹ãÀÂ¹ããö ‡ãñŠ ¼ããöãã|ã‡aŠ Öãì¶ããö ½ãö
 ãã½ã¶ã¶ã|ãã ãããÊããfÃ ãñ|ããè Ööý ÖãèÀã Pã½ã‡aŠ¹ãÀ Ìã ‡aŠÝãñÀ Öãñ|ãã
 Öö •ãããã‡aŠ ‡aŠãñ¾ãÊãã, ‡aŠããÊã, ÖãÆñ¹ãŠãf> ‡aŠãÊãñ ÀãÖã ‡aŠñ
 Öãñ|ãñ Ööý f¶ã‡ãñŠ Öãì¶ããö ½ãö ãã½ã¶ã¶ã|ãã ‡aŠã°ãÃ¶ã ¹ãÀ½ãã¶ãì,ããö
 ‡aŠãè Ì¾ãìãÖ©ãã ½ãö ãã½ã¶ã¶ã|ãã ‡ãñŠ ‡aŠãÀ¶ã Öãñ|ããè Ööý ‡aŠã°ãÃ¶ã
 ¹ãÀ½ãã¶ãì,ããö ‡aŠãè Ì¾ãìãÖ©ãã ‡ãñŠ ,ãããããÀ ¹ãÀ ‡aŠã°ãÃ¶ã ‡ãñŠ
 ãããããã½ã¶ã¶ã ,ã¹ãÀÂ¹ããö ‡aŠãñ ãñ ÌãÖããö ½ãö °ããüãã •ãã|ãã Ööý
 ãã%ãŠÖÊããè¾ãã |ããã ,ããã%ãŠÖÊããè¾ããü ãã%ãŠÖÊããè¾ãã Â¹ã ½ãö
 ‡aŠã°ãÃ¶ã ¹ãÀ½ãã¶ãì ãã¶ãããÌPã|ã %ãŠ½ã ½ãö Ì¾ãìãããÖ©ãã ÀÖ|ãñ Öö,
 •ãããã‡aŠ ,ããã%ãŠÖÊããè¾ãã Â¹ã ½ãö ‡aŠã°ãÃ¶ã ¹ãÀ½ãã¶ãì ãã¶ãããÌPã|ã
 %ãŠ½ã ½ãö Ì¾ãìãããÖ©ãã ¶ãÖãè ÀÖ|ãñ Öö ý ‡aŠã°ãÃ¶ã ‡ãñŠ
 ãã%ãŠÖÊããè¾ãã †Ìãã ,ããã%ãŠÖÊããè¾ãã Â¹ã fÖã ¹ãÆ‡aŠãÀ Öö:

‡aŠã°ãÃ¶ã ‡ãñŠ ,ããã%ãŠÖÊããè¾ãã ,ã¹ãÀÂ¹ã

‡ āŠā°āĀā ‡ āñŠ ,āāā % āŠÔ>Êāāè¾ā ,ā¹āĀĀ¹āāò ½āò ‡ āŠā°āĀā
 'āĀ½āāāi,āāò ‡ āŠāè ‡ āŠāñfĀ āāāāāīPāā Ĩ¾āīāÔāā āā ŖāÔāé Ôāñāāè Ôō
 ,āāāĀā fā ‡ āŠāè āā % āŠÔ>Êāāè¾ā ÔāāĀPāāā āāÔāé Ôāñāāè Ôōý
 ‡ āŠāñ¾āĒāā, Ēā ‡ āŠūāè ‡ āŠā ‡ āŠāñ¾āĒāā, ‡ āŠā•āĒā ,āāāā ‡ āŠā°āĀā
 ‡ āñŠ ,āāā % āŠÔ>Êāāè¾ā ,ā¹āĀĀ¹ā Ôō ý ‡ āŠāñ¾āĒāñ āāā Ēā ‡ āŠūāè
 ‡ āñŠ ‡ āŠāñ¾āĒāñ ,•āvāi āāā ÔāiŖāĀ PāāĀ ‡ āŠāñĒā ½āò 'āĒā¾ā:
 ‡ āīŠœ ,āīāīā¾āāú ,¹āāāÔāā ĀŖāāè Ôōý ,āāf¾āñ fā
 ,āāā % āŠÔ>Êāāè¾ā ,ā¹āĀĀ¹āāò ‡ āŠāè āāīāŖāā PāPāāĀ ‡ āŠĀāñ Ôōý



ĒāŠūāè ‡ āŠā ‡ āŠāñ¾āĒāā (‡ āŠāŖĀ PāāĀ‡ āŠāñĒā)

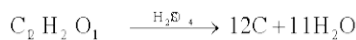
‡ āŠāŖĀ PāāĀ ‡ āŠāñĒā Ēā ‡ āŠūāè ‡ āŠāñ ,āāú ‡ āāāè•āā ‡ āŠāè ‡ āŠ½ā
 ,,¹āāāÔāāāā ½āò °Ŗā ‡ āŠĀ 'āĒā¹ā āā ‡ āŠ¾āā •āāāā ÔōýfŖā
 'āĒ%āŠ½ā ‡ āŠāñ ¼āā•ā‡āŠ ,āāŖāāāā ‡ āŠŖāñ Ŗāōý¾āŖ ‡ āŠāĒāñ ĀāŖā
 ‡ āŠā 'āāāāā Ŗāōý¾āŖ •āĒā Ŗāñ ŖĒā ‡ āŠā Ŗā āā•āŖā‡ āñŠ ‡ āŠāĀā •āĒā
 ½āò āāĀāā Ŗāōý fŖā‡ āŠā 'āĒ¾āāñŖā fĀāāā ‡ āñŠ Ā¹ā ½āò āāā •āĒā
 ‡ āñŠ ĩāāñāāā ½āò āā‡ āŠ¾āā •āāāā Ŗāōý

•āāāi PāāĀ‡ āŠāñĒā

¾āŖ •āāāi,āāò ‡ āŠāè Ŗāāāā¾āāò ‡ āñŠ ¼āā•ā‡āŠ ,āāŖāāāā Ŗāñ °āāā¾āā
 •āāāā Ŗāō ý •āāāi PāāĀ‡ āŠāñĒā ½āò ‡ āōŠāāĒĒā¾ā½ā 'āŠāūŖāñŠ ‡ āñŠ
 Ŗāāāā ‡ āŠā°āĀā ĒāŖā¼āŖā 12% Ŗāñāā Ŗāō ý fŖā ‡ āŠā 'āĒ¾āāñŖā
 Pāāēāāè ,,²āāñŖā ½āò Ŗāāāāñ ‡ āñŠ ĀŖā ‡ āŠāñ ĀāŖāŖāēāā ‡ āŠĀāāñ ½āò
 āāā 'āŠāūŖāŠāñĀŖā ‡ āñŠ ¾āāōāāŖā‡āŠ °āāāāāñ ½āò āā‡ āŠ¾āā •āāāā
 Ŗāō ý

ŖāiŖāĀ PāāĀ‡ āŠāñĒā (‡ āōŠĀā½āñĒā)

ŖāiŖāĀ PāāĀ‡ āŠāñĒā ‡ āŠā°āĀā ‡ āŠā ,āāā % āŠÔ>Êāāè¾ā ,ā¹āĀĀ¹ā Ŗāō ý
 fŖāñ Pāāēāāè (C₁₂H₂₂O₁₁)¹āĀ Ŗāāā Ŗāāāā ‡ āŠ ‡ āñŠ ,ā½Ēā ‡ āŠāè
 āā % āŠ¾āā 'āĀā °āāā¾āā •āāāā Ŗāō ý Ŗāāāā ‡ āŠ ‡ āŠā ,ā½Ēā Pāāēāāè
 Ŗāñ •āĒā ‡ āŠāñ ,āīāāāñāāŖāā ‡ āŠĀ Ēāñāā Ŗāō āāā ‡ āŠā°āĀā ĩāñŖā
 ĀŖ •āāāā Ŗāōý



Pāāēāāè

ÔaìØãÀ PããÀ † ãŠãñÊã ½ãìĒ³⁄₄ã Â¹ã Ôãñ ,ã¹ãPãã³⁄₄ã † ãŠ † ãñŠ Â¹ã ½ãò
 'ãĒ³⁄₄ãì † ã<|ã Öãñ|ãã Ööý ¾ãÖ ĩãã|ãì ,ããù † ã<Ôããf| † ãŠãñ ĩãã|ãì † ãñŠ Â¹ã
 ½ãò ,ã¹ãPãã³⁄₄ã † ãŠÀ|ãã Ööý

Êãõ½¹ã °Êãõ†ãŠ (†ãŠãããÊãĒã)



ããPãã Ôããã 1.3 †ãŠã•ãÊã °ãĴããĴãã

¾ãÖ ½ããñ½ã ,ã©ãìãã |ãñÊã † ãŠãñ ĩãã³⁄₄ãì † ãŠãè Ôããèãã½ã|ã ½ãããã ½ãò
 •ãÊããĴãñ 'ãÀ 'ãĒã¹|ã Öãñ|ãã Öö (ããPãã 1.3)ý ØãĒã½ããèãã àãñããò ½ãò
 Êãõ½¹ã / °ãè¹ã†ãŠ Ôãñ 'ãĒ†ãŠãĪã „|ãĴã †ãŠÀ|ãñ †ãñŠ ããÊã† ãã½ã>ãè
 † ãŠã |ãñÊã 'ãĒ³⁄₄ããñØã ãã † ãŠ³⁄₄ãã •ãã|ãã Ööý fÔãÔãñ 'ãĒã¹|ã
 †ãŠãããÊãĒã ½ãò †ãŠã°ãĴã 98-99% |ã†ãŠ Öãñ|ãã Öö ý
 †ãŠãããÊãĒã †ãŠã 'ãĒ³⁄₄ããñØã ãã¹ãĒĴãÀ †ãŠãè Ô³⁄₄ããÖãè,ãì|ãñ †ãŠãè
 'ããùããÊãĪã |ã©ãã Â°ãÀ >ã³⁄₄ãÀ ,ãããã° °ãĴããĴãñ ½ãò ãã†ãŠ³⁄₄ãã •ãã|ãã Öö ý

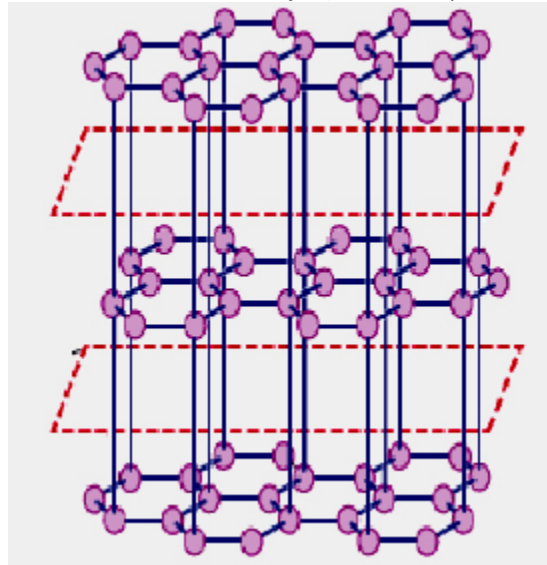
†ãŠã°ãĴã †ãŠñ ãã%ãŠÔ>Êããè³⁄₄ã ,ã¹ãÀÂ¹ã

ÖãèÀã, heãguejerve |ã©ãã ØãĒñ¹ãŠãf> †ãŠã°ãĴã †ãñŠ ãã%ãŠÔ>Êããè³⁄₄ã
 ,ã¹ãÀÂ¹ã Ööý fĴã½ãò †ãŠã°ãĴã 'ãÀ½ãããì ††ãŠ ããĴãããĪPã|ã Ī³⁄₄ãĪãÖ©ãã
 † ãñŠ ,ãĴãØãĪã Ī³⁄₄ãĪãããÖ©ã|ã Öãñ|ãñ Ööý fĴã †ãŠãè ããĴãããĪPã|ã
 ãã%ãŠÔ>Êããè³⁄₄ã ÔããÀPãĴãã Öãñ|ããè Öö ãã•ãĴã †ãñŠ †ãŠãÀãã fĴã †ãñŠ
 ØãĪããò ½ãò ããĪãããĪãÓ|ãã 'ããfÃ •ãã|ããè Ööý ,ããf³⁄₄ãñ fĴã †ãŠãè
 ÔããÀPãĴãã †ãŠã ,ãf³⁄₄ã³⁄₄ãĴã †ãŠÀ|ãñ Ööý

ØãĒñ¹ãŠãf> :-

ØãĒñ¹ãŠãf> Īã^{oa} ØãĒãè †ãŠ ¼ããÓãã †ãñŠ ØãĒñ¹ãŠãñ Ôãñ °ãĴãã Öö,
 ãã•ãÔã†ãŠã ,ã©ãĴã Öö ããÊãĒãĴãã ý 'ãòããÔãÊã †ãñŠ ,ãĴãÀ 'ãĪãÊããè œü|
 (Êããè;) ãã•ãÔãÔãñ ããÊãĒãã •ãã|ãã Öö, ØãĒñ¹ãŠãf> †ãŠãè °ãĴããè Öãñ|ããè
 Öö ý ØãĒñ¹ãŠãf> ½ãò †ãŠã°ãĴã †ãñŠ 'ãÀ½ãããì fÔã 'ãĒ †ãŠãÀ
 Ī³⁄₄ãĪãããÖ©ã|ã ÀÖ|ãñ Öö ãã†ãŠ „Ĵã†ãŠãè ,ãĴãñ†ãŠ Ôã½ã|ãÊããè³⁄₄ã 'ãÀ|ãò
 Öãññ|ããè Ööý 'ãĒĪ³⁄₄ãñ †ãŠ 'ãÀ|ã 'ãÀ œ: †ãŠã°ãĴã 'ãÀ½ãããì
 Óã> †ãŠãñããè³⁄₄ã œÊÊãñ(ããÀãØã) †ãñŠ Â¹ã ½ãò Ī³⁄₄ãĪãããÖ©ã|ã ÀÖ|ãñ
 Ööý œÊÊãñ †ãŠã 'ãĒĪ³⁄₄ãñ †ãŠ †ãŠã°ãĴã 'ãÀ½ãããì
 |ããèĴã DevÜe †ãŠã°ãĴã 'ãÀ½ãããì,ããò Ôãñ •ãìü|ã Öãñ|ãã Ööý
 ØãĒñ¹ãŠãf> ãã %ãŠÔ>Êã ½ãò †ãŠã°ãĴã 'ãÀ½ãããì,ããò †ãŠãè
 Óã> †ãŠãñããè³⁄₄ã ããÀãØããò Ôãñ °ãĴããè ,ãĴãñ †ãŠ 'ãÀ|ãò Öãñ|ããè Öö
 (ããPãã 1.4)ý 'ãÀ|ããò †ãñŠ ½ãf³⁄₄ã ãããèãã °ãÊããò †ãñŠ †ãŠãÀãã

$\emptyset \tilde{a} \tilde{e} \tilde{n}^1 \tilde{a} \tilde{s} \tilde{a} f \rangle$ ¶ $\tilde{a} \frac{1}{2} \tilde{a} \tilde{A}$, $\tilde{a} \tilde{a} \tilde{o} \tilde{A}$ Ô ¶ $\tilde{a} \tilde{n} \tilde{O} \ddot{\ddot{a}} \tilde{s}$ Ô $\tilde{a} \tilde{n} | \tilde{a} \tilde{a}$ Ô $\ddot{o} \acute{y}$ $\emptyset \tilde{a} \tilde{e} \tilde{n}^1 \tilde{a} \tilde{s} \tilde{a} f \rangle$ Ô $\tilde{a} \tilde{e} \tilde{a} \tilde{n} \rangle \tilde{a} \tilde{e} \tilde{n}$
 $\tilde{A} \tilde{a} \tilde{O} \tilde{a}$ ¶ $\tilde{a} \tilde{s} \tilde{a}$ $\frac{1}{2} \tilde{a} \tilde{i} \tilde{E} \tilde{a} \tilde{a} \frac{3}{4} \tilde{a} \frac{1}{2} \tilde{a}$ † $\tilde{l} \tilde{a} \tilde{a}$ $\tilde{a} \tilde{a} \tilde{p} \tilde{a}$ ¶ $\tilde{a} \tilde{s} \tilde{a} \tilde{a} \tilde{a}$ $\tilde{a} \tilde{a} \tilde{a} \tilde{a} \tilde{a} \tilde{A}$ Ô $\ddot{o}$, $f \tilde{O} \tilde{a}$ ¶ $\tilde{a} \tilde{s} \tilde{a}$
 $\emptyset \tilde{a} \tilde{e} \tilde{a} \tilde{a} \tilde{a} \tilde{a}$ ¶ $\tilde{a} \tilde{s}$ 3700° Ô $\tilde{a} \tilde{n} \tilde{a} \tilde{a} \tilde{E} \tilde{O} \tilde{a} \frac{3}{4} \tilde{a} \tilde{O} \tilde{a}$ Ô $\tilde{a} \tilde{n} | \tilde{a} \tilde{a}$ Ô $\ddot{o}$ $\acute{y}$ $\frac{3}{4} \tilde{a} \tilde{O}$ $\tilde{a} \tilde{a} \tilde{l} \tilde{a}^2 \tilde{a} \tilde{i} | \tilde{a}$ ¶ $\tilde{a} \tilde{s} \tilde{a}$
 $\tilde{O} \tilde{a} \tilde{i} \tilde{p} \tilde{a} \tilde{a} \tilde{E} \tilde{a}$ ¶ $\tilde{a} \tilde{s}$ Ô $\ddot{o} \acute{y}$ $f \tilde{O} \tilde{a}$ ¶ $\tilde{a} \tilde{s} \tilde{a}$ $\tilde{a} \tilde{E} \frac{3}{4} \tilde{a} \tilde{a} \tilde{n} \tilde{O} \tilde{a}$ $\tilde{a} \tilde{a} \tilde{l} \tilde{a}^2 \tilde{a} \tilde{i} | \tilde{a}$ $f \tilde{E} \tilde{a} \tilde{n} \ddot{\ddot{a}} \tilde{a} \langle \tilde{E} \tilde{a} \tilde{n} |$ ° $\tilde{a} \tilde{a} \tilde{a} \tilde{a} \tilde{a} \tilde{a}$
 $\frac{1}{2} \tilde{a} \tilde{o}$ $\tilde{a} \tilde{a} \ddot{\ddot{a}} \tilde{s} \frac{3}{4} \tilde{a} \tilde{a}$ • $\tilde{a} \tilde{a} | \tilde{a} \tilde{a}$ Ô $\ddot{o} \acute{y}$ ¶ $\tilde{a} \tilde{s} \tilde{a} \tilde{o} \tilde{a} \tilde{A} \tilde{a}$ ¶ $\tilde{a} \tilde{n} \tilde{s}$, $\tilde{a} \tilde{a} \frac{3}{4} \tilde{a}$, $\tilde{a} \tilde{a} \tilde{A} \tilde{A} \tilde{a} \tilde{a} \tilde{o}$ ¶ $\tilde{a} \tilde{s} \tilde{a} \tilde{e}$ | $\tilde{a} \tilde{A} \tilde{O}$
 $\frac{3}{4} \tilde{a} \tilde{O}$ $\frac{1}{4} \tilde{a} \tilde{a} \tilde{e}$, $\tilde{a} \tilde{a} \tilde{u}$ ¶ $\tilde{a} \langle \tilde{O} \tilde{a} \tilde{a} \tilde{e} \cdot \tilde{a} \tilde{a} \tilde{a}$ ¶ $\tilde{a} \tilde{n} \tilde{s}$ Ô $\tilde{a} \tilde{a} \tilde{a} \tilde{a}$, $\tilde{a} \tilde{a} \tilde{a} \frac{1}{4} \tilde{a} \tilde{a} \tilde{a}$ ‰ $\tilde{a} \tilde{s} \frac{3}{4} \tilde{a} \tilde{a}$ ¶ $\tilde{a} \tilde{s} \tilde{A}$
 $\ddot{\ddot{a}} \tilde{s} \tilde{a} \tilde{o} \tilde{a} \tilde{A} \tilde{a}$ | $\tilde{a} f \tilde{A}$, $\tilde{a} \tilde{a} \tilde{u} \ddot{\ddot{a}} \langle \tilde{O} \tilde{a} \tilde{a} f |$ $\emptyset \tilde{a} \tilde{o} \tilde{O} \tilde{a}$ ° $\tilde{a} \tilde{a} \tilde{a} | \tilde{a} \tilde{a}$ Ô $\ddot{o} \acute{y}$
 $\tilde{a} \tilde{a} \tilde{p} \tilde{a} \tilde{a}$ Ô $\tilde{a} \tilde{a} \tilde{a} 0.14 \emptyset \tilde{a} \tilde{e} \tilde{n}^1 \tilde{a} \tilde{s} \tilde{a} f \rangle$ ¶ $\tilde{a} \tilde{s} \tilde{a} \tilde{e}$ $\tilde{a} \tilde{A} | \tilde{a}$ Ô $\tilde{a} \tilde{a} \tilde{A} \tilde{p} \tilde{a} \tilde{a} \tilde{a}$

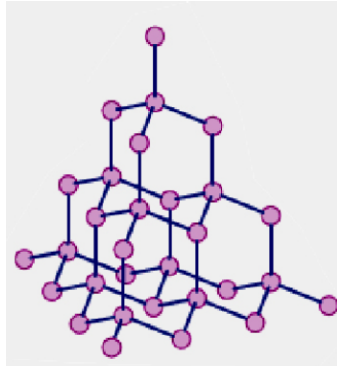


$\ddot{\ddot{a}} \tilde{i} \tilde{s} \tilde{e}$, $\tilde{a} \tilde{a} \tilde{o} \tilde{A}$ $\frac{1}{4} \tilde{a} \tilde{a} \tilde{e}$ • $\tilde{a} \tilde{a} \tilde{a} \tilde{a} \tilde{n}$:

- $\square$ $\emptyset \tilde{a} \tilde{e} \tilde{n}^1 \tilde{a} \tilde{s} \tilde{a} f \rangle$, $\tilde{a} \tilde{a} \tilde{a} \tilde{f} \tilde{a}$ ¶ $\tilde{a} \tilde{s}$ $\frac{1}{2} \tilde{a} \tilde{a} \tilde{a} \tilde{a}$ $\frac{1}{2} \tilde{a} \tilde{o}$ $\tilde{p} \tilde{a} \tilde{a} \tilde{e} \tilde{a}$, $\frac{1}{4} \tilde{a} \tilde{a} \tilde{A} | \tilde{a}$, $\tilde{N} \tilde{a} \tilde{a} \tilde{e} \tilde{E} \tilde{a} \tilde{a}$ ¶ $\tilde{a} \tilde{s} \tilde{a}$,
 $\tilde{a} \tilde{a} \tilde{A} \tilde{a} \tilde{e}$ ¶ $\tilde{a} \tilde{s} \tilde{a} \tilde{n} \tilde{a} \tilde{a} \tilde{A} \frac{3}{4} \tilde{a} \tilde{a}$, $\tilde{a} \tilde{a} \tilde{o} \tilde{A}$ $\frac{1}{2} \tilde{a} \tilde{o} \tilde{a} \tilde{a} \ddot{\ddot{a}} \langle \tilde{O} \tilde{a} \ddot{\ddot{a}} \tilde{s} \tilde{a} \tilde{n}$ $\frac{1}{2} \tilde{a} \tilde{o}$ $\tilde{a} \tilde{a} \frac{3}{4} \tilde{a} \tilde{a}$ • $\tilde{a} \tilde{a} | \tilde{a} \tilde{a}$ Ô $\ddot{o}$ $\acute{y}$
 $\frac{1}{4} \tilde{a} \tilde{a} \tilde{A} | \tilde{a}$ $\frac{1}{2} \tilde{a} \tilde{o}$ $\frac{3}{4} \tilde{a} \tilde{O}$ $\tilde{a} \tilde{a} \tilde{a} \tilde{O} \tilde{a} \tilde{A}$, • $\tilde{a} \frac{1}{2} \frac{1}{2} \tilde{a} \tilde{i} - \ddot{\ddot{a}} \tilde{s} \tilde{I} \frac{1}{2} \tilde{a} \tilde{a} \tilde{e} \tilde{A}$, „ $\tilde{u} | \tilde{a} \tilde{e} \tilde{O} \tilde{a} \tilde{a}$, $\tilde{a} \tilde{a} \tilde{a} \tilde{I} \tilde{p} \tilde{a} \frac{1}{2} \tilde{a} \tilde{a} \tilde{e}$
 $\circ \tilde{a} \tilde{a} \tilde{O} \tilde{a} \tilde{a} \tilde{E} \tilde{a}$, $\tilde{A} \tilde{a} \cdot \tilde{a} \tilde{O} \tilde{a} \tilde{a} \tilde{a} \tilde{a}$, $\tilde{a} \tilde{a} \tilde{a} \tilde{f} \tilde{a} \tilde{E}$ $\tilde{a} \tilde{E} \tilde{a} \tilde{n} \tilde{I} \tilde{a}$, ¶ $\tilde{a} \tilde{s} \tilde{a} \tilde{a} \tilde{A}$ ¶ $\tilde{a} \tilde{s}$ $\frac{1}{2} \tilde{a} \tilde{o}$ $\tilde{a} \tilde{a} \frac{3}{4} \tilde{a} \tilde{a}$
 $\cdot \tilde{a} \tilde{a} | \tilde{a} \tilde{a}$ Ô $\ddot{o}$ $\acute{y}$
- $\square$ $\emptyset \tilde{a} \tilde{e} \tilde{n}^1 \tilde{a} \tilde{s} \tilde{a} f \rangle$ ¶ $\tilde{a} \tilde{o} \tilde{s} \tilde{a} \tilde{a} \tilde{a} \frac{1}{2} \tilde{a}$ $\hat{A} \tilde{a}$ Ô $\tilde{a} \tilde{n}$ ¶ $\tilde{a} \tilde{s} \tilde{a} \tilde{n} \ddot{\ddot{a}} \tilde{s}$ (keâeye&ve keâe Skeâ
 $\text{DeefkeäÇâmšueerÛe}^{\text{TM}} \text{he}$) ¶ $\tilde{a} \tilde{s} \tilde{a} \tilde{n}$ $\tilde{a} \tilde{a} \tilde{l} \tilde{a}^2 \tilde{a} \tilde{i} | \tilde{a}$ $\frac{1}{4} \tilde{a} \rangle \tilde{a} \tilde{Y} \tilde{a} \tilde{e}$ $\frac{1}{2} \tilde{a} \tilde{o}$ $\emptyset \tilde{a} \tilde{A} \frac{1}{2} \tilde{a}$
 $\ddot{\ddot{a}} \tilde{s} \tilde{A} \ddot{\ddot{a}} \tilde{n} \tilde{s}$ ° $\tilde{a} \tilde{a} \tilde{a}$ Ô $\tilde{a} \ddot{\ddot{a}} \tilde{s} | \tilde{a} \tilde{n}$ Ô $\ddot{o}$ $\acute{y}$ $\frac{3}{4} \tilde{a} \tilde{O}$, $\tilde{a} \tilde{a} \tilde{a} \tilde{A} \tilde{a} \tilde{a} \tilde{e}$ Ô $\tilde{a} \tilde{n} | \tilde{a} \tilde{a}$ Ô $\ddot{o}$ $\acute{y}$
- $\square$, $\tilde{a} \frac{3}{4} \tilde{a} \tilde{a} \tilde{a} \tilde{f} \tilde{a} \ddot{\ddot{a}} \tilde{s}$ „ $\tilde{p} \tilde{p} \tilde{a}$ ° $\tilde{a} \tilde{a}$ | $\tilde{a} \tilde{a} \tilde{a}$ | $\tilde{a} \tilde{a} \tilde{a} \tilde{a}$ $\tilde{a} \tilde{A}$ $\emptyset \tilde{a} \tilde{e} \tilde{n}^1 \tilde{a} \tilde{s} \tilde{a} f \rangle$ ¶ $\tilde{a} \tilde{s} \tilde{a} \tilde{n}$ Ô $\tilde{a} \tilde{e} \tilde{A} \tilde{n}$ $\frac{1}{2} \tilde{a} \tilde{o}$
 $\tilde{a} \tilde{a} \tilde{a} \tilde{A} \tilde{i} \tilde{a} \tilde{a} \tilde{a} | \tilde{a} \tilde{A} | \tilde{a}$ $\tilde{a} \tilde{a} \ddot{\ddot{a}} \tilde{s} \frac{3}{4} \tilde{a} \tilde{a}$ • $\tilde{a} \tilde{a}$ Ô $\tilde{a} \ddot{\ddot{a}} \tilde{s} | \tilde{a} \tilde{a}$ Ô $\ddot{o} \acute{y}$ „ $\tilde{p} \tilde{p} \tilde{a}$ | $\tilde{a} \tilde{a} \tilde{a}$ † $\tilde{l} \tilde{a} \tilde{a}$ ° $\tilde{a} \tilde{a}$
 $\emptyset \tilde{a} \tilde{e} \tilde{n}^1 \tilde{a} \tilde{s} \tilde{a} f \rangle$ $\frac{1}{2} \tilde{a} \tilde{o}$ ¶ $\tilde{a} \tilde{s} \tilde{a} \tilde{o} \tilde{a} \tilde{A} \tilde{a}$ $\tilde{a} \tilde{A} \frac{1}{2} \tilde{a} \tilde{a} \tilde{Y} \tilde{a} \tilde{i}$, $\tilde{a} \tilde{a} \tilde{o}$ ¶ $\tilde{a} \tilde{s} \tilde{a} \tilde{e}$ Ô $\tilde{a} \tilde{a} \tilde{A} \tilde{p} \tilde{a} \tilde{a} \tilde{a}$ ¶ $\tilde{a} \tilde{s} \tilde{a} \tilde{n}$
 $\tilde{a} \tilde{i} \tilde{a} \tilde{a} \tilde{i} \frac{3}{4} \tilde{a} \tilde{A} \tilde{i} \tilde{a} \tilde{a} \tilde{a} \tilde{O} \tilde{a} | \tilde{a}$ ¶ $\tilde{a} \tilde{s} \tilde{A}$ ° $\tilde{n} | \tilde{a} \tilde{a}$ Ô $\ddot{o} \acute{y}$ ¶ $\tilde{a} \tilde{s} \tilde{a} \tilde{u} \tilde{p} \tilde{a}$ ¶ $\tilde{a} \tilde{s} \tilde{a} \rangle \tilde{a} \tilde{n}$ ¶ $\tilde{a} \tilde{n} \tilde{s}$ $\tilde{a} \tilde{a} \tilde{E} \tilde{a} \frac{3}{4} \tilde{a} \tilde{n}$
 $\tilde{a} \tilde{E} \frac{3}{4} \tilde{a} \tilde{i} \ddot{\ddot{a}} \langle \tilde{a} | \tilde{a}$ ¶ $\tilde{a} \tilde{s} \rangle \tilde{A}$ | $\tilde{a} \tilde{a} \tilde{a}$, $\tilde{a} \tilde{a} \frac{3}{4} \tilde{a}$ ¶ $\tilde{a} \tilde{s} f \tilde{A}$, $\tilde{a} \tilde{a} \tilde{o} \cdot \tilde{a} \tilde{a} \tilde{A} \tilde{a} \tilde{o}$ $\frac{1}{2} \tilde{a} \tilde{o}$ $\tilde{a} \tilde{E} \frac{3}{4} \tilde{a} \tilde{i} \ddot{\ddot{a}} \langle \tilde{a}$
 $\tilde{O} \tilde{a} \tilde{e} \tilde{A} \tilde{n}$ $\tilde{a} \tilde{E} \tilde{a} \frac{3}{4} \tilde{a}$: $\emptyset \tilde{a} \tilde{e} \tilde{n}^1 \tilde{a} \tilde{s} \tilde{a} f \rangle$ Ô $\tilde{a} \tilde{n}$ ° $\tilde{a} \tilde{a} \tilde{a} \frac{3}{4} \tilde{a} \tilde{n}$ • $\tilde{a} \tilde{a} | \tilde{a} \tilde{n}$ Ô $\ddot{o} \acute{y}$

$\tilde{O} \tilde{a} \tilde{e} \tilde{A} \tilde{a}$

,ãã'ã ½ãò Ôãñ ,ããã£ã ‡ãŠããÍã ÖãèÀãò Ôãñ 'ãããÀããPã|ã ÖãòØãñý ,ãã'ã ½ããò Ôãñ °ãÖì|ã Ôãñ „Ôãñ À|¶ã ‡ãñŠ Â'ã ½ãò ¼ããè •ãã¶|ã|ãñ Ööý ÖãèÀã ‡ãŠã°ãÃ¶ã ‡ãŠã †‡ãŠ 'ããÀ'Íããè ãã%ããŠÔÊããè¾ã ,ã'ãÀÃ'ã Öö ý fÔã½ãò ‡ãŠã°ãÃ¶ã ‡ãŠã †‡ãŠ 'ãÀ½ãã¥ãì keâeye&ve keâs DevÙe PããÀ 'ãÀ½ãã¥ãì,ããò Ôãñ •ãìü|ã Öãñ|ãã Ööý ‡ãŠã°ãÃ¶ã 'ãÀ½ãã¥ãì,ããò ‡ãŠãè Pã|ãìÓ'ãŠÊã ‡ãŠãè¾ã Ì¾ãÌãÔ©ãã ‡ãñŠ ‡ãŠãÀ¥ã ¾ãÖ 'ãì¥ãÃ|ã: ,ãã°ã® ‡ãŠÝãñÀ |ã©ãã ãã°ãããÌã½ããè¾ã ÔããÀPã¶ãã (ããPã°ã 1.5) ‡ãŠã Öãñ|ãã Ööý



ããPã°ã Ôããã0 1.5 ÖãèÀñ ‡ãŠãè ãã°ãããÌã½ããè¾ã ÔããÀPã¶ãã

ÖãèÀã ‡ãŠÝãñÀ|ã½ã 'ãÆã‡ãðŠãã|ã‡ãŠ 'ã°ã©ãÃ Ööý

ÖãèÀñ ‡ãŠã „ã¾ããñØã ‡ãŠãúPã ‡ãŠã¶|ãñ |ã©ãã £ãã|ãì,ããò ½ãò œñª ‡ãŠÃ¶ãñ ‡ãñŠ ããÊã† Öãñ|ãã Öö ý fÔã‡ãŠãñ ããÌããã¼ã¶ã ‡ãŠãñ¥ããò 'ãÀ ‡ãŠã ‡ãŠÀ ØãÖ¶ãñ †Ìãã ,ãúØãìÝãè °ã¶ãã¶ãñ ½ãò ¼ããè 'ãÆ¾ããñØã ‡ãŠÀ|ãñ Öö ý ¼ããÀ|ã ½ãò ÖãèÀã °ãÖì|ã Öãè ‡ãŠ½ã ½ãã°ãã ½ãò 'ã¶ãã, Ôã|ã¶ãã(½ã0'ãÆ0), °ããúª („0'ãÆ0) |ã©ãã ØããñÊã‡ãìŠ¥|ã (‡ãŠ¶ããÃ‡ãŠ) ½ãò 'ãã¾ãã •ãã|ãã Öö ý

heâguejerve

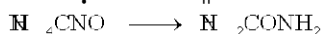
meved 1985 cesb jmeeÙeve%eesb ves ieÇsheâeFš keâes DelÙeefOekeâ GÛÛe leehe lekeâ iece&keâj keâeye&ve keâe Skeâ veÙee Dehej™he mebmuesef<ele efkeâÙee~ Fmekeâe DeCeg ieesueerÙe neslee nw efpemecesb Deveskeâ keâeye&ve hejceeCeg Skeâ otmejs mes peg][s nesles nwb pewmes C₆₀, C₇₀ Decesefjkeâer Jeemlegkeâej yekeâefcevmšj heâguej keâs veece hej Fve ieesueerÙe DeCegDeesb keâes heâguejerve veece efoÙee ieÙee~

‡ãŠã°ãÃãã¶ã‡ãŠ ÀÔãã¾ã¶ã ‡ãŠã 'ãããÀPã¾ã

19 Ìããé Íã|ãã°ãè ‡ãñŠ ,ããÀ½¼ã ½ãò 'ã°ã©ããò ‡ãŠãñ „¶ã ‡ãñŠ 'ãÆã ‡ãðŠãã|ã ‡ãŠ Öããñ|ããò ‡ãñŠ ,ãã£ããÀ 'ãÀ °ãñ ÌãØããò ½ãò ããÌã¼ããã•ã|ã ãã‡ãŠ¾ãã Øã¾ãã ý

1. †ãŠã°ãÃãã¶ã†ãŠ (Organic) 2. ,ã†ãŠã°ãÃãã¶ã†ãŠ (Inorganic)

•ã¶¶ãì,ããò ,ããòÀ Ìã¶ãÔ¹ããã¶ã³⁄⁴ããò (•ããèÌãããÃãè) Ôãñ „¹ãÊã°£ã ¹ãã©ããò
 †ãŠãñ †ãŠã°ãÃãã¶ã †ãŠ ¹ãã©ãÃ ã©ãã Æããã¶ã•ã ¹ãã©ããò, Þã>ã>ã¶ããò,
 ¹⁄⁴ãìÔã¹⁄⁴ãÃ ,ããããª •ãòÔãñ ãã¶ã•ããêÌã Ôãññ|ããò Ôãñ „¹ãÊã°£ã ¹ãã©ããò
 †ãŠãñ ,ã †ãŠã°ãÃãã¶ã †ãŠ ¹ãã©ãÃ †ãŠÔã Øã³⁄⁴ãã •ãòÔãñ - Þããè¶ããè,
 ³⁄⁴ãìããÀ³⁄⁴ãã, †Ê †ãŠãñÔÊã, ããÔãÀ †ãŠã ,ããããª †ãŠã°ãÃãã¶ã †ãŠ
 ³⁄⁴ããòããÔã †ãŠãò †ãñŠ ÌãÔãÃ ¹⁄²ãò |ã©ãã Ôãññãã|³⁄⁴ã¹⁄²ã †ãÊãñÃãÀãfj,
 ÔãfjÊãñ†ãÊãñããÀ†ãŠ ,ã¹⁄²Êã,†ãòŠããÊÔã³⁄⁴ã¹⁄²ã †ãŠã°ããó¶ãñ>,†ãŠã°ãÃãã¶ã
 |ãfÃ ,ããù †ã<Ôããfj ,ããããª ³⁄⁴ããòããÔã †ãŠ ,ã †ãŠã°ãÃãã¶ã †ãŠ
 ³⁄⁴ããòããÔã†ãŠãñã †ãñŠ ÌãÔãÃ ¹⁄²ãò ÀÆãñ Øã³⁄⁴ãñ ý
 Ôã¶ãá 1828 fÃ0 ¹⁄²ãò ÌÙãñÊãÀ ¶ãñ ÔãÌãÃ¹ãÆ©ã¹⁄²ã ¹ãÆ³⁄⁴ããñÔãÌããÊãã
 ¹⁄²ãò †ãŠã°ãÃãã¶ã †ãŠ ³⁄⁴ããòããÔã †ãŠ ``³⁄⁴ãìããÀ³⁄⁴ãã" †ãŠã ÔããÌÊãñÓã¶ã
 ãã †ãŠ³⁄⁴ãã ý ³⁄⁴ãìããÀ³⁄⁴ãã ¹ãÆ³⁄⁴ããñÔãÌããÊãã ¹⁄²ãò °ã¶ã¶ãñ ÌããÊãã ¹ãÔÊãã
 †ãŠã°ãÃãã¶ã †ãŠ ³⁄⁴ããòããÔã †ãŠ Ôõ ý ³⁄⁴ãìããÀ³⁄⁴ãã ,ã¹⁄²ããñãã¶ã³⁄⁴ã¹⁄²ã
 Ôãã³⁄⁴ã¶ãñ> †ãŠãñ Øã¹⁄²ãÃ †ãŠÀ†ãñŠ °ã¶ãã³⁄⁴ãã Øã³⁄⁴ãã ý



³⁄⁴ããñãã¶ã³⁄⁴ã¹⁄²ã Ôãã³⁄⁴ã¶ãñ> ³⁄⁴ãìããÀ³⁄⁴ãã

³⁄⁴ããòããÔã †ãŠãò †ãŠãè †ãŠ °ãüjãè ÔããÆ³⁄⁴ãã †ñÔããè Ôõ, ãã•ã¶ã¹⁄²ãò
 „¹ãããÔ©ãìã |ã|Ìããò ¹⁄²ãò Ôãñ †ãŠ |ã|Ìã †ãŠã°ãÃãã¶ã Ôãñ|ãã Ôõ „¶ã †ãŠãñ
 †ãŠã°ãÃãã¶ã †ãŠ ³⁄⁴ããòããÔã †ãŠ †ãŠÔãñ Ôõý ¹ãÀ¶ãì †ãìŠœ †ãŠã°ãÃãã¶ã
 ³⁄⁴ãì †ã<ã ³⁄⁴ããòããÔã †ãŠ †ãŠã°ãÃãã¶ã †ãŠ ³⁄⁴ããòããÔã †ãŠ †ãñŠ ,ã¶ãÔãÃãã
 ¶ãÔãé ,ãã|ãñ Ôõý •ãòÔãñ CO₂, CO, †ãŠã°ããó¶ãñ>, °ããf †ãŠã°ããó¶ãñ>,
 Ôããf¶ããfj ,ããããªý

†ãìŠœ ,ããòÀ ¹⁄⁴ããè •ãã¶ãñ:

†ãŠã°ãÃãã¶ã ³⁄⁴ãì †ã<ã ³⁄⁴ããòããÔã †ãŠãò †ãŠãñ †ãŠã°ãÃãã¶ã †ãŠ
 ³⁄⁴ããòããÔã †ãŠ |ã©ãã †ãŠã°ãÃãã¶ã ÀããÔã ³⁄⁴ããòããÔã †ãŠãò †ãŠãñ
 ,ã†ãŠã°ãÃãã¶ã†ãŠ ³⁄⁴ããòããÔã†ãŠ ¶ãã¹⁄²ã °ñ†ãŠÀ ÌãÔããè†ãŠÀ¶ã ãã†ãŠ³⁄⁴ãã
 Øã³⁄⁴ããýÔã¹⁄²ãã¶³⁄⁴ãì: Ôã¹⁄⁴ããè †ãŠã°ãÃãã¶ã †ãŠ ³⁄⁴ããòããÔã †ãŠ
 ÔãfÃjÊãñ †ãŠã°ãÃãã¶ã ³⁄⁴ãã „Ôã †ãñŠ Ì³⁄⁴ãì¹ã¶ã¶ã Ôãñ|ãñ Ôõ |ã©ãã
 ¹⁄²ãñ©ãñ¶ã †Ìãã fÔã †ãñŠ Ì³⁄⁴ãì¹ã¶ã¶ãò †ãŠãñ œãñüj †ãŠÀ ÊãÔã¹⁄⁴ãÔã
 Ôã¹⁄⁴ããè †ãŠã°ãÃãã¶ã †ãŠ ³⁄⁴ããòããÔã †ãŠãò ¹⁄²ãò †ãŠã°ãÃãã¶ã- †ãŠã°ãÃãã¶ã
 °ã¶ã Õãñ|ãã Ôõý

†ãŠã°ãÃãã¶ã †ãŠ ³⁄⁴ããòããÔã †ãŠãò †ãŠã ,ã³⁄⁴ã³⁄⁴ã¶ã ÀÔãã³⁄⁴ã¶ã
 ÌããÔã †ãŠãè ãã•ãÔã ÌããÆãã ¹⁄²ãò ãã †ãŠ³⁄⁴ãã •ãã|ãã Ôõ ÌãÔ
 †ãŠã°ãÃãã¶ã†ãŠ ÀÔãã³⁄⁴ã¶ã †ãŠÔÊãã|ããè Ôõ ý

Öäf;Èän†äŠ°äÄ¶ä †ä¼ää Öö ?

†äŠ°äÄ¶ä |ä©ää Öäf;Èän•ä¶ä |ä|läò †änŠ ÄäÖää¼äää¶ä†äŠ Öää¼ääñÖä Öän °ä¶än ¼ääöääÖä†äŠ Öäf;Èän†äŠ°äÄ¶ä †äŠÖÊää|än Öö ý •äöÖän - ½än©än¶ä (CH₄), † ©än¶ä (C₂H₆), † ää©äÊääè¶ä(C₂H₄), †ääÖä»Êääè¶ä(C₂H₂) ,ääää^a ý

1. Öää|äð'ä Öäf;Èän†äŠ°äÄ¶ä

lään Öäf;Èän†äŠ°äÄ¶ä ¼ääöääÖä†äŠ ää•ä¶ä½äò †äŠ°äÄ¶ä- †äŠ°äÄ¶ä †änŠ ½ä£¼ä ††äŠÊä °ä¶ä Öän|ää Öö ,ä©ääÄ|ä †äŠ°äÄ¶ä †äŠäè ÞääÄäö Öää¼ääñ•ä†äŠ|ää†ä ††äŠÊä °ä¶ä 'ää Öää|äð'ä ÄÖääè Öö, Öää|äð'ä Öäf;Èän†äŠ°äÄ¶ä †äŠÖÊää|än Ööý
„^aÖÄ¥ä : ½än©än¶ä (CH₄) †©än¶ä (C₂H₆)

2. ,äÖää|äð'ä Öäf;Èän†äŠ°äÄ¶ä

†ñÖän Öäf;Èän†äŠ°äÄ¶ä, ää•ä¶ä½äò †äŠ°äÄ¶ä- †äŠ°äÄ¶ä 'ä½ää¥äì †änŠ ½ä£¼ä †äŠ½ä Öän †äŠ½ä ††äŠ ää'°ä¶ä ¼ää ää'°ä¶ä „^aääÖ©ä|ä Öän ,äÖää|äð'ä Öäf;Èän †äŠ°äÄ¶ä †äŠÖÊää|än Öö ý „^aÖÄ¥ä : †ää©äÊääè¶ä (C₂H₄) †nääÖä»Êääè¶ä (C₂H₂)

½än©än¶ä (CH₄)

½än©än¶ä, ÖäÄÊä|ä½ä Öäf;Èän†äŠ°äÄ¶ä ¼ääöääÖä†äŠ Öö ý fÖä†änŠ ††äŠ ,ä¥äì ½äò †äŠ°äÄ¶ä †änŠ ††äŠ 'ä½ää¥äì †änŠ Öää©ä ÞääÄä Öäf;Èän•ä¶ä 'ä½ää¥äì •äüñ ÄÖ|än Ööä ý ½än©än¶ä 'äÊä†äðŠää|ä†äŠ ÖäöÖä ,ääöÄ |änÊä †äiŠ'ääò Öän ää¶ä †äŠÊä|än lääÊääè ÖäöÖääò ½äò „^aääÖ©ä|ä Öän|ääè Öö ý ^aÊäÊääè Ö©ää¶äò ½äò 'änü-^aäö£ääò lä ,ä¶¼ä †äŠ°äÄ¶ä †äŠ 'ä©ääò †änŠ Öäü|än Öän „^a¶ä ÖäöÖääò †äŠ ½äì£¼ä Üä» †äŠ ½än©än¶ä ÖäöÖä Öän|ääè Öö ý ½än©än¶ä †äŠän fÖääèääÊä† ½ääläÄ ÖäöÖä ¼ääè †äŠÖ|än Öö ý ½än©än¶ä ,ääöÄ lää¼äì †änŠ ää½äNä¥ä †äŠän 'äÊ•äläääÊä|ä †äŠÄ¶än 'äÄ ¼ä¼ää †äŠÄ ääläÖ'äŠän» Öän|ää Öö ý †äŠän¼äÊän †äŠäè Êää¶äò ½äò ääläÖ'äŠän» Öän¶än †äŠä ¼äÖäè †äŠÄ¥ä Öän|ää Öö ý

†äŠ°äÄ¶ä fÄ£ä¶ä †äŠä ,äälä¼ä†äŠ ,älä¼älä :

Ö½ä °öää¶ä †äŠ •ääèlä¶ä ½äò Êää¶ä 'ä †äŠ¶än †änŠ ääÊä† ^aälä|ä 'än»ÊänääÊä¼ä½ä ÖäöÖä (†Êä0'ääè0•ääè0), Êä †äSüäè, °ää¼ääñÖäöÖä ,ääää^a †äŠä „^a¼ääñÖä fÄ£ä¶ä †änŠ Ä'ä ½äò †äŠÄ|än Ööý fÄ£ä¶ä lään 'ä©ääÄ Öö ää•ä¶äÖän °Öä ää% äŠ¼ää 'ää ...Ö½ää 'äÊä|ä Öän|ääè Ööý ,äää£ä†äŠäälä fÄ£ä¶äò ½äò †äŠ°äÄ¶ä ¼ääöääÖä†äŠ ¼ää |ä|ä Ä'ä ½äò „^aääÖ©ä|ä ÄÖ|ää Ööý fÄ£ä¶ä ...•ää †äŠä 'äÊ½äìÊä Öään|ä Öö ý lä|ä½ää¶ä ½äò ...•ää †äŠäè ½äääÖä †äŠä 'äÊ½äìÊä ääÖÖää fÄ£ä¶ä

‡ãŠãñ •ãÊã‡ãŠÀ 'ãÆã'ã ãã‡ãŠ¾ãã •ãã|ãã Öö ý •ãðÔãñ- ‡ãŠãÀÆãã¶ããò
 ½ãò, Ôãù|‡ãŠ, Ôã½ãì³ |ã©ãã Ìã¾ãì 'ãããÀÌãÖ¶ã ½ãò fÃÆã¶ã Öãè ...ããÃ
 ‡ãñŠ Öãñ|ããò ‡ãñŠ Â'ã ½ãò 'ãÆ¾ãì‡ã<|ã Öãñ|ãã Öö ý Ôã¼ããè fÃÆã¶ã
 •ãðÔãñ -'ãñ>ÊãñÊã, |ãè•ãÊã, ãã½ã>ã>ãè ‡ãŠã |ãñÊã, Êã ‡ãŠù|ãè,
 ‡ãŠãñ¾ãÊãã, ããããª ½ãò ‡ãŠã°ãÃ¶ã ‡ãŠã, ããÌãÌ¾ã‡ãŠã, ãÌã¾ãÌã Öãñ|ãã Ööý
 °öãã¶ã‡ãŠ •ããèÌã¶ã ‡ãñŠ ããÌããã¼ã¶ãã ãã%ãã¾ãã ‡ãŠÊãã'ããò ½ãò ...ããÃ
 ‡ãñŠ Öãñ|ã ‡ãñŠ Â'ã ½ãò fÃÆã¶ã ‡ãŠã, 'ã¾ããñØã ãã‡ãŠ¾ãã •ãã|ãã Ööý
 ãã¶ã½¶ã |ããããÊã‡ãŠã 1.3½ãò, ãããã‡ãŠ|ã ‡ãŠã¾ãÃ ‡ãñŠ Ôã½ããã, Ôã½ãò
 'ãÆ¾ãì‡ã<|ã fÃÆã¶ã ‡ãŠã ¶ãã½ã ããÊãÆãò -

!ãããÊã‡ãŠã -1.3

क्रम संख्या	कार्य/यंत्र	प्रयुक्त ईंधन	क्रम संख्या	कार्य/यंत्र	प्रयुक्त ईंधन
1	खाना पकाना	एलपीजी	5	कार	पेट्रोल/डीजल
2	पानी गर्म करना		6	ट्रैक्टर	
3	चाय बनाना		7	पम्पिंग सेट	
4	जनरेटर		8	थेसर	

fÃÆã¶ã ‡ãñŠ Öãñ|ã ‡ã<¾ãã Öö ?

fÃÆã¶ã ‡ãñŠ, ã¶ãñ‡ãŠ Öãñ|ã Öö ý

1. •ãðÌã 'Ì¾ã½ãã¶ã (°ãã¾ããñ½ããÔã)

Ìã¶ãÔ'ããã|ã¾ããò ‡ã Ìãã •ãã|ãì,ããò ‡ãñŠ ÌãÃãèÀ ½ãò ããÖ©ã|ã 'ãã©ããò
 ‡ãŠãñ •ãðÌã 'Ì¾ã½ãã¶ã ‡ãŠÖ|ãñ Öö, •ãðÔãñ - Êã ‡ãŠù|ãè, ‡ãðŠããÓã
 ,ã'ãããÌãÓ> |ã©ãã Øããñ°ãÀ, ããããª ý ¾ãñ ØããùÌããò ½ãò ùÆãÞãÃ Öãñ|ãñ
 ÌããÊããè ...ããÃ ‡ãŠã, ããããã ‡ãŠããÌã, ããÌã 'ãÆã¶ã ‡ãŠÀ|ãñ Öö ý
 Êã ‡ãŠù|ãè |ã©ãã ‡ãðŠããÓã, ã'ãããÌãÓ>, ããð²ããñããØã ‡ãŠ ÔããÔ©ãã¶ããò
 ½ãò ¼ããè, 'ã¾ããñØã ãã ‡ãŠ¾ãñ •ãã|ãñ Öö, •ãðÔãñ- Øã¶ãñ ‡ãŠãè
 ÆããñfÃ ãã•ãÔãñ 'ãÆã¾ã: ‡ãŠfÃ, ãããñØããò ½ãò °ãã¾ãÊãÃãò ½ãò
 'ãã|ããè Øã½ãÃ ‡ãŠÀ¶ãñ ‡ãñŠ ããÊã¾ãñ •ãÊã¾ãã •ãã|ãã Öö ý

ieÇeCeCe ÜãÃãò ½ãò 'ãÆã¾ã: ÞãÌÊÖãò ½ãò Êã‡ãŠù|ãè •ãÊãã|ãñ Öö ý
 f¶ã ÞãÌÊÖãò ‡ãŠãè °ãã|ãã °ãÖì|ã ‡ãŠ½ã Öãñ|ããè Öö ý, ¶ãÔãñ ‡ãñŠÌãÊã 8%
 ...ããÃ ‡ãŠã Öãè, 'ã¾ããñØã Öãñ 'ãã|ãã Ööý ÌãñÓã fÃÆã¶ã, ã'ãì¥ãÃ °Ö¶ã
 ‡ãñŠ 'ãŠÊãÔìãÂ'ã Æãì,ããù, 'ã¶ã ‡ãŠÀ|ãã Öö •ããñ 'ãÆ¹Ôã¥ã °ãùãã|ãã Öö ý

2. ‡ãŠÞãñ |ãñÊã ‡ãñŠ ‡ãìŠ†ú

f¶ã ‡ãìŠ,ããò 'ãÃã |ãñÊã ¼ãã|ãÃãò Ôãñ 'ãÆã'ã Öãñ|ãñ ÌããÊãñ ‡ãŠÞãñ
 |ãñÊã ‡ãñŠ 'ãÆ¼ãã•ããè, ããÔãÌã¶ã Ôãñ ããÌããã¼ã¶ãã 'ãñ>ÊãñããÊã¾ã½ã
 'ãã©ãÃ fÃÆã¶ã ‡ãñŠ Â'ã ½ãò 'ãÆã'ã Öãñ|ãñ Öö ý

3. †āŠāñ³⁄₄āÊāñ †āŠāè Ąĕāā¶ā

f¶ā Ąĕāā¶āāò Ôāñ fÄĤā¶ā †āñŠ Ā¹ā ½āò 'ā|ĉāĀ †āŠā †āŠāñ³⁄₄āÊāā 'āĤē¹|ā āā†āŠ³⁄₄āā •āā|āā Öö ý

†ā³⁄₄āā fÄĤā¶ā 'āāĉāĀ †āŠāè |āāē¶āāò ,āĬāÔĉāā, āāò ½āò 'āā³⁄₄āñ •āā|āñ Öö ?

- fÄĤā¶ā 'āāĉāĀ †āŠāè |āāē¶āāò ,āĬāÔĉāā, āāò ½āò 'āā³⁄₄āñ •āā|āñ Ööā ý
- Êā † āŠü|āè † āŠā † āŠāñ³⁄₄āÊāā (PāāĀ † āŠāñÊā), 'ā|ĉāĀ † āŠā † āŠāñ³⁄₄āÊāā, Øāāñ°āĀ † āñŠ † āŠ¥|ñ † Ĭāā † āðŠāāŌā ,ā¹āāāĬāŌ> ,āāāā^a ŸāñŌā fÄĤā¶ā Ööā ý
- āā½ā>á>āè † āŠā |āñÊā, |āè•āÊā, 'āñ>ÊāñÊā, ØāðŌāāñÊāāē¶ā, †Ê†āŠāñŌāūÊā ,āāāā^a Ĭā fÄĤā¶ā Öö ý
- Øāāñ°āĀ ØāðŌā, Ĭāā>Ā ØāðŌā (H₂ + CO), † āŠāñÊā ØāðŌā, 'āĤēñ|āĬŌāĀ ØāðŌā (N₂ + CO), 'āĤē † āðŠāā|ā † āŠ ØāðŌā, ³āāĬā|ā 'āñ>ÊāñāāÊā³⁄₄ā½ā ØāðŌā (†Êā0¹āāè0•āāè0), āāāā^a ØāðŌāāè³⁄₄ā fÄĤā¶ā Öö ý

āā%āŠ³⁄₄āā†āŠÊāā¹ā 1.1

fÄ>-¼ā>ā, †āĬŠ½ŌāĀ 'āĀ āā¶āāā½āĀ|ā °āĀ|ā¶ā †āŠāñ 'ā†āŠā¶āñ †āñŠ ŌĉāÊā, Øāāñ°āĀ ØāðŌā 'Êāā¶> † āŠā ¼āĤ½ā¥ā † āŠĀò ý f¶ā½āò 'āĤ³⁄₄āĬ†ā<|ā fÄĤā¶ā †āŠā ,āĬāÊāāñ†āŠ¶ā †āŠĀ†āñŠ ŌāĬPāāè °ā¶āā³⁄₄āñ ý fÄĤā¶ā † āŠā Pā³⁄₄ā¶ā „Ōā † āñŠ „¹ā³⁄₄āāñŌā, ŌāĬāāĬāĤāā ,āāŌā ,āāĬāĬ³⁄₄ā†āŠ|āā 'āĀ āā¶ā¼āĀĀ †āŠĀ|āā Öö, •āðŌāñ -

1. ÜāĀñÊāĬ fÄĤā¶ā

Êā † āŠü|āè, † āŠāñ³⁄₄āÊāā, † āðŠĀāñŌāāē¶ā (āā½ā>>āè † āŠā |āñÊā), ³āāĬā|ā 'āñ>ÊāñāāÊā³⁄₄ā½ā ØāðŌā († Êāū¹āāèū•āāèū), āāāā^a ÜāĀāò ½āò 'āĤ³⁄₄āĬ†ā<|ā Ōāñ¶āñ ĬāāÊāñ ,āĉāĬāā ÜāĀñÊāĬ fÄĤā¶ā Ööāý

2. ,āāð²āāñāāŌā†āŠ fÄĤā¶ā

'āñ>ÊāñÊā, |āè•āÊā, ¶āñ¹ĉāā, † āŠāñ³⁄₄āÊāā, heÇekeâ=eflekeâ iewme (meer.Sve.peer.) ,āāāā^a āāĬāāā¼ā¶ā „²āāñŌāāò ½āò 'āĤ³⁄₄āĬ†ā<|ā ,āāð²āāñāāŌā†āŠ fÄĤā¶ā Ööā ý

3. fâ•ā¶ā fÄĤā¶ā

'āñ>ÊāñÊā, |āè•āÊā, āā½ā>á>āè † āŠā |āñÊā ,āāāā^a āāĬāāā¼ā¶ā 'āĤ † āŠĀĀ †āñŠ fâ•ā¶āāò †āŠāñ PāÊāā¶āñ ½āò 'āĤ³⁄₄āĬ†ā<|ā fâ•ā¶ā fÄĤā¶ā Öö ý

4. Āāū†āñŠ> fÄĤā¶ā

½āñāāĉāÊā Ōāf|Êā•āāē¶ā, ³āāĬā|ā Ōāf|Êāñ•ā¶ā ,āāāā^a •āñ>, Āā†āñŠ> † Ĭāā āā½āŌāāfÊāāò ½āò 'āĤ³⁄₄āĬ†ā<|ā Āāū†āñŠ> fÄĤā¶ā Öö ý

Êã†ãŠüjæè,†ãŠãñ³⁄₄ãÊãã,ØããñªãÀ †ãñŠ †ãŠ¥jñ,†ãðŠããÓã ,ã¹ãããÍãÓ> †Íãã
 'ãñ>ÈãñããÊã³⁄₄ã¹⁄₂ã „¹ããª ,ããããª fÄ£ã¶ã 'ãÀ¹⁄₂'ãÀãØã|ã fÄ£ã¶ã †ãŠÖÊãã|ãñ
 Öö ý f¶ã Ôã¹⁄₄ããè fÄ£ã¶ããò ¹⁄₂ãò †ãŠãªãÃ¶ã ³⁄₄ãã †ãŠãªãÃãã¶ã †ãŠ
 ³⁄₄ããðããØã†ãŠãò †ãñŠ ºÖ¶ã Ôãñ ...Ó¹⁄₂ããè³⁄₄ã ...ããÃ 'ãÆã¹|ã Öãñ|ããè Ööý
 fÄ£ã¶ã †ãñŠ •ãðããÍã†ãŠ Öããñ|ã •ããñ ,ãª Ôã¹⁄₂ãã¹|ã Öãñ ÀÖñ Öú, f¶ã†ãŠã
 ÔããÀãã¥ã ,ããÍãÍ³⁄₄ã†ãŠ Öö ý ...ããÃ †ãñŠ Íãð†ãŠããÊ¹ã†ãŠ Öããñ|ã •ãðÖãñ
 ÔããðÀ ...ããÃ, ããÍã²ãì|ã ...ããÃ, ¶ãããã¹⁄₄ã †ãŠãè³⁄₄ã ...ããÃ ,ãããª †ãŠã
 ¹⁄₄ããè fÄ£ã¶ã †ãñŠ ããÍã†ãŠÊ¹ã †ãñŠ Â¹ã ¹⁄₂ãò 'ãÆ³⁄₄ããñØã ãã†ãŠ³⁄₄ãã •ãã
 ÀÖã Ööý

**¹ãñ>ÈãñããÊã³⁄₄ã¹⁄₂ã, fÄ£ã¶ã |ã©ãã ,ã¶³⁄₄ã „¹ããª †ãŠã
 'ãÆ¹⁄₂ãìÆã Öããñ|ã :**

¹ãð©Íããè †ãñŠ ,ã¶ªÀ †ãŠÀãñüjããñ ÍãÓãÃ 'ãÖÊãñ ¹⁄₄ããðØããñããÊã †ãŠ
 „©ãÊã-¹ãì©ãÊã †ãñŠ 'ãŠÊãÔìãÂ¹ã •ããèìã-ã¶¶ãì ºª Øã³⁄₄ãñ ý ¹⁄₂ãð|ã •ããèìã-
 •ã¶¶ãì ...Ó¹⁄₂ãã, ºªª |ã©ãã „¹ãÆñÀ†ãŠ ãã%ãŠ³⁄₄ãã †ãñŠ 'ãÀã ,ã¹ãÜããã>|ã
 Öãñ †ãŠÀ 'ãñ>ÈãñããÊã³⁄₄ã¹⁄₂ã ¹⁄₂ãò 'ãããÀìããã|ãÃ|ã Öãñ Øã³⁄₄ãñ ý
 'ãñ>ÈãñããÊã³⁄₄ã¹⁄₂ã ããÍããã¹⁄₄ã¶¶ã ÖãfjÈãñ†ãŠãªãÃ¶ããò †ãŠã ãã¹⁄₂ãÑã¥ã Öö
 ý

¹ãñ>ÈãñããÊã³⁄₄ã¹⁄₂ã Íãªª †ãŠãè „¹ããã|ã Êãðãã>¶ã †ãñŠ ºãñ Íãªªãò
 'ãñ>Èã(Petra- Þã>á>ã¶ã)|ã©ãã ,ããñããÊã³⁄₄ã¹⁄₂ã(Oleum- |ãñÊã)Öãñ ÖìfÄ Öö ý
 ³⁄₄ãÖ ¹ãð©Íããè †ãñŠ ¹⁄₄ããè|ãÀ Þã>á>ã¶ããò †ãñŠ ¶ããèÞãñ 'ãã³⁄₄ãã •ãã|ãã Ööý
 ,ã|ã: fÖãñ Æããã¶ã•ã |ãñÊã ¹⁄₄ããè †ãŠÖ|ãñ Ööý ¹ãð©Íããè †ãñŠ ¹⁄₄ããè|ãÀ
 |ãðÀ|ãñ Öì† 'ãñ>ÈãñããÊã³⁄₄ã¹⁄₂ã ¹⁄₄ã¥jãÀãò †ãñŠ Ôãã©ã 'ãÆã³⁄₄ã; ØãðÖã
 †ãŠã † †ãŠ ¹⁄₄ã¥jãÀ ¹⁄₄ããè ããÍã²ã¹⁄₂ãã¶ã Öãñ|ãã Öö, ãã•ãÖãñ
 'ãÆã †ãðŠãã|ã †ãŠ ØãðÖã †ãŠÖ|ãñ Öö, •ããñ ØãðÖããè³⁄₄ã
 ÖãfjÈãñ†ãŠãªãÃ¶ããò †ãŠã ãã¹⁄₂ãÑã¥ã Ööý

†ãìŠœ ,ããðÀ ¹⁄₄ããè •ãã¶ãñ :

□ 'ãñ>ÈãñããÊã³⁄₄ã¹⁄₂ã †ãŠãñ ³Íã Ôããñ¶ãã (Liquid Gold) ¹⁄₄ããè †ãŠÖã •ãã|ãã
 Öö ý Íã|ãÃ¹⁄₂ãã¶ã ³⁄₄ãìØã ¹⁄₂ãò 'ãñ>ÈãñããÊã³⁄₄ã¹⁄₂ã ãã †ãŠÖããè ÀãÓ>È
 †ãñŠ ããÊã† Ôããñ¶ãñ Ôãñ ¹⁄₄ããè ,ããã£ã†ãŠ †ãŠãè¹⁄₂ã|ããè Öö ý ãã†ãŠÖããè
 ¹⁄₄ããè ÀãÓ>È †ãŠãè „¶¶ããã|ã †ãŠã¹ãŠãè Öª |ã †ãŠ fÖã ºãã|ã 'ãÀ
 ãã¶ã¹⁄₄ãÃÀ †ãŠÀ|ããè Öö ãã †ãŠ „Öã †ãñŠ 'ããÖã ãã †ãŠ|ã¶ãã
 'ãñ>ÈãñããÊã³⁄₄ã¹⁄₂ã Ööý †ãðŠããÓã „²ããñØã, ³⁄₄ãã|ãã³⁄₄ãã|ã, ÔããÞããÀ
 ,ããããª ããÍããã¹⁄₄ã¶¶ã †ãŠã³⁄₄ããò ¹⁄₂ãò fÖã †ãŠã „ã³⁄₄ããñØã ,ã¹⁄₄ã¶¶ã
 ¹⁄₂ãÖ|ã¹ã¥ãÃ Ööý

□ 'ãñ>ÈãñããÊã³⁄₄ã¹⁄₂ã „¹⁄₄ãÀãè ÖìfÄ ,ã¹ããñ²ã (ã¹ããÀØã¹⁄₂³⁄₄ã) Þã>á>ã¶ããò
 †ãŠãñ ºãñãã£ã|ã †ãŠÀ 'ãÆã¹|ã ãã †ãŠ³⁄₄ãã •ãã|ãã Öö ý ããÍãÍã †ãŠã

Ôã°ãÔãñ 'ãÖÊãã |ãñÊã ‡ ãîŠ'ã ,ã½ãñããÀ ‡ ãŠã ‡ ãñŠ
 'ãõããÔãÊãîãñãã¶ã¾ãã ½ãõ 1859 fÃ0 ½ãõ Çããñªã Øã¾ãã ý
 □ 1867 fÃ0 ½ãõ ¼ããÀ|ã ‡ ãŠã 'ãÖÊãã |ãñÊã ‡ ãîŠ,ããú ,ãÔã½ã ‡ ãñŠ
 ½ã‡ãŠ‡ãŠ ½ãõ Çããñªã Øã¾ãã ý

'ãñ>ÊãñããÊã¾ã½ã ‡ãŠã Íãññ£ã¶ã

'ãñ>ÊãñããÊã¾ã½ã ØãÔãñ ¼ãîÀñ ÀãØã ‡ãŠã |ãñÊã •ãõÔãã ããÞã‡ãŠ¶ãã
 ‡Ìãã •ãÊã Ôãñ ÖÊ‡ãŠã ³Ìã Ööý ¾ãÖ ,ã¶ãñ‡ãŠ Öãf|Êãñ‡ãŠªã¶ããò ‡ãŠã
 ãã½ãÑã¥ã Ööý 'ãñ>ÊãñããÊã¾ã½ã ‡ãñŠ ããÌããã¼ã¶ã ,ãÌã¾ãÌããò ‡ãŠã
 ‡ãÌã©ã¶ããã ‡ãŠ ãã¼ã¶ã-ãã¼ã¶ã Öãñ|ãã Ööý 'ãñ>ÊãñããÊã¾ã½ã ‡ãŠã
 Íãññ£ã¶ã |ãñÊã Íãññ£ã¶ã ‡ãŠãÀÇãã¶ããò ½ãõ 'ãÆ¼ãã•ããè ,ããÔãÌã¶ã
 ããÌããã£ã 'ããã ãã‡ãŠ¾ãã •ãã|ãã Ööý

‡ãŠÞãñ |ãñÊã ‡ãŠãñ 'ãÆ¼ãã•ã‡ãŠ Ô|ã½¼ã ‡ãñŠ 'ãõªñ ½ãõ ¼ãÀ ‡ãŠÀ
 „Ôãñ 400° ÔãñããÊÔã¾ãÔã |ã ‡ãŠ Øã½ãÃ ‡ãŠÀ|ãñ Öö ý fÔã |ãã'ã 'ãÀ
 'ãñ>ÊãñããÊã¾ã½ã ‡ãñŠ ‡Ô'ãŠãÊ> •ãõÔãñ 'ãÆ¼ãã•ããò ‡ãŠãñ ããñü|‡ãŠÀ
 °ãã‡ãŠãè Ôã½ãÔ|ã 'ãÆ¼ãã•ã ÌããããÔ'ã|ã Öãñ •ãã|ãñ Öö ýfÔã ÌããÔ'ã ‡ãñŠ
 Ý¥|ã Öãñ¶ãñ ‡ãñŠ 'ãÆ%ãã½ã ½ãõ ããÌããã¼ã,ã 'ãÆ¼ãã•ã ãã¼ã,ã ãã¼ã,ã
 |ãã'ã 'ãÀ ³ããÌã|ã Öãñ|ãñ •ãã|ãñ Öö, ãã•ã¶ãÖò 'ãõ©ã‡ãŠ ‡ãŠÀ ããÊã¾ãã •ãã|ãã
 Ööý

'ãñ>ÊãñããÊã¾ã½ã ‡ãñŠ 'ãÆ¼ãã•ããè ,ããÔãÌã¶ã Ôãñ 'ãÆã'|ã Êãã¼ã'ãÆª
 ,ãÌã¾ãÌã fÔã 'ãÆ‡ãŠãÀ Öö- ‡Ô'ãŠãÊ>, 'ãõÀããã'ãŠ¶ã ½ããñ½ã, Ô¶ãñÔ‡ãŠ
 |ãñÊã, |ãè•ãÊã, ‡ãõŠãñÔããè¶ã, 'ãñ>ÊãñÊã, 'ãñ>ÊãñããÊã¾ã½ã fÃ©ãã,
 'ãÆã ‡ãõŠãã|ã ‡ãŠ ØãõÔã ý ‡Ô'ãŠãÊ>, Ô¶ãñÔ ‡ãŠ |ãñÊã |ã©ãã
 'ãõÀããã'ãŠ¶ã ½ããñ½ã ‡ãŠãñ ããñü|‡ãŠÀ ,ã¶¾ã Ôã½ãÔ|ã ,ãÌã¾ãÌã
 ,ããÔã¶ããè Ôãñ 'ãÆ•ÌãããÊã|ã Öãñ Ôã ‡ãŠ|ãñ Öö |ã©ãã ...Ô½ãã „'ã¶ã
 ‡ãŠÀ|ãñ Öö ý f¶ãñ 'ãÆã¾ã: fÃ£ã¶ã ‡ãñŠ Â'ã ½ãõ „'ã¾ããñØã ãã‡ãŠ¾ãã
 •ãã|ãã Öö ý 'ãñ>ÊãñããÊã¾ã½ã ‡ãñŠ 'ãÆ¼ãã•ã ‡ãñŠ „'ã¾ããñØã ‡ãñŠ
 ,ãã£ããÀ 'ãÀ |ããããÊã‡ãŠã 1.4 ‡ãŠãñ 'ãîÀã ‡ãŠÀò -

'ããããÊã‡ãŠã-1.4

क्रमांक	पेट्रोलियम प्रजाज	पेट्रोलियम प्रजाज को प्रयोग करने वाली यस्तुर/मशीनें/वाहन के नाम
1.	पेट्रोल	स्कूल, मोटर साइकिल, मोटरकार
2.	डीजल	
3.	मिट्टी का तेल	
4.	प्राकृतिक गैस	गैसीय ड्रैन, उर्वरक कारखाना
5.	द्विपित पेट्रोलियम गैस	

‡āiŠœ ,āāōÀ ¼āāè •āā¶āñ :

¾āāīāīā ¹āñ>ĒāñāāĒā¾ā½ā ŌāōŌā (†Ēāū ¹āāēū •āāēū) ‡āñŠ āāÀŌāāīā
‡āŠā ¹ā|āā ĒāŌāā¶āñ ‡āñŠ āāĒā† fŌā½āñ ŌāāĒāīāāĒāā ¹ā°ā©āĀ †āā©āĒā
½āÀ ‡āōŠ¹>¶ā (C₂H₅SH) āā½āāāÑā|ā ‡āŠā āā¾āā •āā|āā Ōōý †Ēāū ¹āāēū
•āāēū ½āīĒ³¼ā|ā: ,āāfŌāāñ ³¼āī>ñ¶ā †īāā ¹āĒāñ¹āñ¶ā ŌāōŌāāō ‡āŠā
āā½āÑāŸā Ōāñ|āāē Ōō •āāñ āā‡āŠ Ōā¶ĒāŌāē¶ā Ōāñ|āāē Ōōý

keâesÙeuee (‡āŠāñĒā)

¼āāōŌāāñāāĒā ‡āŠ „©āĒā-¹āī©āĒā ‡āñŠ ¹āŠĒāŌīāĀ¹ā ĒāāĒāāō īāŌāĀ
¹āīīāĀ Ūā¶āñ •āāŌāĒā ¹āō©īāāē ‡āñŠ ,ā¶Ā °ā Ōā¾āñ ý ¾āñ °āñ Ōī †
½āō|ā ¹āñū-¹āāōĒāñ „ĒĒā |āā¹ā †īāā ¹ā°ā ‡āñŠ ¹āĒ¹¼āāīā Ōāñ ‡āŠāñĒā
(¹ā|©āĀ ‡āŠā ‡āŠāñ¾āĒā) ‡āñŠ Ā¹ā ½āō ¹āāāÀīāāā|āĀ Ōāñ Ōā¾āñ
ý keâesÙeuee †‡āŠ •āāēīāāī½ā fĀĒā¶ā Ōō ý ¼āāÀ¹ā ½āō ‡āŠāñ¾āĒāñ
‡āñŠ ¼āŸ|āĀ ½āīĒ³¼ā|ā: āā°āŌāĀ, „ū|āēŌāā, ½āĒ³¼ā¹āĒ°īā |ā©āā
¹āāīĒā½āāē °āŌāāĒā ½āō ¹āā¾āñ •āā|āñ Ōō ý

‡āŠāñ¾āĒāñ ½āō ,āāāĒā ‡āŠāāīā|ā: ‡āŠā°āĀ¶ā, ©āāñ|āē ½āā°āā ½āō
ŌāĒ¹ā<ŠĀ īā ‡āiŠœ ¹āā ¹ā°ā©āĀ (•āueves Jeeuee heoeLe&) Ōāñ|āñ Ōōā ý
¾āŌ |āāē¶ā ½āīĒ³¼ā Ā¹āāō ½āō ¹āā¾āā •āā|āā Ōō ý ¼āīĀā ‡āŠāñ¾āĒāā
(āāĒāŌā¶āāf>), |ā½āĀ ‡āŠāñ¾āĒāā (āā°ā>ūāīāā½ā¶āŌā) |ā©āā
†¶āĒāĒāŌāāf> ý āāīāāā¼ā¶ā ¹āĒ ‡āŠāĀ ‡āñŠ ‡āŠāñ¾āĒāñ ½āō
‡āŠā°āĀ¶ā, °āŪā ¹ā°ā©āĀ |ā©āā ¶ā½āāē ‡āŠāē ½āā°āā āā¼ā¶ā-āā¼ā¶ā
Ōāñ|āāē Ōōý

¼āīĀñ ‡āŠāñ¾āĒāñ (āāĒāŌā¶āāf>) ½āñā 38% ‡āŠā°āĀ¶ā, 19% °āŪā
¹ā°ā©āĀ |ā©āā īāñŌā 43% ¶ā½āāē Ōāñ|āāē Ōō ý †¶āĒāĒāŌāāf> ½āō 96%
‡āŠā°āĀ¶ā, 1% °āŪā ¹ā°ā©āĀ |ā©āā ‡āñŠīāĒā 3% ¶ā½āāē Ōāñ|āāē Ōō ý
āā°ā>ūāīāā½ā¶āŌā ‡āŠāñ¾āĒāā ½āō 65% ‡āŠā°āĀ¶ā Ōāñ|āā Ōō ý ¾āŌ
Ōā°āŌāñ ½āŌ|ā¹āīŸāĀ ‡āŠāñĒā fĀĒā¶ā Ōōý

‡āŠāñ¾āĒāñ Ōāñ ¹āĒā¹ā fĀĒā¶ā

ĒāāñŌñ ‡āñŠ āā>āĀ ½āō ‡āŠāñ¾āĒāñ ‡āŠāñ īāā¾āī ‡āŠāē
,ā¶āī¹āāāŌāāā|ā ½āō Ōā½āĀ ‡āŠā¶āñ ¹āĀ ,āĒāñāāĒāāĒāĒāĒā ¹āĒ¹¼āā•ā
¹āĒā¹ā Ōāñ|āñ Ōō, āā•ā¶ā ‡āŠā „¹ā¾āāñŌā fĀĒā¶ā ‡āñŠ Ā¹ā ½āō
āā‡āŠ¾āā •āā|āā Ōō ý

1. ‡āŠāñĒā¹āāĀ

¾āŌ ‡āŠāĒāñ ĀāŌā ‡āŠā °ā°ā¹āāĀ Ōāāūā ³īā Ōāñ|āā Ōō ý fŌā½āō
°āō•āāē¶ā, >āĒāīfĀ¶ā, ¶āō¹©āĒāāē¶ā, āā¹āŠ¶āāūĒā f|¾āāāā°
‡āŠā°āĀ¶ā‡āŠ ¾āāōāāŌā‡āŠ „¹āāāŌā|ā Ōāñ|āñ Ōō ý

2. ‡āŠāñ‡āŠ

¹a>āĒāñ / °aĴ¹ ‡ āŠ ‡ āŠāē ØāāñĒāāē ‡ āñŠ ,āĴ^aÀ ÀāÔāā³/₄āāāĴā ‡ āŠ
¹a^aāĉāĀ ‡ āñŠ Ôāāĉā °ÔĴāíāāēĒā ¹a^aāĉāĀ ÀĒāā Ôāñ|āā Ôōý fĴā ‡ āñŠ
 Øā¹/₂āĀ ÔāñĴāñ ,āĉāíāā fĴā¹/₂āò ,āāØā ĒāØāāĴāñ ¹aĀ ÀāÔāā³/₄āāāĴā ‡ āŠ

¹ã^aã©ãÃ ,ããù‡ã< Ôããè•ã¶ã „¹ãÊã°fã ‡ãŠÀã|ãñ Öö ãã•ãÔãÔãñ °Ö¶ãíããèÊã
¹ã^aã©ããô ‡ãŠã °Ö¶ã Ôãñ¶ãñ ÊãØã|ãã Ööý °Ö¶ã ‡ãñŠ ¹ãÆ%ãŠ½ã ½ãò
 „¹ã,ã ØãôÔãò ¹ã>ãÊãñ ¾ãã ØããñÊããè ‡ãñŠ ,ããìãÀãã ¹ãÀ ^aã°ã
 ÊãØãã‡ãŠÀ „Ôãñ ããìãÔ¹ã<Šãñ> ‡ãñŠ Ôãã©ã |ããñ|¹ ãñ|ããè Ööý ‡ãŠã°ãÃ¶ã
 ,ããòÀ ‡ãŠã°ãÃ¶ã ¾ãì‡ã<|ã ¾ããôããØã‡ãŠãò ‡ãñŠ °Ö¶ã Ôãñ CO₂ ØãôÔã
 °ã¶ã|ããè Öö •ãñ ÀãØãÖãè¶ã, ØããfãÖãè¶ã ØãôÔã Öö ,ããòÀ Þã¶ãñ ‡ãñŠ
¹ãã¶ããè ‡ãŠãñ ^aíããfã¾ãã ‡ãŠÀ ãñ|ããè Ööý

•ÌãÊã¶ã |ãã¹ã ‡ã<¾ãã Öö ?

ãã•ãÔã |ãã¹ã ¹ãÀ ‡ãŠãñfÃ ¹ã^aã©ãÃ Ìã¾ãì ‡ãŠãè „¹ãããÔ©ããã|ã ½ãò
 •ãÊã¶ãñ ÊãØã|ãã Öö, ÌãÖ „Ôã‡ãŠã •ÌãÊã¶ã |ãã¹ã ‡ãŠÖÊãã|ãã Ööý
¹ãñ>ÊãñÊã ‡ãŠã •ÌãÊã¶ã |ãã¹ã ‡ãŠ½ã Ôãñ¶ãñ ‡ãñŠ ‡ãŠÀãã ÌãÖ •ãÊãè
 ÌããããÓ¹ã|ã Ôãñ‡ãŠÀ ,ããØã ¹ã‡ãŠü Êãñ|ãã Ööý ãã½ã>ã>ãè ‡ãñŠ |ãñÊã ‡ãŠã
 •ÌãÊã¶ã |ãã¹ã ¹ãñ>ÊãñÊã Ôãñ ,ãããfã‡ãŠ Ôãñ¶ãñ ‡ãñŠ ‡ãŠÀãã Öãè „Ôãñ
 Ô>ãñÌã ½ãò ¹ãÆ¾ããñØã ãã‡ãŠ¾ãã •ãã|ãã Ööý

,ããØã ãã‡ãŠÔã ¹ãÆ‡ãŠãÀ °ãìããfÃ •ãã Ôã‡ãŠ|ããè Öö ?

ÛãÀãò, ‡ãŠãÀÊãã¶ããò, Ôããìãã•ãã¶ã ‡ãŠ Ô©ãã¶ããò |ã©ãã Êãñ|ã-
 ÊãããÊãÔã¶ããò ½ãò ,ããØã ÊãØã •ãã¶ãñ ¹ãÀ |ã‡ãŠãÊã ,ããØã °ãìãã¶ãñ
 ‡ãñŠ ããÊã† ,ããããããÊãããÊã|ã „¹ã¾ãã ‡ãŠÀ¶ãñ ÞããããÖ† -

- °Ö¶ãíããèÊã ¹ã^aã©ããô ‡ãŠãñ |ã‡ãŠãÊã Ö>¾ãã •ãã¾ã ý
- ÖÌãã (ããù‡ã<Ôããè•ã¶ã) ‡ãñŠ ¹ãÆÌããÖ ‡ãŠãñ ¾ãã©ãã Ôã½½ãìã
 Àãñ‡ãŠã •ãã¾ã ý
- ,ããØã °ãìãã¶ãñ ÌããÊãñ ¾ãããã Ôãñ ‡ãŠã°ãÃ¶ã |ãfÃ ,ããù‡ã<Ôããf‡ ‡ãŠã
¹ãÆÌããÖ ãã‡ãŠ¾ãã •ãã¾ã ý
- fãìÊã / °ããÊãì |ã©ãã •ãÊã ‡ãŠãñ ,ããØã ¹ãÀ |ãÊãã •ãã¾ã ý
- ¾ããã^a ,ããØã ããìã²ãì|ã ¹ãããÀ¹ã©ã ‡ãñŠ Íãã>Ã Ôããã‡ãŠ> ‡ãñŠ ‡ãŠÀãã
 ÊãØããè Öãñ |ããñ ,ããØã °ãìãã¶ãñ ‡ãŠãè „¹ã¾ããì‡ã<|ã ¹ãÆãã%ãŠ¾ãã
 ‡ãñŠ ¹ãìãã ããìã²ãì|ã Ôã¹ÊããfÃ °ã¶ã ‡ãŠÀ °öý

Íã^{°a}ãìãÊããè

- ãã°ã¶ã Double Bond
- ãã¶ãíÞãñ|ã‡ãŠ Anaesthesia
- ¹ãÆãã|ã•ãôããìã‡ãŠãè Antibiotic
- ¹ãÆ•ÌãããÊã|ã Ignited
- Íããñfã¶ã Purification
- Ôãã|ãð¹ã Saturated
- ÔãìÔãÀ/ÞããÀ‡ãŠãñÊã(‡ãôŠÀã½ãñÊã) Sugar Charcoal
- ãããããìã½ããè¾ã Three Dimensional

ãã`ã°ã¶ã Triple Bond

,ã¹ãÀ¹ã Allotrope

,ãìãíãñÓã Residue

,ããã%ããŠÖ>Êããè³⁄ã Amorphous

,ãã°ã® ‡ãŠŸãñÀ Bound Solid

„¹ããª Product

†‡ãŠÊã °ã¶ã Single Bond

•ìãÀ¶ããíã‡ãŠ Antipyretic

•ãðìã ³ì³⁄ã¹⁄²ãã¶ã Bio-Mass

•ìãÊã¶ã |ãã¹ã Ignition temperature

ªÖ¶ã Combustion

,ã¹⁄³⁄ããÔã ¹ãÆÍ¶ã

1. ãã¶ã¹⁄²¶ãããÊãããÇã|ã ¹ãÆÍ¶ããò ½ãò ÔãÖãè ããìã ‡ãŠÊ¹ã œããù> ‡ãŠÀ
,ã¹⁄³⁄ããÔã ¹ãìããÔ|ã‡ãŠã ½ãò ããÊãããÇã† -

(‡ãŠ) ãã¶ã¹⁄²¶ãããÊãããÇã|ã ¹ãªã©ããò ½ãò Ôãñ ãã ‡ãŠÔã¹⁄²ãò ‡ãŠã°ãÃ¶ã
¶ãÖãé ¹ãã³⁄ãã •ãã|ãã Öã -

(i) ‡ãŠãñ³⁄ãÊãã ½ãò (ii) Þããè¶ããè ½ãò

(iii) Àãñ>ãè ½ãò (iv) ¶ã¹⁄²ã‡ãŠ ½ãò

(Çã) ¹ãÆ‡ãðŠãã|ã ½ãò ‡ãŠã°ãÃ¶ã ¹ãã³⁄ãã •ãã|ãã Öã -

(i) ‡ãñŠìãÊã ½ãì‡ã<|ã ,ãìãÔããã ½ãò (ii) ‡ãñŠìãÊã ³⁄ããðããØã‡ãŠãò ½ãò

(iii) ½ãì‡ã<|ã †ìãã ³⁄ããðããØã‡ãŠªãñ¶ããò ,ãìãÔããã,ããò ½ãò (iv)‡ãñŠìãÊã
,ã¹ã¶ãñ ,ã¹ãÀ¹ããò ½ãò

(Øã) ‡ãìŠãã‡ãŠŠØã ØãðÔã (L.P.G.) ½ãò ãã‡ãŠÔã‡ãŠãè ½ãããã ,ãããã‡ãŠ
Öã - Àã0¹ã0Çããñ0¹ãÀãèãã 2007

(i) ½ãñ©ã¶ã (ii) †ãñ¶ã

(iii) †ãã©ãÊããè¶ã (iv) °³⁄ãì>ñ¶ã

(Üã) ‡ãŠã°ãÃ¶ã ‡ãŠã ãã%ããŠÖ>Êããè³⁄ã Â¹ã Öã - Àã0,ã0,ãã³⁄ã ¹ãÀãèãã
2008

(i) •ã¶ãì ÞããÀ‡ãŠãñÊã (ii) ØãÆñ¹ãŠãf>

(iii) ‡ãŠãñ³⁄ãÊãã (iv) Êã‡ãŠü|ãè ‡ãŠã ÞããÀ‡ãŠãñÊã

2. ããÀ‡ã<|ã Ôããã¶ããò ‡ãŠãè ¹ãìãã|ãÃ ‡ãŠãèãã•ã† -

(‡ãŠ) Ôã¹⁄ããè Ôã•ããèìã |ã©ãã ‡ãìŠœ ãã¶ã•ããèìããò ½ãò
„¹ãããÔã|ã Öã ý

(Çã) ÔãÀÊã|ã¹⁄ã Öãf;Êãñ‡ãŠã°ãÃ¶ã Öã ý

(Øã) Ôã°ãÔãñ ‡ãŠŸãñÀ ¹ãªã©ãÃ Öã ý

(Üã) ¹ãñ>ÊãñÊã fÃã¶ã Öã

(Ý) ¹ãðããÔãÊã ½ãò „¹ãããÔã|ã ‡ãŠãÊãã ¹ãªã©ãÃ Öã ý

6 ûää¶ā½¶āāāÊāāāĈāā¶ā 1āĖĬ¶āāō ½āō PāāÀ-PāāÀ 1ā Ōāōāý1āĖĬ¾āñ‡āŠ
1āĖĬ¶ā ½āō ¶āāē¶ā 1ā āā‡āSŌāāē ¶ā āā‡āSŌāāē Â1ā ½āō †‡āŠ Ōāñ Ōōā
,āāōÀ †‡āŠ 1ā ,ā¾¾ā ¶āāē¶āāō Ōāñ āā1¾ā,ā Ōōý,ā¾¾ā Ōāñ āā1¾ā,ā 1ā

‡ ãŠãè 'ãÖPãã¶ã ‡ ãŠÀ ,ã^{1/4}₄ããÔã 'ãìããÔ|ã ‡ ãŠã ½ãò ããÊãããŒã † -
Ãã0'ãÆ0Œããñ0'ãÀãèããã
(‡ãŠ)û ÖãèÀã, ‡ãŠãñ^{3/4}ãÊãã, •ã¶||ãì PããÀ‡ãŠãñÊã, ‡ãŠã•ãÊã
(Œã) ½ãñ©ã¶ã, fÃ©ãñ¶ã, 'ãÆãñ'ãñ¶ã, f©ãÊããè¶ã
(Øã) †Êã0'ããè0•ããè0 ØãõÔã, 'ãñ>ÊãñÊã, ÿãè•ãÊã, Êã‡ãŠÿãè
(Üã) Œãã¶ãñ ‡ãŠã Ôããñÿã, Pããè¶ããè, Àãñ>ãè, ¶ã^{1/2}ã‡ãŠ
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f‡ãŠãfÃ : 2

**...•ããÃ ‡ãñŠ ¹ãÆã‡ãðŠãä|ã‡ãŠ †lãâ
lãõ‡ãŠãäÊ¹ã‡ãŠ Õãñ|ã**



...•ããÃ ‡ãñŠ äãlããä¹/₄ã¶¶ã Õãñ|ã ý

Õããèãä¹/₂ã|ã ...•ããÃ ‡ãñŠ Õãñ|ã †lãâ ,ãÕããèãä¹/₂ã|ã ...•ããÃ ‡ãñŠ Õãñ|ã ý

lãõ‡ãŠãäÊ¹ã‡ãŠ ...•ããÃ Õãñ|ããð ‡ãŠã äãlã‡ãŠãÕã †lãâ „¹ã³/₄ããñÕã ý

...•ããÃ ‡ãŠãè ,ããlãl³/₄ã‡ãŠ|ãã ý

¹/₂ãã¶ãlã ‡ãŠãè äãlããä¹/₄ã¶¶ã ,ããlãl³/₄ã ‡ãŠ|ãã,ããð •ãðÕãñ - ¹/₂ã ‡ãŠã¶ã, ‡ãŠ¹ãü|ã, ¹/₄ããñ•ã¶ã, ÆñÊã, Õãü|ã‡ãŠ, •ãÊã, lãã³/₄ãì, ¹ãããÀlãÕ¶ã, ÕããPããÀ, ÕãlPã¶ãã ,ããðÀ ¹ãÆÕããÀ¥ã †lãâ ,ã¶³/₄ã ¹/₂ãã¶ãlã ÕããÕãã£ã¶ããð ‡ãñŠ äã¶ã¹/₂ããÀ¥ã †lãâ „¶Õð ‡ãŠã³/₄ãÃ ‡ãŠãÀãè °ã¶ãã¶ãñ ‡ãñŠ äãÊã† ...•ããÃ ‡ãŠãè ,ããlãl³/₄ã ‡ãŠ|ãã Õãñ|ããè Õð ý äãlã—ãã¶ã ,ããðÀ ¹ãÆãð²ããñããÕã ‡ãŠãè ‡ãñŠ äãñãã ¹/₂ãð äãlã ‡ãŠãÕã ‡ãñŠ ¹ãŠÊãÕlãÀ¹ã ‡ãŠãÀÊãã¶ããð, ,ããð²ããñããÕã ‡ãŠ ÕããÕãã¶ããð ¹/₂ãð Õããããã¹ã|ã ¹/₂ãlããè¶ããð ‡ãñŠ ÕããPããÊã¶ã ‡ãñŠ äãÊã† ...•ããÃ ,ããlãl³/₄ã‡ãŠ Õð ý

Õã•ããèlããð ‡ãñŠ °õãã¶ã ‡ãŠ äã %õãã³/₄ãã ‡ãŠÊãã¹ããð †lãâ äãlã²ãì|ã „¹ã ‡ãŠã¥ããð ‡ãñŠ ÕããPããÊã¶ã ¹/₂ãð ...•ããÃ ‡ãŠãè ¹ãÆ¹/₂ãìÊãã ¹/₄ãlãã¹/₂ã‡ãŠã Õãñ|ããè Õð ý

Õã¹/₄ããè Õã•ããèlã, ...•ããÃ ‡ãñŠ ‡ãŠãÀ¥ã Õãè PãÊã¶ãñ, äã¹ãŠÀ¶ãñ, °ãðü|ãñ †lãâ ,ã¶³/₄ã äãlããä¹/₄ã¶¶ã ¹ãÆ‡ãŠãÀ ‡ãñŠ ‡ãŠã³/₄ãÃ ‡ãŠã¶ãñ ¹/₂ãð Õããã¹/₂ã Õãñ|ãñ Õð ý Üããñü|ñ, ...ú, Õãããè ,ãããã° •ãã¶ãlãÀ ...•ããÃ ‡ãñŠ ‡ãŠãÀ¥ã Õãè °ããñçãã ðãñ¶ãñ †lãâ ¹ãããÀlãÕ¶ã ‡ãñŠ ‡ãŠã¹/₂ã ,ãã|ãñ Õð ý

Õã•ããèlããð ‡ãŠãè ...•ããÃ ‡ãŠã Õãñ|ãã ‡ãã³/₄ãã Õð ?

Õã•ããèlããð ‡ãŠãè ...•ããÃ ‡ãŠã ¹ãÆ¹/₂ãìÊã Õãñ|ãã ¹/₄ããñ•ã¶ã Õð ý Õã¹/₄ããè •ã¶ãì ,ã¹ã¶ãñ ¹/₄ããñ•ã¶ã ‡ãñŠ äãÊã† ¹ãÆ³/₄ããã ³/₄ãã ¹ãÀãñãã Æ¹ã ¹/₂ãð ¹ãñü|ã¹ããð£ããð ¹ãÀ äã¶ã¹/₄ãÃ Õãñ|ãñ Õðý ¹ãñü|ã¹ããð£ãñ ¹/₄ããñ•ã¶ã °ã¶ãã¶ãñ ‡ãñŠ äãÊã† ...•ããÃ ‡ãŠã „¹ã³/₄ããñÕã Õãl³/₄ãÃ Õãñ ‡ãŠã|ãñ Õðý

½ãããÔããÖãÀãè •ã¶|ãì,ããò ‡ ãŠã ¼ããñ•ã¶ã ããìããã¼ã¶¶ã ¹ãÆ ‡ ãŠãÀ ‡ ãñŠ
•ã¶|ãì Öãñ|ãñ Ööý

...•ããÃ ‡ ãŠãè ,ããìãì³¼ã ‡ ãŠ|ãã,ããò ‡ ãŠãè ¹ãìãã|ãÃ ãã ‡ ãŠ¶ã Öããñ|ããò Öãñ
Öãñ|ããè Öö ? ,ããf† Ö½ã ...•ããÃ ‡ ãñŠ ããìããã¼ã¶¶ã Öããñ|ããò ‡ ãñŠ ¹ããÀñ
½ãò ããìãããÀ ‡ ãŠÀ|ãñ Öö-

1. Ôãî³¼ãÃ :- ...•ããÃ ‡ ãŠã Öããñ|ã Öö ý

ãã%ãŠ³¼ãã ‡ ãŠÊãã¹ã 2.1

,ããf† ‡ ãìŠœ Ôã½ã³¼ã ‡ ãñŠ ããÊã† Ö½ã Ôã¼ããè ãã¹ã ½ãò Æãüñ Öãñ|ãñ
Ööý ý ‡ ãòŠÔãã ,ã¶|ãì¼ãìã Öãñ|ãã Öö ? Ö½ã Øã½ããè (ãã¹ã) ‡ ãŠã ,ã¶|ãì¼ãìã
‡ ãŠÀ|ãñ Ööý

ãã¹ã ½ãò •ãÊã Öãñ ¼ãÀãè ¹ããÊãè ÀÆã¶ãñ ¹ãÀ ‡ ã<³¼ãã Öãñ|ãã Öö ?

ØããèÊãñ ‡ ãŠ¹ãüñ, ØããèÊããè Êã‡ãŠüãè †ìãã ¶ã½ã ìãÔ|ãì,ããò ‡ ãŠãñ ãã¹ã
½ãò ÀÆãò |ããñ ‡ ã<³¼ãã Öãñ|ãã Öö ?

Ôã¼ããè ìãÔ|ãì†ú ÔãìÆã •ããããè Öö ý

ÔãìÆã¶ãñ ‡ ãŠãè ãã%ãŠ³¼ãã ½ãò ¶ã½ããè ‡ ãŠÖãú ÞãÊããè •ããããè Öö ?
ìããÓ¹ããè‡ãòŠ|ã Öãñ‡ãŠÀ ìãã³¼ãì ½ãò ãã½ãÊã •ããããè Öö ý

**Ôãî³¼ãÃ Öãñ ¹ãÆ ‡ ãŠãìã ‡ ãñŠ Ôãã©ã-Ôãã©ã ...Ó½ããè³¼ã ...•ããÃ
¼ããè ¹ãÆã¹ã Öãñ|ããè Ööý**

fÔãÖãñ ããÔã® Öì,ãã ãã ‡ ãŠ Ôãî³¼ãÃ Öãñ ¹ãÆã¹ã Öãñ¶ãñ ìããÊããè ...
Ó½ãã ‡ ãñŠ ‡ ãŠãÀã Öãè ìãã³¼ãì Øã½ãÃ Öãñ ‡ ãŠÀ ...¹ãÀ „ÿ|ããè Ööý
,ããÔã-¹ããÔã ‡ ãŠãè ÿããè ìãã³¼ãì ¹ãÃ „Ôã ‡ ãŠã Ô©ãã¶ã Êãñ¶ãñ ‡ ãñŠ
‡ ãŠãÀã ìãã³¼ãì ¹ãÆìããÖ ¹ã¶|ãã Ööý ,ãã: ìãã³¼ãì ...•ããÃ ‡ ãŠã ‡ ãŠãÀã
Ôãî³¼ãÃ ‡ ãŠãè ...•ããÃ Öãè Ööý Ôã½ãì³ãò, çããèÊããò ìã ¶ããã³¼ããò ‡ ãŠã
•ãÊã Ôãî³¼ãÃ ‡ ãŠãè ...Ó½ãã Öãñ Øã½ãÃ Öãñ‡ãŠÀ ìããÓ¹ã ‡ ãñŠ Â¹ã ½ãò
...¹ãÀ „ÿ|ãã Öö ãã•ãÔãÖãñ ¹ããÊããò ‡ ãŠã ãã¶ã½ãããã Öãñ|ãã Ööý ÿãã
Öãñ¶ãñ ¹ãÀ ¹ããÊã ìãÔããÃ ¾ãã ããÖ½ã¹ãã ‡ ãñŠ Â¹ã ½ãò ¹ãì¶ã: •ãÊã †ìãã
¹ããŠ ‡ ãñŠ Â¹ã ½ãò ¹ããÊã •ãããñ Ööý

Ôãî³¼ãÃ ‡ ãñŠ ¹ãÆ ‡ ãŠãìã ‡ ãŠãè „ãããÔ©ãããã ½ãò ¹ãÆ ‡ ãŠãìã
ÔããìÊãñÓãã ‡ ãŠãè ãã%ãŠ³¼ãã ¹ãÀ ¹ãñü-¹ããòãñ ,ã¹ã¶ã ¼ããñ•ã¶ã
¹ã¶ããñ Ööý fÔã ¹ãÆãã%ãŠ³¼ãã ½ãò ¹ã¶ãñ ¾ããòããØã‡ãŠãò ½ãò Ôãî³¼ãÃ
‡ ãŠãè ...•ããÃ ÀãÔãã³¼ãã¶ã ‡ ãŠ ...•ããÃ ‡ ãñŠ Â¹ã ½ãò Ôããããããã Öãñ
•ããããè Ööý fÔã ¹ãÆ ‡ ãŠã ¹ãñü-¹ããòãñ ‡ ãñŠ ããìããã¼ã¶¶ã ¼ããØããò
½ãò Ôãî³¼ãÃ ‡ ãŠãè ...•ããÃ ÀãÔãã³¼ãã¶ã ‡ ãŠ ...•ããÃ ‡ ãñŠ Â¹ã ½ãò
Ôããããããã ÀÖ|ããè Öö ý ¹ãñü-¹ããòãñ Ö½ããñ ¼ããñ•ã¶ã ‡ ãñŠ Öããñ|ã
Öãñ¶ãñ ‡ ãñŠ ‡ ãŠãÀã ¹ãÃããã ½ãò Ôãî³¼ãÃ Ö½ããñ ¼ããñ•ã¶ã Öãñ
¹ãÆã¹ã Öãñ¶ãñ ìããÊããè ...•ããÃ ‡ ãŠã ½ãìÆ³¼ã Öããñ|ã Ööý Êã‡ãŠüãè †ìãã

Øãññ°ãÀ ‡ãñŠ ‡ããŠjñ ¼ããè ...•ããÃ ‡ãñŠ Õãññ|ã Ööý Êã‡ãŠüjãè Ìã ‡ããŠjñ
 ½ãò ¼ããè Õãññ¼ãÃ ‡ãŠãè ...•ããÃ (ÕããòÀ ...•ããÃ) ÀãÕãã¾ããã‡ã ‡ãŠ ...
 •ããÃ ‡ãñŠ Â¹ã ½ãò ÕããããPã|ã Öãññããè Öö ý f‡Öò •ãÊãã‡ãñ 'ãÀ ÕããããPã|ã
 ...•ããÃ, 'ãÊ‡ãŠãÌã †Ìãã ...Ó½ãã ‡ãñŠ Â¹ã ½ãò ½ãì‡ã<|ã Öãññããè Öö ý
 Õìãã,ããò ‡ãŠã PãÊã‡ãã †Ìãã ÌãÕããÃ ‡ãŠã Öãñ‡ãã ãã‡ãŠÕã‡ãñŠ ‡ãŠãÀãã
 Õã½¼ãÌã Öö ?

Õìãã,ããò ‡ãŠã PãÊã‡ãã ¾ãã ÌãÕããÃ ‡ãŠã Öãñ‡ãã Õãñ¾ãÃ ‡ãŠãè ...•ããÃ
 (ÕããòÀ ...•ããÃ) ‡ãñŠ ‡ãŠãÀãã ÕãÊ¼ãÌã Ööý
 „¹ã¾ãìÃ‡ã<|ã „ãÖãããò Õãñ Õ¹ãÓ Öö ãã‡ãŠ -

**ÕããòÀ ...•ããÃ Õã•ããèÌããò ‡ãñŠ •ããèÌã‡ã ‡ãñŠ ããÊã† ‡ãŠ
 ,ããã‡ãÌã¾ãÃ ,ããÌãÌ¾ã‡ãŠ'ãã Öö ý**

2. fÄfã‡ã :-

•ããñ 'ããã©ãÃ °Ö‡ã ‡ãŠãè ãã %ãã ¾ã¾ãã 'ãÀã ...•ããÃ 'ãÊãã‡ã ‡ãŠã|ãñ
 Öö, fÄfã‡ã ‡ãŠÕÊãã|ãñ Öö ý °Ö‡ã ãã %ãã ¾ã¾ãã 'ãÀã fÄfã‡ã, ...Ó½ãã
 †Ìãã 'ãÊ‡ãŠãÌã „¹ã‡‡ã ‡ãŠã|ãñ Öö ý Êã‡ãŠüjãè, •ã‡ãì,ããò ‡ãñŠ Øãññ°ãÀ
 ‡ãñŠ ‡ããŠjñ, ‡ãŠãñ¾ãÊãã, ãã½ã>ã>ãè ‡ãŠã |ãñÊã, 'ãñ>ÈãñÊã, jãè•ãÊã,
 ¾ããÌã|ã 'ãñ>ÈãñããÊã¾ã½ã ØãòÕã, °ã¾¾ãñØãòÕã ,ãããã fÄfã‡ã ‡ãñŠ
 „ãÖããã Öö ý

Ìã|ã½ãã‡ã ½ãò ¼ããñ•ã‡ã 'ã‡ãŠã‡ãñ Ìã ,ã‡ãñ‡ãŠ ‡ãŠã¾ããò Õñ|ãì ...•ããÃ
 ‡ãñŠ Õãññ|ã ‡ãñŠ Â¹ã ½ãò ‡ãŠãññüjãò >‡ã Êã‡ãŠüjãè |ã©ãã ‡ããŠjãñã
 ‡ãŠã „¹ã¾ããñØã ãã‡ãŠ¾ãã •ãã|ãã Öö ý fÕã‡ãñŠ ããÊã† „‡‡ã|ã PãÊÖñ
 ããÌã‡ãŠããÕã|ã ãã‡ãŠ¾ãñ Øã¾ãñ Öö (ããPãã 2.1)ý



ããPãã Õããã0 2.1 ,ãããããã‡ã‡ãŠ PãÊÖã

‡ãŠãñ¾ãÊãã ¼ããè ‡ãŠ 'ãÀ½¹ãÀãØã|ã fÄfã‡ã Öö ý
 ÌãÕããò ,ããòÀ ‡ãŠÕããò ½ãò ¼ããñ•ã‡ã 'ã ‡ãŠã‡ãñ ‡ãñŠ ããÊã† ³Ìã
 'ãñ>ÈãñããÊã¾ã½ã ØãòÕã (L.P.G.) ‡ãŠãñ ÊããñÕñ ‡ãñŠ ããÕãããÊã‡ãÀãò
 ½ãò ¼ãÀ ‡ãŠÀ ¼ãñ•ãã •ãã|ãã Ööý fÕãÕãñ ¼ããñ•ã‡ã 'ã ‡ãŠã‡ã
 ÕãìããÌããã•ã‡ã ‡ãŠ Öãññãã Öö ý ¼ããñ•ã‡ã °ãÖìã ‡ãŠ½ã Õã½¾ã ½ãò
 'ã‡ãŠ •ãã|ãã Öö ý fÕã‡ãñŠ 'ãÊ¾ããñØã Õãñ Ìã¾ãì ½ãò 'ãÊ¹Õããã ‡ãÖãè
 Öãñ|ãã Öö ý

•ãŋlãĀn>À, ½ãān>À ‡ ãŠãÀ, °ãÔã, ½ãān>À Ôããfãã ‡ ãŠÊã, >È ‡ ãŠ, ĀnĒãØãāüjãè, ĩãã³⁄⁴ãĩ³⁄⁴ããŋlã ‡ ãñŠ PãĒããŋlã ½ãò 'ãñ>ĒãñããĒã³⁄⁴ã½ã, „lãã³⁄⁴ãò (jãè•ãĒã / ãã½ã>á>ãè ‡ ãŠã |ãñĒã / 'ãñ>ĒãñĒã) ‡ ãŠã „lã³⁄⁴ããñØã ãã ‡ ãŠ³⁄⁴ãã •ããlãã Öö ý Ôã¹⁄⁴ããè 'ããĀĬãÖŋlã ‡ ãñŠ Ôããfãŋlã ½ãĩĒ³⁄⁴ã Ā¹ã Ôãñ 'ãñ>ĒãñããĒã³⁄⁴ã½ã „lãã³⁄⁴ãò 'ãĀ Öãè ããŋlã¹⁄⁴ãĀĀ Öö ý
Ôã¹⁄⁴ããè 'ãĒãŠãĀ ‡ ãñŠ fĀfãŋlã ...•ããĀ ‡ ãñŠ Ôããñlã Öö ý

3. ãĬlã²ãĩlã ...•ããĀ :-

ŪãĀãò, °ã<lãĀãò ½ãò 'ãĒ ‡ ãŠãĬã „lãŋlã ‡ ãŠĀŋlã ½ãò, ‡ ãŠãĀĒããŋlããò ½ãò, ½ãĬããèŋlããò ‡ ãŠãñ PãĒããŋlã ½ãò, 'ãĀĒãã, ãã¹ãĒŠ•ã, >ãèŌĬããèŌ, ‡ ãĩŠĒãĀ ,ãããã³⁄⁴ãò ãã ‡ ãŠÔã 'ãĒ ‡ ãŠãĀ ‡ ãŠãè ...•ããĀ ‡ ãŠã „lã³⁄⁴ããñØã Ôãñlãã Öö ? ãĬlã²ãĩlã ...•ããĀ ‡ ãŠã „lã³⁄⁴ããñØã ãã ‡ ãŠ³⁄⁴ãã •ããlãã Öö ý
lãã¹ã ãĬlã²ãĩlã 'ãĬlãĀ 'Ēããŋlã, •ãĒã ãĬlã²ãĩlã 'ãĬlãĀ 'Ēããŋlã, ŋlãããã¹⁄⁴ã ‡ ãŠãè³⁄⁴ã ...•ããĀ 'ãĬlãĀ 'Ēããŋlã Ôãñ ãĬlã²ãĩlã ...•ããĀ 'ãĒã¹lã Ôãñlããè Öö ý ³⁄⁴ãñ 'ãĬlãĀ 'Ēããŋlã ãĬlã²ãĩlã ...•ããĀ „lã,ã ‡ ãŠĀŋlã ‡ ãñŠ ããĒã ‡ ãã ‡ ããã¹⁄⁴ã,ã 'ãĒ ‡ ãŠãĀ ‡ ãŠãè ...•ããĀ „lã³⁄⁴ããñØã ‡ ãŠĀŋlã Ööý fŋlã¹⁄⁴ãò ‡ ãŠãñ³⁄⁴ãĒãñ lã©ãã jãè•ãĒã ‡ ãŠãè ĀãÔãã³⁄⁴ãããŋlã ‡ ãŠ ...•ããĀ, °ãÖlãñ •ãĒã lã©ãã 'ãĬlãŋlã ‡ ãŠãè Øãããlã•ã ...•ããĀ, ŋlãããã¹⁄⁴ã ‡ ãŠãè³⁄⁴ã ãĬlãĒĒãŋlã Ōãñ „lã,ã ...•ããĀ •ãöŌãñ ...•ããĀ Ōããñlããò ‡ ãŠã „lã³⁄⁴ããñØã ‡ ãŠĀŋlã Ööý
,ããfãĬããŋlã ‡ ãŠ 'ãĒããö²ããñããØã ‡ ãŠ ŌããŌããŋlããò ½ãò ãĬlããã¹⁄⁴ãŋlã 'ãĒ ‡ ãŠãĀ ‡ ãŠãè ½ãĬããèŋlããò ‡ ãŠãñ PãĒããŋlã ½ãò, ĀnĒãØãāüjãè ‡ ãñŠ fã•ãŋlã PãĒããŋlã ½ãò, ‡ ãöŠããŌã ããŌãPããfĀ ‡ ãñŠ ããĒã ‡ „lã³⁄⁴ããñØã ½ãò ,ããŋlã ĩããĒãñ ŋlãĒã ‡ ãĩŠ¹ã ½ãñn>Āãò ½ãò jã©ãã ŌãĩPãŋlã 'ãĒãö²ããñããØã ‡ ãŠãè ‡ ãŠãè ãĬlããã¹⁄⁴ãŋlã ½ãĬããèŋlããò ‡ ãŠãñ PãĒããŋlã ½ãò ãĬlã²ãĩlã ...•ããĀ ‡ ãŠã „lã³⁄⁴ããñØã ,ãl³⁄⁴ãããfã ‡ ãŠ ½ããã ½ãò ãã ‡ ãŠ³⁄⁴ãã •ãĀ ĀÖã Öö ý
°ããŋlã ‡ ãŠ •ããèĬãŋlã ‡ ãŠãè ãĬlããã¹⁄⁴ãŋlã ,ãĬlãĬ¹⁄⁴ã ‡ ãŠlãã,ããò ‡ Ĭãã ãã % ãŠ³⁄⁴ãã ‡ ãŠĒãã¹ããò ½ãò ...•ããĀ ,ãã¹ãĬãlãĀ ‡ ãŠã 'ãĒ¹⁄⁴ãĩĒã Ōããñlã ãĬlã²ãĩlã ...•ããĀ Öö ý

4. °ãã³⁄⁴ããñØãöŌã :-

•ããèĬã-•ãŋlãĩ,ããò ‡ ãñŠ ,ãĬlãñŌã 'ãã©ããò, ½ãĒã¹⁄⁴ãĩã, Øããñ°ãĀ, ‡ ãĩŠüjã- ‡ ãŠPãĀã ½ãò ĀãŌãã³⁄⁴ãããŋlã ‡ ãŠ ...•ããĀ ŌããããPãlã Ōãñlããè Öö ý Øããñ°ãĀ ‡ ãŠãñ ŌãĩĒãã ‡ ãŠĀ „Ōãñ •ãĒããŋlã Ōãñ ½ãĩĒ³⁄⁴ãlã: ...Ō¹⁄⁴ãã ‡ ãñŠ Ā¹ã ½ãò ...•ããĀ „lãŋlã Ōãñlããè Öö lã©ãã fãĩ,ããú ¼ããè ,ãããfã ‡ ãŠ ½ããã ½ãò „lãŋlã Ōãñlãã Öö, ãã•ãŌãŌãñ ĩãã³⁄⁴ãĩ½ãŋlãĒã ½ãò 'ãĒ¹⁄⁴ãĩĒã ¼ããè °ãüŋlãã Öö ý ,ãlã: ‡ ããŠjãò ‡ ãŠã „lã³⁄⁴ããñØã ³⁄⁴ã©ãã Ōã¹⁄⁴ãĬã ‡ ãŠ¹⁄⁴ã ãã ‡ ãŠ³⁄⁴ãã •ããŋlã PããããŌ ‡ ý

Øãññ°ãÀ Ôãñ ...•ããÃ ¹ãÆã¹|ã ‡ãŠÀ¶ãñ ‡ãŠã ¹ÔãÀã Ôãã£ã¶ã Øãññ°ãÀ
ØãðÔã ¹Êã¶¶ Öö ý Øãññ°ãÀ ØãðÔã ¹Êã¶¶ Ôãñ „¹ã¶¶ã
ØãðÔã, °ãã³⁄⁴ããñØãðÔã ‡ãŠÖÊã|ããè Ööý

¼ããñ•ã¶ã ¹ã‡ãŠã¶ãñ, Ôãü|‡ãŠ ‡ãñŠ ãã‡ãŠ¶ããÀñ Ìã ÜãÀãð ½ãð ¹ãÆ‡ãŠãÌã
„¹ã¶¶ã ‡ãŠÀ¶ãñ Ìã ãã•ã¶ã ÞãÊãã¶ãñ ‡ãñŠ ããÊã† ãÆã¶ã ‡ãñŠ Âã ½ãð
°ãã³⁄⁴ããñ ØãðÔã ‡ãŠã „¹ã³⁄⁴ããñØã ãã‡ãŠ³⁄⁴ãã •ãã|ãã Öö ý ¼ããÀ|ã ½ãð °ãÖì|ã
„ããã£ã‡ãŠ Ôãã£³⁄⁴ãã ½ãð °ãã³⁄⁴ããñ ØãðÔã Ôãã³⁄⁴ããã Ôãããã¹ã|ã ãã‡ãŠ†
•ãã Þãì‡ãñŠ Ööý

Øãññ°ãÀ, ½ãÊã½ãñã Ìã ‡ãðŠããÓã „ã¶ãì¹ã³⁄⁴ããñØããè ¹ãã©ããð ‡ãŠã
„¹ã³⁄⁴ããñØã °ãã³⁄⁴ããñØãðÔã „¹ã¶¶ã ‡ãŠÀ¶ãñ ½ãð ãã‡ãŠ³⁄⁴ãã •ãã³⁄⁴ãã |ããñ
„ããã£ã ‡ãŠ|ã½ã Øããü|ããð ½ãð ...•ããÃ ‡ãŠãè ‡ãŠ½ããè ‡ãŠãè ¹ãñã|ãÃ
Ôã½⁄⁴ãÌã Ôãñ Ôã‡ãŠ|ããè Öö ý

½ãÊã½ãñã, Øãññ°ãÀ „ãããã ¼ããè ...•ããÃ ‡ãñŠ Ôããñ|ã Öö ý

**Ôããèãã½ã|ã ...•ããÃ ‡ãñŠ Ôããñ|ã †Ìãã „ãÔããèãã½ã|ã ...•ããÃ
‡ãñŠ Ôããñ|ã :-**

¹ã|ãÀ ‡ãŠã ‡ãŠãñ³⁄⁴ãÊãã †Ìãã ¹ãñ>ÈãñããÊã³⁄⁴ã½ã „¹ããã •ãðÔãñ |ãè•ãÊã,
¹ãñ>ÈãñÊã, ãã½ã>ããè ‡ãŠã |ãñÊã, ¹ãÆã‡ãðŠãã|ã‡ãŠ ØãðÔã „ãããã ...•ããÃ
‡ãñŠ †ñÔãñ Ôããñ|ã Öö ãã•ã¶Öö ¹ãì¶ã: ¶ãÖãé ¹ãÆã¹|ã ãã‡ãŠ³⁄⁴ãã •ãã
Ôã‡ãŠ|ãã Öö ‡ã<³⁄⁴ããðãã ‡ãŠ ã¶ã ‡ãñŠ ãã¶ã½ããÃ¶ã ½ãð ‡ãŠÀãñü|ãñã
ÌãÓãÃ ÊãØã|ãñ Ööý ³⁄⁴ãñ ¹ãì¶ã: ¶ã ¹ãÆã¹|ã Öãñ¶ãñ ÌããÊãñ ...•ããÃ ‡ãñŠ
Ôããñ|ã Ööý

„ã©ããÃ|ã ³⁄⁴ãñ ...•ããÃ ‡ãñŠ Ôããèãã½ã|ã Ôããñ|ã (DeveJeerkeâjCeerÙe
meÇesle) Ööý

¹ãñü|ã-¹ããð£ããð ‡ãñŠ ¹ãð©Ìããè ‡ãñŠ „ã¶ã ØãÖããã ãÆã ½ãð °ãã •ãã¶ãñ ‡ãñŠ
¹ãŠÊãÔìã¹ã „ãü ‡ã<Ôããè•ã¶ã ‡ãŠãè „ã¶ãì¹ãããÔããã|ã ½ãð Êãã£ããð
‡ãŠÀãñü|ãð ÌãÓããð ‡ãñŠ ¹ãÌÞãã|ãã ‡ãŠãñ³⁄⁴ãÊãñ ‡ãŠã ãã¶ã½ããÃ¶ã Ôãñ|ãã
Öö ý ‡ãŠãñ³⁄⁴ãÊãã ‡ãìŠœ ¹ã©ãÀãèÊãñ ¹ãã©ãÃ †Ìãã ‡ãŠã°ãÃ¶ã ‡ãñŠ
•ããã>Êã ³⁄⁴ããðããØã‡ãŠãñã Ôãñ °ã¶ãã Öãñ|ãã Ööý ãÆãè ¹ãÆ‡ãŠãÀ •ããèÌã
•ã¶ãì,ããð ‡ãñŠ „ãìãÌãñÓããð ‡ãñŠ ¼ãñãã½ã „ã©ãÌãã •ãÊã ‡ãñŠ ¶ããèÞãñ °ãã
•ãã¶ãñ ¹ãÀ Êãã£ããð ÌãÓããð ½ãð ¹ãñ>ÈãñããÊã³⁄⁴ã½ã °ã¶ã|ãã Ööý
¹ãñ>ÈãñããÊã³⁄⁴ã½ã ‡ãñŠ „ããã£ã‡ãŠããÌã ¼ãã|ãÀ ©ãÊã |ã©ãã Ôã½ãì³ ‡ãŠãè
|ãÊããè Ôãñ ‡ãŠ ãÆã Ö•ããÀ ½ããè>À ‡ãŠãè ØãÖããã ãÆã ¹ãÀ ¹ãã³⁄⁴ãñ •ãã|ãñ Ööý
ã¶ã ¼ãã¶ãÀãð Ôãñ ¹ãñ>ÈãñããÊã³⁄⁴ã½ã ãã¶ã‡ãŠãÊã¶ãñ ‡ãñŠ ããÊã† ‡ãìŠ†ã
°ã¶ã³⁄⁴ãñ •ãã|ãñ Ööãý ¹ãñ>ÈãñããÊã³⁄⁴ã½ã Ôãð‡ãSü|ãð ÖããÊã‡ãŠã°ãÃ¶ã
‡ãŠã ãã½ãÑã¶ã Ôãñ|ãã Öö ý „ãÔãÌã¶ã ããÌããã£ã ¹ãÀ ¹ãñ>ÈãñããÊã³⁄⁴ã½ã
Ôãñ ãã½ã>ããè ‡ãŠã |ãñÊã, ¹ãñ>ÈãñÊã, |ãè•ãÊã „ãããã ¹ãÆã¹|ã ‡ãŠÀ|ãñ Öö ý

‡ aŠāñ³⁄₄āĒā † İāā 'āñ>ĒāñāāĒā³⁄₄ā¹⁄₂ā „¹āā°āò ‡ aŠāñ •āāèİāİ¹⁄₂ā
fĀĤā¶ā ¼āāè ‡ aŠÖ|āñ Ööó ý İā|āĀ¹⁄₂āā¶ā ½āñò ½āā¶āİā ‡ aŠāè ĒāÖā¹⁄₄āÖā
 80% **fĀĤā¶ā** ‡ aŠāè 'āīāā|āĀ •āāèİāİ¹⁄₂ā **fĀĤā¶ā** ‡ aŠĀ|āñ Ööó ý
 •ā¶āÔāĀĒ³⁄₄āā °āü¶āñ ‡ āñŠ 'āāĀĀāā¹⁄₂āÔİāĀ¹ā ‡ aŠāñ³⁄₄āĒā † İāā
 'āñ>ĒāñāāĒā³⁄₄ā¹⁄₂ā „¹āā°āò ‡ aŠāè ½āāúÖā |āñ•āāè Ôāñ °āü¶āāè •āā ĀÖāè
 Ööó **fĀĤā¶ā** ‡ āñŠ **f¶ā** Ôāñ|āāò ‡ āñŠ Ôā¹⁄₂āā¹|ā Öāñ •ā¶āñ 'āĀ **f¶ā** Ööó 'āī¶ā:
 'āĒā¹|ā ‡ aŠĀ¶āā Ôā¹⁄₂¼āİā ¶āÖāè Ööó ý **f¶ā** ‡ āñŠ ĒāÖāā|āāĀ 'āĒ³⁄₄āāñÖā
 Ôāñ ...•āāĀ Ôāā ‡ aŠ> ‡ aŠāè † ‡ aŠ ¼ā³⁄₄āāİāÖ āāÖ©āāā|ā „¹ā¶ā Öāñ
 Ôā‡aŠ|āāè Ööó ,āāāĀ|ā ¾āñ ...•āāĀ ‡ āñŠ **Ôāāèāā¹⁄₂ā|ā Ôāāñ|ā Ööó**
 İāā³⁄₄āī, •āĒā, °āā³⁄₄āāñÖāōÔā † İāā Ôāİ³⁄₄āĀ 'āī¶ā: 'āĒā¹|ā Öāñ¶āñ İāāĒāñ
 ...•āāĀ ‡ āñŠ Ôāāñ|ā Ööó ý İāā³⁄₄āī ...•āāĀ ‡ aŠā „¹ā³⁄₄āāñÖā 'āİā¶ā
 Pā ‡ ā< ‡ aŠāè ½āò † İāā •āĒā ...•āāĀ ‡ aŠā „¹ā³⁄₄āāñÖā •āĒā āāİā²āİ|ā
 Ôāā³⁄₄āā¹ā ½āò ‡ aŠĀ ‡ āñŠ āāİā²āİ|ā ...•āāĀ „¹ā¶ā ‡ aŠāè •āā|āāè Ööó ý
 °āā³⁄₄āāñÖāōÔā ‡ aŠā „¹ā³⁄₄āāñÖā ¼āāñ•ā¶ā 'ā ‡ aŠā¶āñ † İāā 'āĒ ‡ aŠāİā
 „¹ā¶ā ‡ aŠĀ¶āñ ½āò āā ‡ aŠ³⁄₄āā •āā|āā Ööó ý ¾āñ ...•āāĀ
 ‡ āñŠ ,āÔāāèāā¹⁄₂ā|ā Ôāāñ|ā(veJeerkeajCeerUe meÇesle) Ööó

‡ā<³⁄₄āā Ö¹⁄₂āāĀñ •āāèİā¶ā ‡āñŠ āāĒā† ...•āāĀ ,āāİāİ³⁄₄ā‡aŠ Ööó ?

İāĀāèĀ ‡ āñŠ ,ā¶āĀ āāİāāā¹⁄₄ā¶ā ,āāÖāāò ‡ aŠāè āā%āŠ³⁄₄āā³⁄₄āò ...•āāĀ
 ‡ āñŠ ‡ aŠĀĀāā Öāè Öāñ|āāè Ööó ý İāÔā¶ā āā%āŠ³⁄₄āā, 'āāPā¶ā āā%āŠ³⁄₄āā,
 ½āĒā¹⁄₂āīā āā¶āÓ ‡ aŠāÔā¶ā ,āāāā āā%āŠ³⁄₄āā,āāò ½āò āā ‡ aŠÔāāè ¶ā
 āā ‡ aŠÔāāè Ā¹ā ½āò ...•āāĀ ‡ aŠā „¹ā³⁄₄āāñÖā Öāñ|āā Ööó ý İāĀāèĀ ½āò
 Öāāā|ā¹⁄₂āā¶ā ĀāāĤāĀ |āā¹ā ‡ aŠāñ āā¶ā³⁄₄āāāā¹|ā ‡ aŠĀ|āā Ööó |āāā
 ½āāāÔā¹āñāāİā³⁄₄āāò ‡ aŠāñ Öāāā|ā 'āĒā¶ā ‡ aŠĀ|āā Ööó ý ĀāāĤāĀ ‡ aŠāñ
fÔā ‡ aŠā³⁄₄āĀ ‡ āñŠ āāĒā† ...•āāĀ ‡ aŠÖāú Ôāñ 'āĒā¹|ā Öāñ|āāè Ööó ?
 ¼āāñ•ā¶ā Ôāñ 'āĒā¹|ā Öāñ|āāè Ööó ý

¼āāñ•ā¶ā 'ā‡aŠā¶āñ |āāā 'āĒ‡aŠāİā † İāā ...Ô¹⁄₂āā „¹ā¶ā ‡ aŠĀ¶āñ ‡ āñŠ
 āāĒā† Ēā ‡ aŠü|āè, ‡ aŠāñ³⁄₄āĒā |āāā 'āñ>ĒāñāāĒā³⁄₄ā¹⁄₂ā „¹āā°āò ‡ aŠā
 'āĒ³⁄₄āāñÖā āā‡aŠ³⁄₄āā •āā|āā Ööó ý ¾āñ Ôā¹⁄₄āāè ...•āāĀ ‡ āñŠ Ôāāñ|ā Ööó ý
 •āāèİā¶ā ‡ āñŠ ,āāāÔ|ā|ā ‡ āñŠ āāĒā† ¼āāñ•ā¶ā, ‡ aŠ¹āü|ā, ½ā ‡ aŠā¶ā,
 ¾āā|āā³⁄₄āā|ā, āāİāāā † İāā ½ā¶āāñĀā•ā¶ā ‡ āñŠ ÔāāĤā¶ā ,āāā|ā ,āāİāİ³⁄₄ā‡aŠ
 Ööó ý Ö¹⁄₂āāĀñ ¼āāñ•ā¶ā ‡ aŠāè ,āā¹āīāā|āĀ ‡ āİŠœ •ā¶āİ,āāò ‡ āñŠ
 ,āāā|āāĀ ‡ ā<|ā ‡ āōŠāāÔā „¹āā°āò Ôāñ Öāñ|āāè Ööó ý •ā¶āİ,āāò † İāā
 ‡ āōŠāāÔā „¹āā°āò ‡ āñŠ āāĒā† İāā³⁄₄āī, •āĒā |āāā Ôāİ³⁄₄āĀ ‡ āñŠ
 'āĒ‡aŠāİā ‡ aŠāè ,āāİāİ³⁄₄ā‡aŠ|āā Öāñ|āāè Ööó ý ¾āñ Ôā¹⁄₄āāè ...•āāĀ ‡ āñŠ
 Ôāāñ|ā Ööó Ö¹⁄₂āāĀñ °āā¶ā ‡ aŠ •āāèİā¶ā ½āò 'āĒ³⁄₄āāñÖā ½āò ,āā¶āñ
 İāāĒāñ āāİāāā¹⁄₄ā¶ā ÔāāĤā¶āāò / „¹ā ‡ aŠĀāāò ‡ aŠā āā¶ā¹⁄₂āāĀā,
 ‡ aŠ¹āü|āò ‡ aŠā āā¶ā¹⁄₂āāĀā āāİāāā¹⁄₄ā¶ā 'āĒ ‡ aŠĀ ‡ āñŠ

,ãã²ãñããØã ‡ ãŠ ‡ ãŠãÀĈããĴããò ½ãò ãã ‡ ãŠ³ãã •ãã|ãã Öõ ý Ôã¼ããè
 'ãĖ‡ãŠãÀ ‡ãŠñ ,ãã²ãñããØã‡ãŠ ‡ãŠãÀĈããĴããñò ½ãò ½ãĴããèĴããò ‡ãŠñ
 ÞãĖããĴãñ ‡ãñŠ ããĖã† ããĴã²ãĴã / ...Ó½ããè³ã ...•ããÃ ‡ãŠãè ,ããĴãĴ³ã‡ãŠ|ãã
 Öãñ|ããè Öõ ý

•ããèĴãĴã ‡ãñŠ ,ãããÖ|ãĴã ‡ãñŠ ããĖã† ...•ããÃ ,ããĴãĴ³ã‡ãŠ Öõ ý

...•ããÃ ‡ãŠãè ½ããúØã ½ãò Ĵãðãã® ‡ã<³ããò ? •ãĴãÖãĈĖ³ãã ½ãò
 |ãñ•ããè Öãñ Ĵãðãã® Öãñ ÀÖãè Öõ ý •ããèĴãĴã ‡ãŠñ ÔãĴãĴãĴãã•ãĴã ‡ãŠ
 °ãĴããĴãñ ĴããĖãñ ¾ãã|ãã¾ããĴã, ½ãĴããñÃã•ãĴã, „ããñØããò † Ĵãã ,ãĴ³ãã
 ÔããĴãĴããò ½ãò ¼ããè ããĴãÀĴã Ĵãðãã® Öãñ ÀÖãè Öõ ĴÔãããĖã† ...•ããÃ
 ‡ãŠãè Ĉã¹ãĴã ãããĴããò-ãããĴã °ãüĴããè •ãã ÀÖãè Öõ ý Ĉãã²ã 'ããĈããò
 •ãòÖãñ - ĴãĖãÀãñ>ãè, ãããÖ ‡ãĴŠ>, ÝŸĴñ 'ãñ³ã † Ĵãã ,ããĴÔã %ããŠãè½ã
 ,ããããª ‡ãŠã „ĴããĴã ĴããĴãĴãããã¾ã ‡ãŠ Öãñ Øã¾ãã Öõý ĴĴã ‡ãŠñ
 °ãĴããĴãñ, ããĴãã °ãª ‡ãŠãĴãñ, ÔããØãĖÖ †Ĵãã ããĴãĴãĴã ‡ãŠãĴãñ ½ãò ...
 •ããÃ ‡ãŠã „ã¾ããñØã ãã ‡ãŠ³ãã •ãã|ãã Öõý °ãããĴã ‡ãŠ •ããèĴãĴã ‡ãñŠ
 ãã %ããŠ³ãã ‡ãŠĖãã¹ããò †Ĵãã ,ããĴãĴ³ã ‡ãŠ|ãã,ããò ½ãò ¼ããè ããĴãÀĴã
 Ĵãðãã® ÖãñĴãñ ‡ãñŠ ‡ãŠãÀĴã 'ãĖĴ³ãñ‡ãŠ 'ãããÀĴãÀ ½ãò ÔããÔããĴãĴããò
 ‡ãŠãè Ĵãðãã® Öãñ ÀÖãè Öõ ý ÔããÔããĴãĴããò ‡ãñŠ 'ãĖ¾ããñØã ½ãò ...
 •ããÃ ‡ãŠãè ,ããĴãĴ³ã‡ãŠ|ãã Öãñ|ããè Öõý

•ãĴãÖãĈĖ³ãã ,ããòÃ °ãããĴã ‡ãŠ ãã%ããŠ³ãã ‡ãŠĖãã¹ããò ½ãò Ĵãðãã®
 ‡ãñŠ 'ãŠĖãÔĴã¹ã ...•ããÃ ‡ãŠãè ½ããúØã ããĴãÀĴã °ãüĴããè •ãã
 ÀÖãè Öõ ý

¾ãããª ...•ããÃ Ĉã¹ãĴã ‡ãŠãè °À ĴÔããè 'ãĖ ‡ãŠãÀ °ãüĴããè ÀÖãè |ãñ
 ,ããØãñ ,ããĴãñ ĴããĖãñ ĴãÓããò ½ãò ...•ããÃ keâer keâceer keâs keâejCe
 nceeje •ããèĴãĴã Ôãã‡ãŠ>½ã¾ã Öãñ •ãã¾ãñØããý

Ĵãò ‡ãŠããĖ¹ã ‡ãŠ ...•ããÃ Ôããñ|ããò ‡ãŠã ããĴã ‡ãŠãÔã †Ĵãã
 „ã¾ããñØã :-

¹ãÀ½¹ãÀãØãĴã ...•ããÃ Ôããñ|ã ‡ãñŠ Â¹ã ½ãò ‡ãŠãñ¾ãĖãã †Ĵãã
 'ãñ>ĖãñããĖã¾ã½ã „Ĵãããò ‡ãŠã „ã¾ããñØã °ãÖĴã ,ãããĴã‡ãŠ ½ãããã ½ãò
 ãã‡ãŠ³ãã •ãã ÀÖã Öõý ĴĴã‡ãñŠ ¼ãŸĴãÀ Ôããèãã½ãĴã Öãã ý Ö½ããÃñ ãñĴã
 ½ãò —ããĴã ‡ãŠãñ¾ãĖãñ ‡ãñŠ ¼ãŸĴãÀãò ‡ãñŠ ĖãØã¼ãØã 250 ĴãÓããò
 ‡ãñŠ 'ãĴÞããĴã Ôã½ãã¹ã ÖãñĴãñ ‡ãŠãè Ôã½¼ããĴãĴã Öõý 'ãĴã: 'ãĖã¹ã
 Öãñ Ôã ‡ãŠĴãñ ĴããĖãñ ...•ããÃ Ôããñ|ããò ‡ãñŠ ,ã¾ãããĴã ‡ãŠ „ã¾ããñØã
 Öãñ ...•ããÃ Ôãã‡ãŠ> ‡ãŠãñ ÔĖã ãã‡ãŠ³ãã •ãã Ôã‡ãŠ|ãã Öõ ý ,ãĴã: 'ãĴã:
 'ãĖã¹ã Öãñ Ôã ‡ãŠĴãñ ĴããĖãñ(Ĵãò ‡ãŠããĖ¹ã ‡ãŠ)...•ããÃ ‡ãñŠ Ôããñ|ããò
 ‡ãŠã ããĴã ‡ãŠãÔã ,ã¹ãããÀÖã¾ãÃ Öõ ý Ĵãò ‡ãŠããĖ¹ã ‡ãŠ ...•ããÃ ‡ãñŠ
 Ôããñ|ã ‡ã<¾ãã Öõ ?

ÔããõÀ ...•ããÃ, Øããã|ã¹/₂ãã¶ã Ìãã³/₄ãì, •ãÊã, Ôã¹/₂ãì³ãè •ÌããÀ-¹/₄ãã>ã, •ãõÌã¹/₂ãããã(°ãã³/₄ããñ¹/₂ããÔã)Ìãõ ‡ãŠããÊ¹ã ‡ãŠ ...•ããÃ ‡ãñŠ ‡ãìŠœ Ôããñ|ã Ööý f¶ã¹ãÀ ,ãã£ããããÀ|ã ‡ãìŠœ ³/₄ãìãã‡ã<|ã³/₄ããò 'ãÀã Ìã|ãÃ¹/₂ãã¶ã¹/₂ãò ...•ããÃ¹ãÆã¹ã ‡ãŠãè •ãã ÀÖãè Öö 'ãÀ¶ãì ,ã¹/₄ããè ¹/₄ããè fÔã ããñã¹/₂ãò ããÌã‡ãŠãÔã ‡ãŠãè Ôã¹/₂¹/₄ããÌã¶ãã†ã ,ã¶ã¶ã Ööý Ìãõ ‡ãŠããÊ¹ã ‡ãŠ ...•ããÃ¹ãÆã¹ã ‡ãŠã¶ãñ ‡ãŠãè ãã¶ã¹/₂¶ãããÊãããÆã|ã³/₄ãìãã‡ã<|ã³/₄ããú Öö -

1. ÔããñÊãÀ ‡ãìŠ‡ãŠÀ :-

ÔããñÊãÀ ‡ãìŠ‡ãŠÀ 'ãÀã ÔããõÀ ...•ããÃ ‡ãŠãñ ...Ô¹/₂ãã ‡ãñŠ Æ¹ã¹/₂ãò ‡ãŠããã|ã ‡ãŠã‡ãñŠ fÔãñ ¹/₄ããñ•ã¶ã¹ã‡ãŠã¶ãñ¹/₂ãò¹ãÆ³/₄ããñØã ãã‡ãŠ³/₄ãã •ãã|ãã Ööý ããPããã¶ãìÔããÀ (ããPããã 2.2) Ôãñ³/₄ãÃ ‡ãŠãè¹ãÆ‡ãŠãÌã ãã‡ãŠã¥ãò ‡ãìŠ‡ãŠÀ ‡ãñŠ ‡ãŠãúPã ‡ãñŠ ‡ã<‡ãŠ¶ã|ã©ãã¹ãÀãÌã|ãÃ‡ãŠ¹ãÀ¹ãü|ããè Ööý ‡ãŠãúPã ‡ãñŠ ‡ã<‡ãŠ¶ã¹ãÀ|ã©ãã¹ãÀãÌã|ãÃ‡ãŠ Ôãñ¹ãÀãÌããã|ãÃ|ã Öãñ‡ãŠÀ ,ãã¶ãñ ÌããÊããè¹ãÆ‡ãŠãÌã ãã‡ãŠã¥ãò °ãã‡ã<Ôã¹/₂ãò Æãñ °ã|ãÃ¶ã C₁,C₂ |ã©ãã „Ôã‡ãŠãè¹/₄ããè|ãÃãè ãã¹ÌããÀãò¹ãÀ¹ãü|ããè Ööý °ã|ãÃ¶ã ‡ãŠãè °ããÔããè Ôã|ãÖ |ã©ãã °ãã‡ã<Ôã ‡ãŠãè °ãèÌããÀò Ìã |ãÊããè Ôã¹/₄ããè ‡ãŠãÊãñ ÆãØã ‡ãŠãè Öãñ|ããè Öö, ãã•ãÔãÔãñ Ôãñ³/₄ãÃ ‡ãŠãè ãã‡ãŠã¥ããò ‡ãŠãè ...•ããÃ ‡ãŠãñ ,ãÌãÌããñããÔã|ã ‡ãŠÀ ããÊã³/₄ãã •ãã|ãã Ööý¹ãããÀ¥ãã¹/₂ãÔãã¹ã °ãã‡ã<Ôã ‡ãñŠ ,ã¶ãÀ ‡ãŠã |ãã¹ã °ãü•ãã|ãã Ööý¹ãñ, |ããè¶ã Üãã>ãò¹/₂ãò fÔã‡ãñŠ ,ã¶ãÀ Æãã Æãã¶ãã¹ã‡ãŠ •ãã|ãã Öö ý ÔããñÊãÀ ‡ãìŠ‡ãŠÀ ‡ãŠãè ÔãÔã³/₄ã|ãã Ôãñ Pã¹ãã|ããè °ã¶ãã¶ãñ ,ããòÀ¹ãÆŠãfÃ ‡ãŠã¶ãñ ‡ãñŠ ,ããã|ãããÀ‡ã<|ã Ôã¹/₄ããè¹ãÆ‡ãŠãÀ ‡ãñŠ¹/₄ããñ•ã¶ã¹ã‡ãŠã³/₄ãñ •ãã Ôã‡ãŠ|ãñ Öö ý

ãã‡ãŠã¥ãò

¹ãÀãÌã|ãÃ‡ãŠ (Ôã¹/₂ã|ãÊã¹ãÃã)



‡ãŠããPã ‡ãŠã ‡ã<‡ãŠ¶ã

Êã‡ãŠüãè ‡ãŠã °ããü‡ã<Ôã

Ôãñ³/₄ãÃ ‡ãŠãè

ÔããñÊãÀ ‡ãìŠ‡ãŠÀ

ããPããã Ôããã0 2.2

2. ÔããõÀ ÔãñÊã (ÔããñÊãÀ ÔãñÊã):-

ÔããõÀ ÔãñÊã ÌãÖ ¾ãìãã†ã<|ã Öö,ãã•ãÔãÔãñ Ôãî¾ãÃ †ãŠãè 'ãÆ†ãŠãÍã ...
 •ããÃ †ãŠãñ ããìã²ãì|ã ...•ããÃ ½ãò °ããÊãã •ãã|ãã Öö (ããPã"ã 2.3)ý ÔããõÀ
 ÔãñÊã °ã¶ã¶ãñ ½ãò ããÔãããÊã †ãŠã¶ã 'ãÆ¾ããñÖã †ãŠÀ|ãñ Öö ý † †ãŠ
 ÔããñÊãÀ ÔãñÊã ÊãÖã¼ãÖã 0.5 ÌããñÊ> †ãŠã ããìã¼ãìã¶ãÀ |ã©ãã 0.6
 †ñãã½¹ã¾ãÀ †ãŠãè ããìã²ãì|ã £ããÀã „¹ã¶¶ã †ãŠÀ Ôã†ãŠ|ãã Ööý ,ããã£ã†ãŠ
 ããìã²ãì|ã £ããÀã 'ãÆã¹|ã †ãŠÀ¶ãñ †ãñŠ ããÊã† ,ããã£ã†ãŠ ÔããÆ¾ãã ½ãò
 ÔããñÊãÀ ÔãñÊããò †ãŠãñ •ããñü|ã •ãã|ãã Öö ãã•ãÔãñ ÔããñÊãÀ 'ãö¶ãÊã
 †ãŠÖ|ãñ Ööý ããPã"ãã¶ãìÔããÀ ÔããñÊãÀ 'ãö¶ãÊã 'ãÀã 'ãÆ†ãŠãÍã †ãŠãè ...
 •ããÃ †ãŠãñ ããìã²ãì|ã ...•ããÃ ½ãò 'ãããÀìããã|ã÷|ã ãã †ãŠ¾ãã •ãã|ãã Ööý
 'ãÆ¾ãã: ÔããõÀ 'ãö¶ãÊã 'ãÀã „¹ãããã¹|ã ããìã²ãì|ã †ãŠã „¹¾ããñÖã °ãõ>Àãè
 †ãŠãñ Pãã•ãÃ †ãŠÀ¶ãñ †ãñŠ ããÊã† ãã †ãŠ¾ãã •ãã|ãã Ööý °ãõ>Àãè Ôãñ
 ,ããìã¹¾ã †ãŠ|ãã¶ãìÔããÀ ããìã²ãì|ã †ãŠã „¹¾ããñÖã °ãÊ°ã •ãÊãã¶ãñ †Ìãã
 Àñãã¾¾ãñ,>ãèÖìããèÖ |ã©ãã •ãÊã 'ã½¹ã ,ãããã PãÊãã¶ãñ ½ãò ãã †ãŠ¾ãã
 •ãã|ãã Ööý ¹ÌÖ©ã ÖãÆã½ããè¥ã àãñ"ããò ½ãò •ãÖãú ããìã²ãì|ã „¹ãÊã°£ã
 ¶ãÖãè Öö,ÔããñÊãÀ 'ãö¶ãÊã †ãŠã „¹¾ããñÖã ããìã¹ãñÓã Á¹ã Ôãñ
 ãã†ãŠ¾ãã •ãã|ãã Ööý

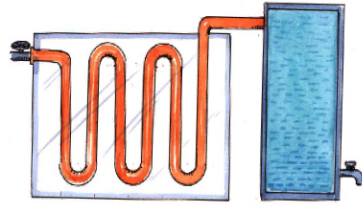


3. ÔããõÀ •ãÊã ...Ó½ã†ãŠ :-

† †ãŠ †ãŠããPã †ãñŠ °ããú †ã<Ôã †ãñŠ ,ã¶ãÀ |ããã°ãñ †ãŠãè >¿ãî°ã
 ããPã"ãã¶ãìÔããÀ (ããPã"ã 2.4)ÊãÖãã °ãè •ãã|ããè Ööý fÔã †ãŠãè °ããÖÀãè
 Ôã|ãÖ †ãŠãñ †ãŠãÊãã †ãŠÀ ãã¾¾ãã •ãã|ãã Öö ãã•ãÔãÔãñ ...Ó½ãã †ãŠã
 ,ããã£ã †ãŠ Ôãñ ,ããã£ã †ãŠ ,ãìãìããñÓã¥ã Ôãñ Ôã †ãñŠ ý Ôãî¾ãÃ †ãŠã
 'ãÆ†ãŠãÍã fÔããè >¿ãî°ã 'ãÀ 'ãü|ãã Ööý fÔã >¿ãî°ã †ãñŠ † †ãŠ ããÔãÀñ
 Ôãñ Ý¥|ã •ãÊã 'ãÆìãñÍã †ãŠÀ|ãã Öö |ã©ãã ¹ÔãÀñ ããÔãÀñ Ôãñ
 ãã¶ã †ãŠÊã|ãã Ööý fÔã †ãŠã „¹¾ããñÖã ,ãÔ¹ãããÊããò Ìã Ôãñ>Êããò ½ãò
 ãã †ãŠ¾ãã •ãã|ãã Ööý ,ã¶¾ã ãã|ããf¶ã †ãñŠ ÔããõÀ- „SÓ½ã †ãŠ ¼ããè
 ããìã†ãŠããÔã|ã ãã†ãŠ¾ãñ Öã¾ãñ Ööý †ñÔãñ Ôãè ††ãŠ ÔããõÀ- ...Ó½ã†ãŠ
 'ãÀã ,ã¶ãã•ããò, 'ãŠÊããò †Ìãã Ôããã°ã¾ããò †ãŠãñ ¼ããè ÔãìÆãã¾ãã •ãã|ãã
 Ööý

Ý¥|ã •ãÊã

'ãÆ†ãŠãÍã



Øã½ãÃ •ãÊã

•ãÊã ...Ó½ã¼ãŠ

ããPã"ã Ôããã0 2.4 ÔãããÀ •ãÊã ...Ó½ã¼ãŠ

¹ãÌã¶ã ...•ããÃ ¼ã¼ãã Öö ?

Ìãã¼ãì ¼ ãñŠ Øããã|ãÍããèÊã Öãñ¶ãñ Ôãñ „¹ã¶¶ã Øããã|ã•ã ...•ããÃ ¼ ãŠãñ ¹ãÌã¶ã ...•ããÃ ¼ ãŠÖ|ãñ Ööý fÔã ¼ ãŠã „¹ã¼ããñØã ¹ãÌã¶ã Pã ¼ ã< ¼ ãŠãè ¼ ãñŠ °Êãñ|ãò (¹ãÊãÌããü¼ããò) ¼ ãŠãñ Üãì½ãã¶ãñ ½ãò ãã ¼ ãŠ¼ãã •ãã|ãã Ööý ¹ãÌã¶ã Pã ¼ ã< ¼ ãŠãè ¼ ãñŠ 'ãÀã ããPã"ãã¶ãìÔããÀ (ããPã"ã 2.5) •ãÊã ¹ã½'ã ,ãããA ,ããã Pã¼ã<¼ãŠãè PãÊãã¼ããè •ãã|ããè Ööý



¼ãìŠœ ,ãããÀ ¼ããè •ãã¶ãò

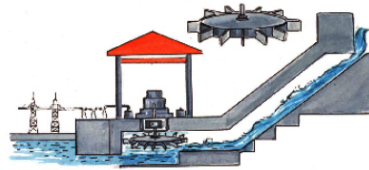
□ ,ã¹ã¶ãñ ãñÍã ¼ãñŠ |ããã½ãÊã¶ãã|ì S Jeb iegpejele heÇosMeesb ½ãò ¹ãÌã¶ã ...•ããÃ ¹ãÀ ,ããÊããããÀ|ã ããÌã¶; ãã½ãÊã ¹ãŠã½ãÃ 'ãÀã ããÌã²ãì|ã ...•ããÃ ¼ãŠã „¹ãã¶ã ãã¼ãŠ¼ãã •ãã ÀÖã Ööý

□ efjnv0 (G0heÇ0), YeeKe][e-vee@ieue (hebpeeye) S Jeb efšnjer (GlòejeKeC[]) ces peue Éeje efJeÅegle Glòehévve keâjves keâs mebÙe\$e mLeeefhele efkeâÙes ieÙes nwb~

,ãã•ã¼ãŠÊã ¼ãìŠœ àãñ"ããò ½ãñâ ,ã¶ãñ¼ãŠ ¹ãÌã¶ã Pããã¼ã<¼ãŠ¼ããò ¼ãñŠ Ôã½ãìÖãò 'ãÀã (ããÌã¶;ãã½ãÊã) ¹ãÌã¶ã ãã½ãÊã ¹ãŠã½ãÃ °ã¶ãã ¼ãŠÀ ããÌã²ãì|ã ¼ãŠã „¹ãã¶ã ãã¼ãŠ¼ãã •ãã|ãã Ööý

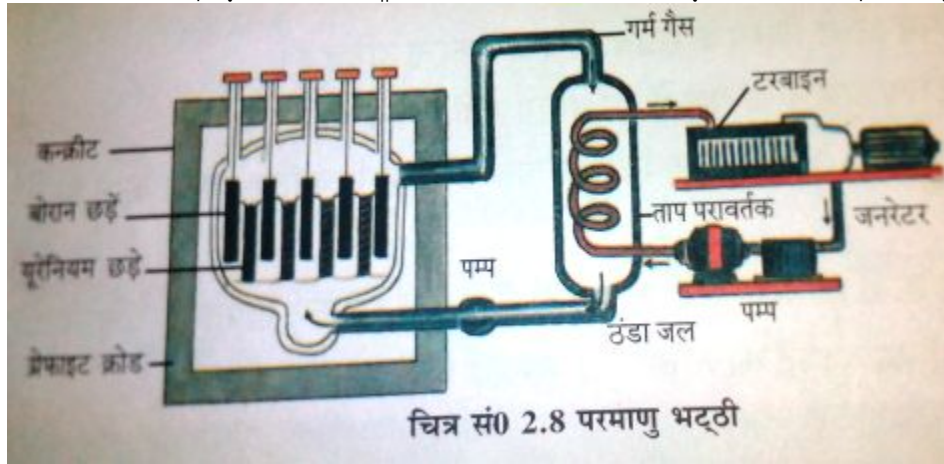
¼ã¼ãã •ãÊã, ...•ããÃ ¼ãŠã Öããñ|ã Öö ?

°ãÖ|ãñ Öì† •ãÊã ½ãò Øããã|ã•ã ...•ããÃ Öãñ|ããè Öö ý fÔã Øããã|ã•ã ...•ããÃ ¼ãŠãñ •ãÊã ããÌã²ãì|ã Ôãã¼ãã"ã 'ãÀã ããÌã²ãì|ã ...•ããÃ ½ãò °ãÊãã •ãã|ãã Öö ý fÔã ¹ãÆ ¼ãŠãÀ °ãÖ|ãã Öì,ãã •ãÊã,...•ããÃ ¼ãŠã Öããñ|ã Öö ý ¶ããè ¹ãÀ

$\rangle \dot{A}^{\circ} \tilde{a} \tilde{a} f \P \tilde{a}$ 

•ãāèlā•ã¶lài,ãāò ‡ãñŠ ½ãÊã½ãîã, Øãñ°ãÀ, ‡ãŠPãÀã, ‡ãðŠããÓã „¹ãããò ‡ãñŠ ,ã¹ãããlãÓ› ,ãããã^a ‡ãŠãñ •ãðlã ½ãããã ‡ãŠÖlãñ Öö ý f¶ã ‡ãŠã ãalãlãñÓã ¹ãÆ‡ãŠãÀ ‡ãñŠ Ôãã³⁄₄ããã ½ãò ããlãUã¶ã ‡ãŠÀ ...•ããÃ ‡ãñŠ †‡ãŠ Ôããñlã °ãã³⁄₄ããñØãðÔã ‡ãŠã „¹ããã¶ã ãã‡ãŠ³⁄₄ãã •ãlãã Öö ý Øãñ°ãÀ ½ãò ÔããããPãlã ÀãÔãã³⁄₄ããã¶ã ‡ãŠ ...•ããÃ ‡ãŠãñ °ãã³⁄₄ããñ ØãðÔã ½ãò

,ãā¹ā¶āñ ¶āāā¼ā‡ãŠæ³⁄₄ā ¼ā>á>æ ‡ãŠā ¶āā¹⁄₂ā ,āīāī³⁄₄ā Ôāī¶āā ÖāñÖāāý
 ¶āāā¼ā‡ãŠæ³⁄₄ā ¼ā>á>æ ½āò āā¶ā³⁄₄āāāāāā¶ā āÀ ¹āÀ ¹āÀ¹⁄₂āāāāī ...•āāÅ
 ¹āÆā¹ā Öāñ|āāè Öō āā•āÔā‡ãŠā „¹ā³⁄₄āāñÖā āāīā²āī|ā „¹āā¶ā‡āñŠ āāÊā‡
 ¶āāā¼ā‡ãŠæ³⁄₄ā ¹āāīāÀ ¹Êāā> ½āò āā‡ãŠ³⁄₄āā •āā|āā Öō (āāPāā 2.8)ý
 ¹āÀ¹⁄₂āāāāī ¼ā>áYāè ½āò ¶āāā¼ā‡ãŠæ³⁄₄ā āāīāÆāā¶ā Ôāñ „¹ā,ā ...Ó¹⁄₂āā
 Ôāñ •āÊā Öā¹⁄₂āÅ‡ãŠÀ‡āñŠ ¼āā¹ā °ā¶āā³⁄₄āāè •āā|āāè Öōý „Pā āā‡ãŠæ
 ¼āā¹ā Ôāñ >Àyeā¶ā PāÊāāfÅ •āā|āāè Öō •āāñ āāīā²āī|ā •āā¶āÇā Ôāñ
 •āīü|āè Öāñ|āāè Öōý •āā¶āā āāīā²āī|ā „¹āāā¶ā‡ãŠÀ ¶āāā¼ā‡ãŠæ³⁄₄ā ...
 •āāÅ‡ãŠāñ ,ā¶ā|ā: āāīā²āī|ā ...•āāÅ ½āò ¹āāÀīāÅāā|ā‡ãŠÀ °ñ|āā Öōý
 ¹āÀ¹⁄₂āāāāī ¼ā>áYāè ½āò ¹āÀ¹⁄₂āāāāī āāīāÆā¶ā (¶āāā¼ā‡ãŠæ³⁄₄ā
 āāīāÆā¶ā) ‡ãŠæ āā % āŠ³⁄₄āā āā¶ā³⁄₄āāāā¶ā Öāñ|āāè Öōý
 ¶āāā¼ā‡ãŠæ³⁄₄ā ¼ā>áYāè ½āò „¹ā¶ā ¶āāā¼ā‡ãŠæ³⁄₄ā ...•āāÅ °āÖī|ā
 ,āāāāā‡ãŠ Ôā¹⁄₂ā³⁄₄ā |ā‡ãŠ PāÊā¶āñ īāāÊāā ...•āāÅ‡ãŠ Ôāāñ|ā Öōý



īāā¹⁄₂āā¶ā ½āò ,ā¹ā¶āñ °ñīā ½āò ‡ãŠÊā¹ā‡ãŠ ½ā (¶āā¹⁄₂āÊā¶āāī),
 |āāÅā¹āīÀ(½āÖāÀāÓ>E), ‡ãŠāñ>ā (Àā•āÔāā¶ā) ,āāōÀ ¶āÅāñÀā(,0¹āE0)
 ½āò ¶āāā¼ā‡ãŠæ³⁄₄ā ...•āāÅ ÜāÀ Ôāāāā¹ā|ā Öōý

**...•āāÅ‡ãŠæ °āü|āāè ½āāâÖā‡ãŠāñ ¹āīÀā‡ãŠÀ¶āñ īāāÊāñ
 ÔāÖā¼ā‡ãŠ Üā‡ãŠ‡ãŠ³⁄₄āā Öō ?**

•ā¶āÔāāÆ³⁄₄āā īāðāā®,āāōÀ °ōā¶ā‡ãŠ ‡ãŠ •āāēīā¶ā‡ãŠæ āāīāā¼ā¶ā
 ,āāīāī³⁄₄ā‡ãŠ|āā,āāò ‡īāā ,ā¶āñ‡ãŠ °āü|āā ÖīÜes āā%āŠ³⁄₄ā‡ãŠ‡ãŠÊāā¹āāò
 ½āò ...•āāÅ İ³⁄₄ā³⁄₄ā‡ãŠ‡ãŠ‡ãŠÀ¶ā ...•āāÅ‡ãŠæ ½āāâÖā āā¶āesbñāā¶ā
 °āü|āāè •āā ÀÖāè Öōý īāā¹⁄₂āā¶ā ½āò ‡ãŠÊā ...•āāÅ ,āā¹āīā|āÅ‡ãŠ
 °āÖī|ā °āü|ā ¼āāÖā ÊāÖā¹⁄₄āÖā 80 ¹āÆāā|āīā|ā ¼āāÖā ¹āñ>ÊāñāāÊā³⁄₄ā¹⁄₂ā
 „¹āāāò ¹āÀ āā¶ā¹⁄₄āÅÀ Öō ý ...•āāÅ‡ãŠ 18 ¹āÆāā|āīā|ā ¼āāÖā‡ãŠæ
 ,āā¹āīā|āÅ Êā‡ãŠü|āè, ‡ãŠāñ³⁄₄āÊāā |āāā °āā³⁄₄āāñÖāōÔā ¹āÅ Öāñ|āāè
 Öō ý īāñÓā ...•āāÅ‡ãŠæ ,āā¹āīā|āÅ ¶āīāāè‡ãŠÀ¶āāè³⁄₄ā ...•āāÅ

(lǎo † ǎSǎǎĒ'ǎ † ǎS ...•ǎǎĀ) Ōǎǎñ|ǎ lǎǎ³/₄ǎi, •ǎĒǎ, Ōǎĭ³/₄ǎĀ ,ǎǎǎǎ^a † ǎñS 'ǎĀǎ
Ōǎñ|ǎǎè Ööý

...•ǎǎĀ Ōǎǎ†ǎS> †ǎSǎè ¹/₄ǎ³/₄ǎǎlǎŌ ǎǎŌ©ǎǎǎ|ǎ †ǎñS Ōǎ^ǎ/₄ǎĀ ¹/₂ǎò ...•ǎǎĀ
† ǎSǎ ŌǎǎĀǎǎǎǎ ,ǎǎlǎl³/₄ǎ † ǎS Ōǎ |ǎ©ǎǎ ...•ǎǎĀ † ǎñS lǎo † ǎSǎǎĒ'ǎ † ǎS
Ōǎǎñ|ǎǎò † ǎñS ǎǎlǎ†ǎSǎŌǎ 'ǎĀ 'ǎ³/₄ǎǎĀ¹|ǎ °ǎĒǎ †ǎSǎè ,ǎǎlǎl³/₄ǎ†ǎS|ǎǎ Ōǎ ý
fŌǎ † ǎñS ǎǎĒǎ† ,ǎǎǎǎǎǎĒǎǎǎĒǎ|ǎ ǎǎ°ǎ^ǎ,ǎǎò † ǎSǎñ ¹/₄ǎǎ^ǎ ¹/₂ǎò ĀĒǎǎ
•ǎǎ^ǎǎǎ PǎǎǎǎŌ†ý

□ ...•ǎǎĀ ,ǎ'ǎl³/₄ǎ³/₄ǎ † ǎSǎè Āǎñ † ǎS©ǎǎ¹/₂ǎ ,ǎǎǎĀ ...•ǎǎĀ °ǎPǎ|ǎ † ǎSǎè
„ǎǎPǎ|ǎ ,ǎǎ^ǎ|ǎǎò † ǎSǎ —ǎǎ^ǎǎ ...•ǎǎĀ °ǎPǎ|ǎ ¹/₂ǎò ŌǎŌǎ³/₄ǎ†ǎS Ōǎñ Ōǎ†ǎS|ǎǎ
Ööý

□ ...•ǎǎĀ ŌǎǎĀǎǎǎǎ † ǎñS ŌǎǎŌ> † ǎSǎñǎǎ Ōǎñ 'ǎĀ¹/₂'ǎĀǎŌǎ|ǎ
(,ǎ^ǎǎlǎǎè † ǎSǎǎǎǎè³/₄ǎ) ...•ǎǎĀ Ōǎǎñ|ǎǎò † ǎSǎ „'ǎ³/₄ǎǎñŌǎ ³/₄ǎǎǎ † ǎSǎǎ Ōǎè
† ǎSǎĀ^ǎǎǎ „'ǎ³/₄ǎi†ǎ<|ǎ ŌǎñŌǎǎý

□ ŪǎĀ † ǎñS ǎǎlǎ²ǎi|ǎ „'ǎ † ǎSǎǎǎ •ǎǎŌǎñ 'ǎǎĒǎñ, °ǎĒ°ǎ, Ōǎè>Ā ,ǎǎǎǎ^a
† ǎSǎñ ,ǎǎǎ|ǎ ,ǎǎlǎl³/₄ǎ † ǎS Ōǎñ^ǎǎñ 'ǎĀ Ōǎè 'ǎĒ³/₄ǎǎñŌǎ ¹/₂ǎò Ēǎǎ^ǎǎǎ
PǎǎǎǎŌ†ý ,ǎǎlǎl³/₄ǎ † ǎS|ǎǎ ^ǎǎ Ōǎñ^ǎǎñ 'ǎĀ f^ǎǎ † ǎSǎ „'ǎ³/₄ǎǎñŌǎ °ǎ^ǎ
ĀĒǎ^ǎǎǎ PǎǎǎǎŌ†ý

□ •ǎŌǎú 'ǎĀ Ōǎ¹/₂'ǎlǎ Ōǎñ ¹/₄ǎǎñ•ǎ^ǎǎ 'ǎ † ǎSǎ^ǎǎñ ¹/₂ǎò, ¹/₄ǎǎñ•³/₄ǎ 'ǎǎ©ǎǎò
† ǎñS ŌǎiĒǎǎ^ǎǎñ ¹/₂ǎǎñ, 'ǎǎ^ǎǎǎè † ǎSǎñ Ōǎ¹/₂ǎĀ † ǎSǎ^ǎǎñ ¹/₂ǎò ŌǎǎǎĀ ...
•ǎǎĀ † ǎSǎ Ōǎè 'ǎĒ³/₄ǎǎñŌǎ † ǎSǎ^ǎǎǎ PǎǎǎǎŌ†ý

□ ŌǎǎñĒǎĀ † ǎiS†ǎSǎ Ōǎñ ¹/₄ǎǎñ•ǎ^ǎǎ 'ǎ†ǎSǎ^ǎǎñ 'ǎĀ ,ǎǎlǎl³/₄ǎ†ǎS |ǎ|ǎ ¹/₄ǎǎè
ŌǎiĀǎǎǎǎ|ǎ ĀŌ|ǎñ Ööý

□ 'ǎĒ † ǎSǎlǎ „'ǎ^ǎǎǎ † ǎSǎ^ǎǎñ † ǎñS ǎǎĒǎ† >³/₄ǎĭ°ǎ Ēǎǎf>,Ōǎǎñǎǎ;³/₄ǎ¹/₂ǎ
lǎǎŌ'ǎ Ēǎǎ¹/₂'ǎ / ¹/₂ǎĀ † ǎSǎǎè lǎǎŌ'ǎ Ēǎǎ'ǎ † ǎSǎ 'ǎĒ³/₄ǎǎñŌǎ ŪǎĀǎò ¹/₂ǎò
|ǎ©ǎǎ Ōǎü;†ǎS 'ǎĀ † ǎSǎ^ǎǎǎ PǎǎǎǎŌ†ý

□ ¹/₄ǎǎñ•ǎ^ǎǎ 'ǎ†ǎSǎ^ǎǎñ † ǎñS ǎǎĒǎ† 'ǎĒñlǎĀ † ǎiS†ǎSǎ † ǎSǎ 'ǎĒ³/₄ǎǎñŌǎ
† ǎSǎ^ǎǎǎ PǎǎǎǎŌ†, fŌǎŌǎñ ...•ǎǎĀ † ǎSǎè °ǎPǎ|ǎ Ōǎñ|ǎǎè Ööý

□ °ǎĒǎǎò † ǎñS 'ǎ†ǎS^ǎǎñ † ǎSǎ Ōǎ¹/₂ǎ³/₄ Ūǎ>ǎ^ǎǎñ † ǎñS ǎǎĒǎ† 'ǎ†ǎSǎ^ǎǎñ
† ǎñS 'ǎŌĒǎñ °ǎĒǎǎò † ǎSǎñ 'ǎǎ^ǎǎǎè ¹/₂ǎò ǎǎ¹/₄ǎŌǎñ °ǎ^ǎǎǎ PǎǎǎǎŌ†ý

□ Ēǎǎ^ǎǎǎ 'ǎ†ǎSǎ^ǎǎñ ¹/₂ǎò ǎǎ¹/₂ǎ>d>ǎè † ǎñS |ǎñĒǎ † ǎSǎ 'ǎĒ³/₄ǎǎñŌǎ † ǎSǎ|ǎñ
Ōǎ¹/₂ǎ³/₄ǎ ,ǎPǎñ ǎǎ † ǎSŌ¹/₂ǎ † ǎñS Ō>ǎñlǎ † ǎSǎ 'ǎĒ³/₄ǎǎñŌǎ † ǎSǎ^ǎǎǎ
„ǎǎPǎ|ǎ Ööý

□ ,ǎǎŌǎ-'ǎǎŌǎ † ǎñS Ō©ǎǎ^ǎǎǎò † ǎñS ,ǎǎ^ǎǎñ •ǎǎ^ǎǎñ † ǎñS ǎǎĒǎ† 'ǎñ>ĒǎñĒǎ/
ǎè•ǎĒǎ † ǎñS lǎǎŌ^ǎǎǎò † ǎSǎ 'ǎĒ³/₄ǎǎñŌǎ ^ǎǎŌǎè † ǎSǎ^ǎǎǎ PǎǎǎǎŌ†ý

□ l³/₄ǎǎǎ † ǎ<|ǎŌǎ|ǎ lǎǎŌ^ǎǎǎò † ǎñS 'ǎĒ³/₄ǎǎñŌǎ † ǎñS Ō©ǎǎ^ǎǎ 'ǎĀ ³/₄ǎǎ°ǎǎ
ĀñĒǎŌǎǎü;ǎè /°ǎŌǎ •ǎǎŌǎñ ŌǎǎlǎĀ•ǎǎǎ^ǎǎ † ǎS lǎǎŌ^ǎǎǎò Ōǎñ † ǎSǎ^ǎǎǎè
PǎǎǎǎŌ†ý †ñŌǎǎ † ǎSǎ^ǎǎñ 'ǎĀ fĀǎǎ^ǎǎ † ǎSǎè °ǎPǎ|ǎ ŌǎñŌǎǎèý

□ „Ppā †āššā^{3/4}ā³ā³ āā|āā īāāĒāñ „, 'ā†āššā³āāō †āñš 'ā³āāñōā Ōāñ ¼āāē
 ...•āā³ †āššāē °āpā|ā †āššāē •āā Ōā †āššāāē Ōōý fĀfāā †āššāē †āššā^{1/2}ā³
 Ēā'ā|ā †āššāāāñ īāāĒāñ īāāōāāō †āššā 'ā³āāñōā †āššāāā pāāāāō† ý
 Ī^{3/4}āāā †ā<|āōā|ā † īāā Ōāāīāā•āāāā †āš īāāōāāō †āššā „āāpā|ā ÀĒā
 -ÀĒāāīā †āššāāā Ōōāā pāāāāō†ý

†āīšœ ,āāōÀ ¼āāē •āāāāō

- 'ā³āāñōā ½āō ,āāāā īāāĒāāē āāīāāā¼āāā ½āīāāēāāō †āñš 'āī•āāō
 ā †āššāñ †ñōāāē āā½āāāñā|ā fāā|āī Ōāñ °āāā^{3/4}āāñ •āāāāñ †āššāē
 ,āāīāī^{3/4}ā †āššāā Ōō āā•āā 'āÀ Ūāōāāā †āššā 'ā³āāīā ā¼āīā|ā^{1/2}ā³
 Ōāñý Ōā¼āāē 'āī•āāō †āššāē Ōā'āššāfĀ † īāā „ā¼āō īāāāāāē|ā
 āā†āššō^{1/2}ā †āñš Ōāāō†āš 'āāāāāō †āššā Ēāñ'āā āāā^{3/4}āā½ā|ā Ā'ā
 Ōāñ †āššāāā pāāāāō†ý
- Ōāī^{3/4}ā³ā³ ...•āā³ 'āā Ī^{3/4}āā'ā †āš Ā'ā Ōāñ °āūñ Ōāā 'āā āāīā²āīā
 „, 'āāāā †āñš āāĒā† āāīā²āīā Ōāōōāō †āñš āāā¼āāāā Ōñ|āī īāō—
 āāāāā†āššāō †āššāñ Ēāāñ•ā •āāāē ÀĒāāā pāāāāō†ý

īā°āīāĒāē

,āīā^{3/4}ā^{3/4}ā Misuse

'ā³āāāāī ¼āāāē Atomic furnace

ŌāāpāāĒāā Conduct

Ōāāō†āš Lubricant

•āāēīāāī^{1/2}ā fĀfāā Fossil - Fuel

āāāā¼ā†āššāē^{3/4}ā āāīāĒāāā Nuclear fission

,ā¼¼āāōā 'āĒīāā

1.āāā¼āāāāĒāāāĒāā 'āĒīāāō ½āō Ōāōāē āāīā †āššē'ā œāāū> †āššā
 ,ā¼¼āāōā 'āīāō|ā†āššā ½āō āāĒāāāĒā†-

(†āšš) 'āīā: 'āĒā'ā Ōāñāā īāāĒāē (veJeerkeâjCeerŪe)...•āā³ †āššā
 Ōāāñ|ā Ōō -

(i) †āššāñ¼āĒā (ii) 'āñĒāāāĒā¼ā½ā

(iii) •īāāÀ-¼āāā †āššāē ...•āā³ (iv) 'āĒā†āššāā|ā†āšš Ōāōōā

(Ēā) 'āīā: 'āĒā'ā āā Ōāñāā īāāĒāē (DeveJeerkeâjCeerŪe)...•āā³
 †āššā Ōāāñ|ā Ōō -

(i) 'āīāā ...•āā³ (ii) °āōāā Ōī† •āĒā †āššāē ...•āā³

(iii) ŌāāōÀ ...•āā³ (iv) †āššāñ¼āĒā †āššāē ...•āā³

(Ōā) ŌāāōÀ ...•āā³ †āššāñ Ōāāēāā āāīā²āīā ...•āā³ ½āō °āāĒā •āā|āā
 Ōō-

(i) ŌāāōÀ ¼āYdYāē 'āā (ii) ŌāāōÀ-ŌāāĒā 'āā

(iii) ÔãñÊãÀ ‡ãîŠ‡ãŠÀ 'ãÀã (iv) ÔããõÀ-•ãÊã ...Ó½ã‡ãŠ 'ãÀã
 2. ããÀ‡ã<ã Ô©ãã¶ããò ‡ãŠãè 'ãîãã|ãÃ ‡ãŠãèãã•ã†-
 (‡ãŠ) 'ãããÀìãÖ¶ã Õñ|ãî ...•ããÃ ‡ãŠã 'ãÆ½ãîĈã Õãñ|ã Öö ý
 (Ĉã) ½ãîĈ³ã|ã: •ãèìãî½ã fÄfã¶ã.....,ããõÀ..... Öö ý
 (Øã) Ôã¼ããè 'ãÆã¥ããè ,ã¹ã¶ãã ¼ããñ•ã¶ã.....Ôãñ 'ãÆã¹|ã ‡ãŠÀ|ãñ
 Öö ý
 (Üã) °ãã¾ããñØãõÔã ½ãîĈ³ã|ã: ,ããõÀ ‡ãŠã ãã½ãÑã¥ã
 Öö ý
 (j.)•ãÊãããìã²ãî|ã Ôãã¾ããã ‡ãŠã ½ãîĈ³ã Õãñ|ã Öö ý
 3. ãã¶ã½¶ãããÊãããĈã|ã ‡ãŠ©ã¶ããò ½ãò ÔãÖãè ‡ãŠ©ã¶ã ‡ãñŠ
 Ôã½½ãîĈã ÔãÖãè (√) ,ããõÀ ØãÊã|ã ‡ãŠ©ã¶ã ‡ãñŠ Ôã½½ãîĈã ØãÊã|ã
 (×) ‡ãŠã ããÞã¶Ö ÊãØããf†-
 (‡ãŠ) Ôã¼ããè 'ãÆ‡ãŠÀ ‡ãŠãè ...•ããÃ ‡ãŠã ½ãîĈ³ã Õãñ|ã Ôãî¾ãÃ
 Ööý
 (Ĉã) ìã³ãî ‡ãŠãè „ãããÔ©ããã|ã ½ãò °ãã¾ããñ½ããÔã ‡ãñŠ ,ã¹ãÜã¶ã
 Ôãñ °ãã¾ããñØãõÔã „¹ã¶ã Õãñ|ãè Ööý
 (Øã) ãã½ã>ã>ãè ‡ãŠã |ãñÊã ,ããõÀ |ãè•ãÊã 'ãñ>ÊãñããÊã¾ã½ã Ôãñ 'ãÆã¹|ã
 ãã‡ãŠ¾ãñ •ãñ|ãñ Ööý
 (Üã) ÔããõÀ ...•ããÃ Ôãñ ããìã²ãî|ã ...•ããÃ 'ãÆã¹|ã ¶ãÖãè ‡ãŠãè •ãã
 Ôã‡ãŠ|ããè Ööý
 (üj) °ãããfã 'ãÀã °ã¶ãã¾ãñ Øã¾ãñ •ãÊããìã¾ã ‡ãñŠ •ãÊã ½ãò Øããã|ãã ...
 •ããÃ Õãñ|ãè Ööý
 (Þã) ããìã²ãî|ã, ...•ããÃ ‡ãŠã ,ãÞãã Õãñ|ã Öö ý fÔãÔãñ 'ãÆ¹Óã¥ã „¹ã¶ã
 ¶ãÖãè Õãñ|ãã Ööý
 (œ) ãã¶ã¾ãããã|ã ¶ãããã½ã ‡ãŠãè¾ã ããìãĈã¶ã|ã 'ãÀã ½ãî ‡ã<ã ...•ããÃ
 Ôãñ ããìã²ãî|ã ...•ããÃ „¹ã¶ã ‡ãŠãè •ãã Ôã‡ãŠ|ãè Ööý

4. Ô|ã½¼ã ‡ãŠ ,ããõÀ Ô|ã½¼ã Ĉã ½ãò ãã¾ãñ Øã¾ãñ Íã^{oa}ãò ‡ãŠã
 ãã½ãÊãã¶ã ‡ãŠãèãã•ã† ý

‡ãŠ	Ĉã
'ãñ>ÊãñÊã	ãã¹ããè¾ã ããìã²ãî ã ÜãÀ
‡ãŠãñ¾ãÊãã	•ãÊã ããìã²ãî ã Ôãã¾ããã
•ãÊããìã¾ã 'ãÀ °ãããfã	°ãÔã
ãè•ãÊã	'ãìã¶ã Þã‡ã<‡ãŠãè
ìã¾ãî	Ô‡ãîŠ>À

5. ãã¶ã½¶ãããÊãããĈã|ã 'ãÆ¹¶ããò ‡ãñŠ „¹ãÀ °ãèãã•ã† -
 (‡ãŠ) 'ãò©ìããè 'ãÀ ...•ããÃ ‡ãŠã Ôã°ãÔãñ °ãüjã Õãñ|ã ‡ãŠãõ¶ã Öö ?
 (Ĉã) ÔããñÊãÀ ÔãñÊã ‡ãŠã ‡ã<¾ãã „¹¾ããñØã Õãñ|ãã Öö ?

(Øã) 'ãñ>ÈãñããÊã¾ã½ã ãã‡ãŠÔã 'ãÆ‡ãŠãÀ °ã¶ã|ãã Öö ?
 (Üã) °ãã¾ããñØãõÔã ‡ã<¾ãã Öö ? ¾ãÖ ãã‡ãŠÔã 'ãÆ‡ãŠãÀ „¹ã¶¶ã ‡ãŠãè
 •ãã|ããè Öö ?
 (Ý) ÔããõÀ ...•ããÃ ‡ ãñŠ ...Ó½ããè¾ã 'ãÆ¼ããlã ‡ ãŠã „¹ã¾ããñØã
 ãã‡ãŠÔã 'ãÆ‡ãŠãÀ ãã‡ãŠ¾ãã •ãã Ôã‡ãŠ|ãã Öö ?
 (Þã) ¶ããã¹¼ã‡ãŠãè¾ã ...•ããÃ ‡ã<¾ãã Öö ? fÔã‡ãŠã ‡ã<¾ãã „¹ã¾ããñØã
 Öö ?
 (œ) lã|ãÃ½ãã¶ã ½ãò •ããèlããl½ã fÄfã¶ã ...•ããÃ ‡ ãñŠ 'ãÆ½ããlãã Õããñ|ã
 ‡ã<¾ããò Öö ?
 (•ã) ...•ããÃ Ôãã‡ãŠ> ‡ã<¾ãã Öö ? ,ãã¹ã „Ôã Ôãã‡ãŠ> ‡ãŠãñ ¹l ããŠÀ¶ãñ
 ‡ãñŠ ‡ã<¾ãã „¹ã¾ãã ‡ãŠÀñØãò ?
 (çã) Ôããèãã½ã|ã |ã©ãã ,ãÔããèãã½ã|ã ...•ããÃ ‡ ãñŠ |ããè¶ã-|ããè¶ã „ªãÖÀ¥ã
 ããÊããããã†ý
 6. ãã¶ã½¶ãããÊãããããã 'ãÆl¶ããò ½ãò ÞããÀ 'ãª Ööý |ããè¶ã 'ãª ãã‡ãŠÔããè
 ¶ã ãã‡ãŠÔããè Â¹ã ½ãò †‡ãŠ Ôãñ Ööý †‡ãŠ 'ãª ,ã¶¾ã |ããè¶ããò Ôãñ
 ãã¼ãã,ã Ööý ãã¼ãã,ã 'ãª ‡ãŠãè 'ãÖÞãã¶ã ‡ãŠÀ ,ã¼¾ããÔã 'ãlããÔ|ã‡ãŠã
 ½ãò ããÊããããã†- **Äã0 'ãÆ0 Æããñ0 'ãÀãèãã**
 (‡ãŠ). jãè•ãÊã, 'ãñ>ÈñãÊã, Ôãñ¾ãã, ãã½ã>á>ãè ‡ãŠã |ãñÊã
 (Æã). lãã¾ãl, •ãÊã, °ãã¾ããñØãõÔã, ‡ãŠãñ¾ãÊãã
 (Øã) . ÔããñÊãÀ ‡ ãlŠ ‡ãŠÀ,ÔããõÀ ÔãñÊã, 'ãÆ ‡ãŠãlã ,ÔããõÀ •ãÊã ...
 Ó½ã‡ãŠ
 (Üã) fÄfã¶ã,ã¶ãã•ã,¹ãŠÊã,Ôããª°•ã¾ããú

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Œăăă¶ā•ā¹ă/Ėă‡ăđŠăă!ă‡ăŠ¹ă^aă©ăĂ ‡ăăŠ Â¹ă ½ăđ :

Ô½ã 'ašÊã Ôã°•ããè ,ãããã ‡ãŠãñ ‡ãŠã>¶ãñ Õñ|ài Pãã‡ãĩŠ |ã©ãã Êã‡ãŠũ;ãè
 ‡ãŠã>¶ãñ Õñ|ài ‡ãĩŠÊÕãũ;ãè ‡ãŠã 'aÆ¾ããñØã ‡ãŠÀ|ãñ Ööý •ãðÔãã ãã‡ãŠ
 Ô½ã •ã¶ã|ãñ Öö, Pãã‡ãĩŠ ,ããðÀ ‡ãĩŠÊÕãũ;ãè ÊããñÕñ Ôãñ °ã¶ãñ Öãñ|ãñ
 Ööý fÔããè 'aÆ ‡ãŠãÀ ÜãÀãð ½ãð ãã°ã•ãÊããè ,ãã'ãîãã|ãÃ Õñ|ài |ããÀ
 |ããú°ãñ ‡ãŠã °ã¶ãã Öãñ|ãã Ööý ‡ã<¾ãã ,ãã'a¶ãñ ‡ãŠ¼ããè ÔããñPãã Öö
 ãã ‡ãŠ ÊããñÔã ,ããðÀ |ããú°ãã ,ãããã ‡ãŠÖãú Ôãñ 'aÆã¹|ã Öãñ|ãñ Ööã ?
 ÎããÔ|ãÎã ½ãð ¾ãñ Çããã¶ã•ã 'ã°ã©ãÃ ‡ãñŠ Â¹ã ½ãð 'ãð©Îããè ‡ãŠãè ¼ãî-
 'ã¹ãÃ>ãè Ôãñ 'aÆã¹|ã Öãñ|ãñ Ööý 'ãð©Îããè ‡ãñŠ ¼ãî-'ã¹ãÃ>ãè ‡ãŠã
 ãã¶ã¹ã²ããÃ¥ã ããÎããã¼ã¶¶ã 'aÆ ‡ãŠãÀ ‡ãñŠ |ã|Îããð †Îãã ¾ããðããØã ‡ãŠãð
 Ôãñ Ôì,ãã Ööý ¼ãî-'ã¹ãÃ>ãè ½ãð 'aÆã ‡ãðŠãã|ã ‡ãŠ Â¹ã Ôãñ 'ãã¾ãñ
 •ã¶ãñ ÎããÊãñ ,ã ‡ãŠã°ãÃãã¶ã ‡ãŠ |ã|Îã ,ã©ãÎãã ¾ããðããØã ‡ãŠãð
 ‡ãŠãñ Çããã¶ã•ã ‡ãŠÖ|ãñ Öö •ãðÔãñ- ‡ãÎãã>Ãã•ã, ½ããf ‡ãŠã
 (ã¹ãÆ‡ãŠ),Õñ½ãñ>ãf>, °ããú‡ã<Ôããf>, ã•ãó¶ãf>, ØãÆñ¶ããf>ý f¶ã‡ãñŠ
 ,ããã|ãããÀ‡ã<|ã ,ããðÀ ¼ããè °ãÔì|ã Ôãñ Çããã¶ã•ã 'aÆ‡ãðŠãã|ã ½ãð 'ãã¾ãñ
 •ãã|ãñ Öö ý Pã>á>ã¶ãñâ ½ãîÇ¾ã|ã: ããÔãããÊã‡ãñŠ>ãð ‡ãŠãè °ã¶ããè Öö •ããñ
 ãã‡ãŠ 'ãð©Îããè 'ãÀ Ôã°ãÔãñ Ôãã½ãã¶¾ã Çããã¶ã•ã Ööý





Ēããã¶ã·ã ¶ãŠÖãú 'ãã¾ãñ ·ãã|ãñ Öö ?

Ēããã¶ã·ã 'ãã©ìããè ¶ãñŠ |ãĒã 'ãÀ, ¼ãì-ìã'ãĀ>ãè ½ãò |ã©ãã Ôã½ãì³ ½ãò 'ãã¾ãñ ·ãã|ãñ Ööý Ôããñãã¾ã½ã ¶ã ãĒããñÀãfì, Ôããñãã¾ã½ã ,ãã¾ããñ|ãfì, Ôããñãã¾ã½ã ,ãã¾ããñ|ñ> ,ããããª Ēããã¶ã·ã Ôã½ãì³ãè ·ãĒã ½ãò 'ãã¾ãñ ·ãã|ãñ Ööý Ēããã¶ã·ã ããã|ãì |ã©ãã ,ãããã|ãì "ãñ¶ããò 'ãĒãŠãÀ ¶ãñŠ Ôãñ Ôã ¶ãŠ|ãñ Ööý Ô'ãŠãã> ¶ãŠ, ¶ãĒãã>á·ãĀ, ,ã¼ãĒã ¶ãŠ ,ããããª ,ãããã|ãì Ēããã¶ã·ã Öö ý Ēããã¶ã·ã,ãããã|ãì Ìã ,ãããã|ãì |ã|Ìããò ¶ãñŠ ¾ãããããã ¶ã Š ¼ããè Öãñ Ôã ¶ãŠ|ãñ Öö, ·ããããñ - "ããù ¶ãĒ·ã> (Al₂O₃·2H₂O)¶ãã½ã ¶ãŠ Ēããã¶ã·ã ,Ykqehfu;e (ããã|ãì) |ã©ãã ,ããù ¶ãĒããè·ã¶ã (,ãããã|ãì) ¶ãŠã ¾ããããããã ¶ãŠ Ööý fÔããè 'ãĒãŠãÀ ¶ãŠãù'ãÀ ØĒãã@Ôã (Cu₂S)¼ããè |ããú"ãã(ããã|ãì) |ã©ãã ÔãĒ'ãŠÀ (,ãããã|ãì) ¶ãŠã ¾ããããããã ¶ãŠ Öö ý ,ãããããã¶ãŠããÌã ããã|ãì†ú Ôãã¾ãì ¶ãĒã ,ãÌãÔããã ½ãò ,ã'ã¶ãñ ¾ããããããã ¶ãŠãò ¶ãñŠ Ā'ã ½ãò 'ãĒã'ãã Öãñããè Ööý 'ãĒãŠããã ½ãò ¶ãñŠÌãĒã ¶ãìŠœ Öãè ããã|ãì†ú ½ãì ¶ãĒã ,ãÌãÔããã ½ãò 'ãã¾ããè ·ãã|ããè Ööý ,ãÖÀã¶ã ¶ãñŠ ããĒã† Ôããñ¶ãã |ã©ãã 'Ēããã>¶ã½ã ·ããããè ããã|ãì†ú |ã|Ìã ¶ãñŠ Ā'ã ½ãò 'ãã¾ããè ·ãã|ããè Ööý ,ã¶¾ã ,ãããããã¶ãŠããÌã ããã|ãì†ú 'ãĒãŠããã ½ãò ¾ããããããã¶ãŠãò ¶ãñŠ Ā'ã ½ãò 'ãã¾ããè ·ãã|ããè Ööý ,Ykqehfu;e, ĒããñÖã ,ãããÀ ½ããããããããè·ã ·ãããããè ,ã¶ãñ ¶ãŠ ããã|ãì†ú ,ããù ¶ãĒ·ã> ¶ãñŠ Ā'ã ½ãò |ã©ãã ¶ãìŠœ ããã|ãì†ú ÔãĒ'ãŠãfì |ã©ãã ¶ãŠã"ããã¶ãñ> ¶ãñŠ Ā'ã ½ãò 'ãã¾ããè ·ãã|ããè Ööý

,ã¾ãÔãŠ

Ēãã¾ãããã Ôã½ããè Þã>á>ã¶ããò ½ãò ¶ãìŠœ ¶ã ¶ãìŠœ ½ããããã ½ãò ããããã|Ìã ¶ãŠ Ēããã¶ã·ã 'ãã¾ãñ ·ãã|ãñ Öö, 'ãĀ¶ãì ¶ãìŠœ ½ãò ããã|ãì ¶ãŠãè ½ããããã f|ã¶ããè ¶ãŠ½ã Öãñããè Öö ãã ¶ãŠ „ÔãÔãñ ããã|ãì ¶ãŠãñ ãã¶ãÓ ¶ãŠããÓãĀ'ã (ãã¶ã ¶ãŠãĒã¶ãã) ¶ãŠã¶ãã ¶ãŠããÝ¶ã† Ìãã "ãÖìã ½ãÖüãã 'ãü|ãã Öö ý ¾ãããª Ēããã¶ã·ã ½ãò ããã|ãì ¶ãŠãè ½ããããã ,ãããããã¶ãŠ Öãñããè Öö |ããñ „ÔãÔãñ ããã|ãì ¶ãŠã ãã¶ãÓ ¶ãŠÓãĀãã ÔãĒĒã† Ìãã Ēãã¼ã ¶ãŠÀ Öãñãã Ööý† ñÔãñ Ēããã¶ã·ã, ãã·ã¶ãÔãñ ããã|ãì ¶ãŠã ãã¶ãÓ ¶ãŠÓãĀãã ,ãããããã ¶ãŠ ½ããããã ½ãò ÔãĒĒãããã Ôãñ† Ìãã ¶ãŠ½ã Ēãããããã ½ãò Öãñ ·ãã|ãã Öö, ,ã¾ãÔãŠ (Ore) ¶ãŠÖĒãããñ Ööý fÔã

'ãã³/ãñ •ãã¶ãñ ÌããÊãñ Ćããã¶ã•ããò ‡ãñŠ °ããÀñ ½ãò •ãã¶ã‡ãŠãÀãè 'ãÆã¹|ã
‡ãŠÀòý ¼ããÀ|ã ½ãò 'ãã³/ãñ •ãã¶ãñ ÌããÊãñ Ćããã¶ã•ã ‡ Ìãã „¶ã ‡ãñŠ
'ãÆããã¹|ã ÔĊãã¶ã ãã¶ã½¶ãããÊãããĆã|ã Öö :-

!ããããÊã‡ãŠã 3.2

वातु का नाम	अयस्क का नाम	प्राप्ति स्थान
लोहा ताँबा सेना एलुमिनियम	हेमेटाइट कोपर पाइराइट (मुक्त अवस्था में) बॉक्साइट	बिहार, उड़ीसा, मध्य प्रदेश, कर्नाटक, तमिलनाडु, छत्तीसगढ़ आन्ध्र प्रदेश, बिहार, मध्य प्रदेश, राजस्थान कोलार खान— कर्नाटक, आन्ध्र प्रदेश मध्य प्रदेश, छत्तीसगढ़, बिहार, उड़ीसा, तमिलनाडु, गुजरात, जम्मू—कश्मीर
कैल्शियम	चूना पत्थर	यह सभी राज्यों में पाया जाता है। संगमरमर के रूप में यह राजस्थान तथा मध्य प्रदेश में पाया जाता है।

f¶ã £ãããã|ã ‡ãŠ Ćããã¶ã•ããò ‡ãñŠ ,ããã|ãããÀ ‡ã<|ã °ñÌã ½ãò ‡ãìŠœ
,ã£ãããã|ã ‡ãŠ Ćããã¶ã•ã •ãòÔãñ ,ã¼ãÆ ‡ãŠ, ‡ãŠãñ³/ãÊãã,
'ãñ>ÈãñããÊã³/ã½ã 'ãã³/ãñ •ãã|ãñ Ööây 'ãñ>ÈãñããÊã³/ã½ã ³Ìã ,ãÌãÔĊãã
½ãò ¼ãî-¹ã¹ã>è Ôãñ 'ãÆã¹|ã ãã ‡ãŠ³/ãã •ãã|ãã Ööý fÔãããÊã ‡fÔãñ
Ćããã¶ã•ã |ãñÊã ¼ããè ‡ãŠÔ|ãñ Ööý ,ã¹ã¶ãñ °ñÌã ½ãò f¶ã‡ãŠãè „¹ãÊã°£ã|ãã
ãã¶ã½¶ãããÊãããĆã|ã |ããããÊã‡ãŠã ½ãò 'ãÆãããÌã|ã Öö :-

!ããããÊã‡ãŠã 3.3

अधात्विक खनिज	प्राप्ति स्थान
अभ्रक बहुमूल्य पत्थर पेट्रोलियम कोयला	बिहार, उड़ीसा, तमिलनाडु, राजस्थान। राजस्थान गुजरात, असम, अरुण सागर के तटीय क्षेत्र तथा कावेरी कृष्णा, गोदावरी के मुहानों पर। पश्चिम बंगाल, बिहार, तमिलनाडु

¼ããÀ|ã ½ãò Ôããñ¶ãã, |ããúãã, ãã•ãã ‡ãŠ (•ãÔ|ãã) |ãĊãã >ãÔãÔ¶ã
Ćããã¶ã•ããò ‡ãŠãè „¹ãÊã°£ã|ãã °ãÔì|ã ‡ãŠ½ã Öö |ãĊãã 'Êãñãã¶ã½ã
Ćããã¶ã•ã ‡ãŠã 'ãî¥ãÃ ,ã¼ããÌã Ööý

,ã³/ãÔ‡ãŠ Ôãñ £ãã|ãì ‡ãŠã ãã¶ãÔ‡ãŠÔãÃ¥ã

,ã³/ãÔ ‡ãŠ Ôãñ Íãì® £ãã|ãì ‡ãŠfÃ %ãŠãã½ã ‡ãŠ 'ãÆ%ãŠ½ããò ‡ãñŠ
'ãÍPãã|ã 'ãÆã¹|ã Ôãñ|ããè Ööý ,ã³/ãÔ ‡ãŠ Ôãñ ,ãÌãìãã®³/ããò ‡ãŠãñ °Ìã
‡ãŠÀ ‡ãñŠ £ãã|ãì ‡ãŠãñ ãã¶ã ‡ãŠãÊã¶ãñ |ãĊãã Íãì® ‡ãŠÀ¶ãñ ‡ãŠã
'ãÆ%ãŠ½ã £ãã|ãì‡ãŠ½ãÃ ‡ãŠÔÊãã|ãã Öö ý £ãã|ãì‡ãŠ½ãÃ 'ãÆ%ãŠ½ããò
‡ãŠãñ ÔãìããÌã£ãã¶ãìÔããÀ ãã¶ã½¶ãããÊãããĆã|ã 'ãÆ½ãìĆã PãÃ¥ããò ½ãò
°ããã>ã •ãã Ôã‡ãŠ|ãã Öö :-

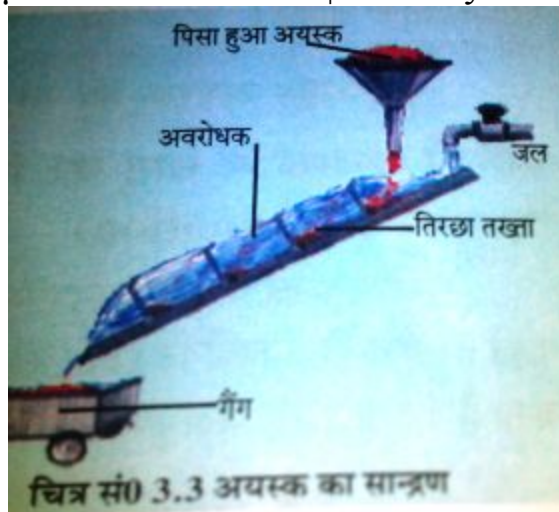
,ã³/ãÔ‡ãŠ ‡ãŠã Ôãã¶³¥ã

³/ãÔ ,ã³/ãÔ ‡ãŠ ‡ãŠã 'ãÆãÀãã½¼ã‡ãŠ „¹ãPããÀ Ôãñ|ãã Ööý ãã•ãÔã¹½ãò
,ãÌãìãã®³/ããò (ãã½ã>ã>è, ‡ããŠ‡ãŠü, 'ã¹ĊãÀ ,ããããã) ‡ãŠãñ ,ãÊãÔã ‡ãŠÀ
ããÊã³/ãã •ãã|ãã Ööý ,ã³/ãÔ ‡ãŠ Ôãñ ,ãÌãìãã®³/ããò ‡ãŠãñ 'ãðĊã ‡ãŠ

‡ ãŠÀ¶āñ ‡ ãŠāē āāīāāāā Ōāāā³¥ā ‡ ãŠÖÊāā|āāē Ööý ,ã³⁄₄āÔ ‡ ãŠ ‡ ãŠā Ōāā¶³¥ā ,āīāīāā® ‡ āñŠ Ōīā¹⁄₄āāīā ‡ āñŠ ,ã¶āīĀ¹ā |āāē¶ā āāīāāāāā³⁄₄āāō Ōāñ āā‡ãŠ³⁄₄āā •āā Ōā‡ãŠ|āā Ööý

1. ØāīĀ¹āāē³⁄₄ā¹āð©ā‡ã<‡ãŠÀ¥ā āāīāāāāā

³⁄₄āāāª ,ã³⁄₄āÔ ‡ ãŠ ½āō ¹āā³⁄₄āāē •āā¶āñ īāāĒāāē ,āīāīāā®³⁄₄āāū āāā|āī Ōāñ ÖÊ‡ãŠāē Ōāō |āāñ Ōāā¶³¥ā ‡ ãŠāē fŌā āāīāāāāā ‡ ãŠā ,¹ā³⁄₄āāñŌā ‡ ãŠĀ|āñ Ööý fŌā¹⁄₂āō ,āīāĀāñāā ‡ ãŠ ĒāŌāñ Ōī† Ēā ‡ ãŠü|āē ‡ āñŠ † ‡ ãŠ |āĒ|āñ ‡ ãŠāñ āāPāª 3.3 ‡ āñŠ ,ã¶āīŌāāĀ ī³⁄₄āīāāāŌ©ā|ā ‡ ãŠĀ|āñ Öö ý fŌā ¹āĀ āā¹āŌāā Ōī,āā ,ã³⁄₄āÔ ‡ ãŠ āāŌāĀā|āñ Öö ý fŌā ,ã³⁄₄āÔ ‡ ãŠ ½āō ,āīāīāā®³⁄₄āāū āā¹⁄₂āĒāāē Ōāñ|āāē Öö ý f¶ā ,āīāīāā®³⁄₄āāō ‡ ãŠāñ ,ã³⁄₄āÔ‡ãŠ Ōāñ ‡ āōŠŌāñ ,āĒāŌā ‡ ãŠĀ|āñ Öö ? f¶Ōō ,āĒāŌā ‡ ãŠĀ¶āñ ‡ āñŠ āāĒā† āāPāª 3.3 ‡ āñŠ ,ã¶āīŌāāĀ •āĒā ‡ ãŠāē |āñ•ā āāĀĀ ¹āĒīāāāāŌ|ā ‡ ãŠĀ|āñ Ööý •āĒā ‡ āñŠ ¹āĒīāāŌ ‡ āñŠ ‡ ãŠāÀ¥ā ¹⁄₄āāĀāē ,ã³⁄₄āÔ ‡ ãŠ |āāñ ,āīāĀāñāā ‡ ãŠāō ‡ āñŠ °āāēPā Ā ‡ ãŠ •āā|āā Ōō •ā°āāā ‡ ãŠ ÖÊ ‡ ãŠāē ,āīāīāā®³⁄₄āāū •āĒā ‡ āñŠ Ōāā©ā°āŌ •āā|āāē Ōāōý



³⁄₄āāāª ,ã³⁄₄āÔ ‡ ãŠ ½āō ,¹āāāŌ©ā|ā ,āīāīāā® āāā|āī Ōāñ ÖÊ‡ãŠāē Ōō |āª Ōāāā³¥ā ‡ āñŠ āāĒā† ØāīĀ¹āāē³⁄₄ā¹āð©ā‡ã<‡ãŠÀ¥ā āāīāāāāā ‡ ãŠā ,¹ā³⁄₄āāñŌā āā‡ãŠ³⁄₄āā •āā|āā Öö ý

2. Pāī¹⁄₂ª‡ãŠāē³⁄₄ā¹āð©ā‡ã<‡ãŠÀ¥ā āāīāāāāā

³⁄₄āāāª ,ã³⁄₄āÔ ‡ ãŠ ½āō Pāī¹⁄₂ª‡ãŠāē³⁄₄ā ,āīāīāā® ,¹āāāŌ©ā|ā Ōāñ |āāñ Ōāāā³¥ā ‡ āñŠ āāĒā† Pāī¹⁄₂ª ‡ ãŠāē³⁄₄ā Ōāā¶³¥ā āāīāāāāā ‡ ãŠā ,¹ā³⁄₄āāñŌā āā‡ãŠ³⁄₄āā •āā|āā Öö ý āā¹āŌāñ Ōī† ,ã³⁄₄āÔ‡ãŠ ‡ ãŠāñ āāPāª 3.4 ‡ āñŠ ,ã¶āīŌāāĀ Pāī¹⁄₂ª‡ãŠāē³⁄₄ā ¹āð©ā‡ã<‡ãŠāĀāē ‡ ãŠāē ŌāŌā³⁄₄ā|āā Ōāñ Ōāāāā¶³|ā āā‡ãŠ³⁄₄āā •āā|āā Ööý Pāī¹⁄₂ª‡ãŠāē³⁄₄ā ¹āð©ā‡ã<‡ãŠāĀāē ½āō †‡ãŠ Pāī¹⁄₂āü|ñ ‡ ãŠā ¹āªā Ōāñ|āā Ōō ,•āāñ āāñ ĀāñĒāĀāō ¹āĀ Üāī¹⁄₂ā|āā ĀŌ|āā Ōō āā•ã¶ā¹⁄₂āō Ōāñ † ‡ ãŠ

ÀāñÊāÀ āāīā²āī|ā Pāī½°ā † āŠāē³⁄₄ā Öāñ|āā Ööý °āāÀāē†āŠ āā¹āÖāñ Öì³⁄₄āñ
,ā³⁄₄āÖ†āŠ †āŠāñ Üāī½ā|āñ Öì† ¹ā>á>ñ †āñŠ ††āŠ āāÖāĀñ ¹āÀ |āÊā|āñ Ööý
•ā°ā ,ā³⁄₄āÖ†āŠ PāÊā|āñ ¹ā>á>ñ †āñŠ ¹ÖāĀñ āāÖāĀñ †āñŠ ¹āāÖā ¹āÖìúPā
† āŠÀ āāÖāĀ|āā Öō, |āāñ ,ā³⁄₄āÖ†āŠ † āŠ † āŠā Pāī½°ā † āŠāē³⁄₄ā ¼āāÖā
Pāī½°ā † āŠ Öāñ ,āā†āŠāāÖāĀ|ā Öāñ†āŠÀ „Öā†āñŠ Öā½āāē¹ā ††āŠ ñĀ
† āñŠ Ā¹ā ½āò f † āŠ>áYā Öāñ •āā|āā Ööý fÖāāē ¹āÆ † āŠāÀ
,āPāī½°ā † āŠāē³⁄₄ā ,āīāīāā®³⁄₄āū Pāī½°ā † āŠāē³⁄₄ā ,ā³⁄₄āÖ†āŠ Öāñ ¹ā
āāÖāĀ†āŠÀ ††āŠ ¹āð©ā†āŠ ñĀ °āā|āā|āāē Ööý

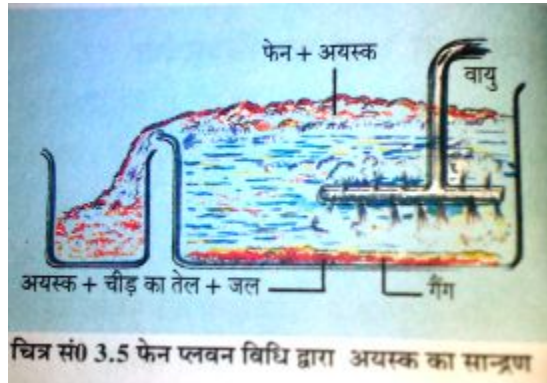


āā•āā ,ā³⁄₄āÖ†āŠāò ¾āā „ā†āŠāē ,āīāīāā®³⁄₄āāò ½āò
Pāī½°ā † āŠāē³⁄₄ā ÖāīYā Öāñ|āñ Öō „ā¹ā½āò ,āīāīāā®³⁄₄āāò † āŠāñ
¹āð©ā†āŠ † āŠÀāāñ † āñŠ āāÊā† Pāī½°ā † āŠāē³⁄₄ā ¹āð©ā†āŠ † āŠÀYā
āāīāāāā†āŠ † āŠā „ā³⁄₄āāñÖā āā†āŠ³⁄₄āā •āā|āā Ööý

3. ¹āŠñā ¹Êāīā āāīāāāā

°āāÀāē†āŠ āā¹āÖāñ Öì† ,ā³⁄₄āÖ†āŠ † āŠāñ °āūñ Öāō•ā ½āò •āÊā † āñŠ
Öāā©ā āā½āāāNā|ā † āŠÀ † āñŠ † āŠ¹Ā½ā (Slurry) °āāā Êāñ|āñ Ööý
|ā¹āīPāā|āā „Öā½āò Pāāēü † āŠā |āñÊā |āÊā|āñ Ööý Öāā½āā®³⁄₄ā|ā: Pāāēü
† āñŠ |āñÊā Öāñ ÖāÊ¹āŠāf, ,ā³⁄₄āÖ†āŠ |ā©āā ÖāōÖā † āŠāñ •āÊā ¹āÀ
ÖāāēÊāā āā†āŠ³⁄₄āā •āā|āā Ööý fÖā † āŠ¹Ā½ā ½āò •ā°ā |āāēīāÆ Öāāā|ā Öāñ
īāā³⁄₄āī ¹āÆīāāāāÖ|ā † āŠāē •āā|āāē Öō |āāñ „Öā†āñŠ ¹āŠÊāÖīāĀ¹ā |āñÊā
Öāñ āāPā¹ā † āŠ † āŠÀ ,ā³⁄₄āÖ†āŠ † āñŠ ÖÊ † āñŠ † āŠYā,(ÖÊ † āŠā
|āñÊā¹āñŠā) āā•āÖā½āò ¹āÆ½āīĒā|ā: ÖāÊ¹āŠāf, ,ā³⁄₄āÖ†āŠ Öāñ|āā Öō,
...¹āÀ „Y†āŠÀ >†āŠ † āŠāē ...¹āĀāē Öā|āÖ ¹āÀ ,āā†āŠÀ ½āÊā¹āñŠā
(½āòÊā çāāÖā) † āñŠ Ā¹ā ½āò |āðĀāñ ÊāÖā|āñ Ööý|ā¹āīPāā|āā fÖā
½āÊā¹āñŠā † āŠāñ īāā³⁄₄āī ½āò ÖāīĒāā † āŠÀ ,ā³⁄₄āÖ†āŠ † āñŠ † āŠYā

'aÆã¹|ã ‡ ãŠÀ Êãñ|ãñ Ööý fÔã ããlãããfã ‡ ãŠãñ 'ãñŠ¶ã 'Êãlã¶ã ããlãããfã
 ‡ ãŠÖ|ãñ Öö (ããPãã 3.5) Pãîããã ‡ ãŠ ,ãlãlãã®¾ããò ‡ ãñŠ ‡ ãŠ¥ã ¼ããÀãè
 Ôñã|ãñ Öö ,ã|ã: •ãÊã ½ãò ÿãã ‡ ãŠÀ >ò ‡ ãŠ ‡ ãñŠ |ãÊã 'ãÀ ‡ ãŠããã|ã Öãñ
 •ãã|ãñ Ööý



ÔãÊ¹ãŠãf; ,ã¾ãÔ ‡ ãŠ ‡ ãŠã Ôããã¥ã 'ãñŠ¶ã 'Êãlã¶ã ããlãããfã 'ãÀã
 ãããŠ¾ãã •ãã|ãñ Öö ý

Ôãããã¶³|ã ,ã¾ãÔ‡ãŠ Ôãñ £ãã|ãì ‡ãŠã ãã¶ãÓ‡ãŠÓãÃ¥ã

ãã¶ãÔ|ãã¹ã¶ã (Calcination)

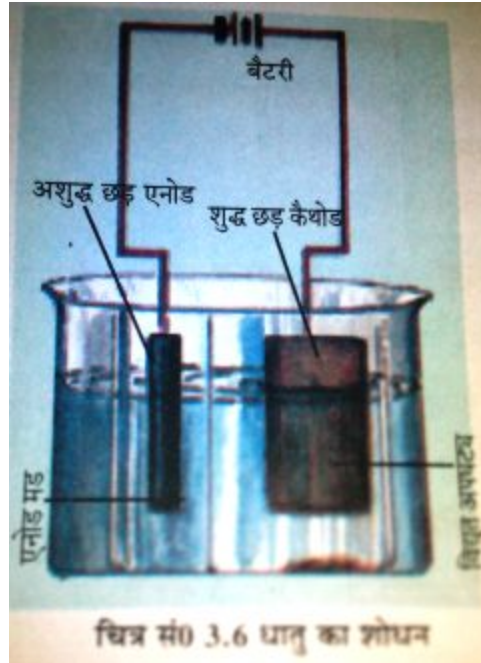
,ã¾ãÔ ‡ ãŠ ‡ ãŠãñ lãã¾ãì ‡ ãŠãè ,ã¶ãl¹ãããÔããã|ã ½ãò „Ôã ‡ ãñŠ
 ØãÊã¶ããã ‡ ãŠ Ôãñ ¶ããèPãñ Øã½ãÃ ‡ ãŠÀ ‡ ãñŠ £ãã|ãì ,ããù ‡ ã<Ôããf; ½ãò
 °ãÊã¶ãñ ‡ ãŠãè ãã%ãŠ¾ãã ‡ ãŠãñ ãã¶ãÔ|ãã¹ã¶ã ‡ ãŠÖ|ãñ Ööý •ãòÔãñ-Êãñ;
 ‡ãŠã°ããó¶ãñ> (PbCO₃) ¾ãì ‡ ã<|ã ,ã¾ãÔ‡ãŠ ‡ ãŠãñ Øã½ãÃ ‡ ãŠÀ¶ãñ 'ãÀ Êãñ;
 ‡ãŠã°ããó¶ãñ> Êãñ; ,ããù ‡ ã<Ôããf; (PbO) ½ãò 'ãããÀlããã|ãÃ|ã Öãñ •ãã|ãñ Öö
 ý fÔããè 'ãÆ ‡ ãŠãÀ •ãÊã¾ãì ‡ ã<|ã ,ããù ‡ ã<Ôããf; ‡ lãã Öãf;Êãù ‡ ã<Ôããf;
 ‡ãŠã ¼ããè ãã¶ãÔ|ãã¹ã¶ã ‡ ãŠÀ|ãñ Ööý

Êãñ; ‡ãŠã°ããó¶ãñ> Øã½ã ‡ ãŠÀ¶ãñ 'ãÀ Êãñ; ,ããù ‡ ã<Ôããf; + ‡ãŠã°ãÃ¶ã ÿãZ ,ããù ‡ ã<Ôããf;

¼ã•ãÃ¶ã (Roasting)

,ã¾ãÔ‡ãŠ ‡ ãŠãñ lãã¾ãì ‡ ãŠãè „lãããÔããã|ã ½ãò „Ôã‡ãñŠ ØãÊã¶ããã‡ãŠ
 Ôãñ ‡ ãŠ½ã |ãã¹ã |ã ‡ ãŠ ØãÀ½ã ‡ ãŠÀ ‡ ãñŠ ,ããù ‡ ã<Ôããf; ½ãò
 'ãããÀlããã|ãÃ|ã ‡ ãŠÀ¶ãñ ‡ ãŠãè 'ãÆãã%ãŠ¾ãã ‡ ãŠãñ ¼ã•ãÃ¶ã ‡ ãŠÖ|ãñ
 Ööý •ãòÔãñ- ‡ãŠãù¹ãÀ ÔãÊ¹ãŠãf; (Cu₂S) ¾ãì ‡ ã<|ã ,ã¾ãÔ‡ãŠ lãã¾ãì ½ãò
 ØãÀ½ã ‡ ãŠÀ¶ãñ 'ãÀ lãÖ ‡ ãŠãù¹ãÀ ,ããù ‡ ã<Ôããf; (CuO) ½ãò
 'ãããÀlããã|ãÃ|ã Öãñ •ãã|ãñ Ööý Ôããã Öãè ÔãÊ¹ãŠÀ, 'ãŠãùÔ¹ãŠãÀÔã
 ,ããããã ‡ ãŠãè ,ãlãlãã®¾ããù lããÓ¹ãlããèÊã ,ããù ‡ ã<Ôããf; °ã¶ã ‡ ãŠÀ
 ãã¶ã‡ãŠÊã •ãã|ããè Ööý

‡ãŠãù¹ãÀ ÔãÊ¹ãŠãf; + ,ããù ‡ ã<Ôããèã¶ã ØãÀ½ã ‡ ãŠÀ¶ãñ 'ãÀ ‡ãŠãù¹ãÀ ,ããù ‡ ã<Ôããf; + ÔãÊ¹ãŠÀ
 ÿãÃ ,ããù ‡ ã<Ôããf;



शुद्धीकरण, धातु शुद्धीकरण का क्या है ?

धातु शुद्धीकरण का अर्थ है धातु में मौजूद अशुद्धियों को हटाना। धातु शुद्धीकरण का प्रमुख उद्देश्य धातु की शुद्धता को 93% से बढ़ाकर 99.99% तक ले जाना है। धातु शुद्धीकरण के दो मुख्य प्रकार हैं: रासायनिक शुद्धीकरण और विद्युत रासायनिक शुद्धीकरण। रासायनिक शुद्धीकरण में धातु को रासायनिक पदार्थों के साथ प्रतिक्रिया करवाया जाता है, जिससे अशुद्धियाँ हट जाती हैं। विद्युत रासायनिक शुद्धीकरण में धातु को विद्युत के माध्यम से शुद्ध किया जाता है।

Fmheele

Fe 98.8% mes 99.8% keâeye&ve 0.25% mes 1.5% Mes<e Si, P, S, Mn keâer DeMegefÉÙee@b heeÙeer peeleeer nwb Fmekeâe GheÙeesie ceessj iee][er, veš yeesuš Deeefo keâs efvecee&Ce cesb efkeâÙee peelee nw~

धातु शुद्धीकरण, धातु शुद्धीकरण का क्या है ?

धातु शुद्धीकरण, धातु शुद्धीकरण का क्या है ?

धातु शुद्धीकरण, धातु शुद्धीकरण का क्या है ?

धातु शुद्धीकरण, धातु शुद्धीकरण का क्या है ? धातु शुद्धीकरण का अर्थ है धातु में मौजूद अशुद्धियों को हटाना। धातु शुद्धीकरण का प्रमुख उद्देश्य धातु की शुद्धता को 93% से बढ़ाकर 99.99% तक ले जाना है। धातु शुद्धीकरण के दो मुख्य प्रकार हैं: रासायनिक शुद्धीकरण और विद्युत रासायनिक शुद्धीकरण। रासायनिक शुद्धीकरण में धातु को रासायनिक पदार्थों के साथ प्रतिक्रिया करवाया जाता है, जिससे अशुद्धियाँ हट जाती हैं। विद्युत रासायनिक शुद्धीकरण में धातु को विद्युत के माध्यम से शुद्ध किया जाता है।

धातु शुद्धीकरण, धातु शुद्धीकरण का क्या है ? धातु शुद्धीकरण का अर्थ है धातु में मौजूद अशुद्धियों को हटाना। धातु शुद्धीकरण का प्रमुख उद्देश्य धातु की शुद्धता को 93% से बढ़ाकर 99.99% तक ले जाना है। धातु शुद्धीकरण के दो मुख्य प्रकार हैं: रासायनिक शुद्धीकरण और विद्युत रासायनिक शुद्धीकरण। रासायनिक शुद्धीकरण में धातु को रासायनिक पदार्थों के साथ प्रतिक्रिया करवाया जाता है, जिससे अशुद्धियाँ हट जाती हैं। विद्युत रासायनिक शुद्धीकरण में धातु को विद्युत के माध्यम से शुद्ध किया जाता है।

‡ãŠÿāñÀ|āā

āā%āŠ³/āā ‡ãŠÊāā'ā 3.2

(āā%āŠ³/āā ‡ãŠÊāā'ā ,ā£³/āā'ā‡ãŠ ‡ãŠāē °ñĒā-ĀñĒā ½āò āā‡ãŠ³/āā
•āā³/āý)

Ôāñāā_j³/ā¹/₂ā £āā|āi ‡ãŠā >ì‡ãŠü_jā Êāñ ‡ãŠÀ „Ôāñ œĴāā ‡ãŠāŌā•ā Ôāñ
ÔāiĒāā Êāòý £āā|āi ‡āñŠ >ì‡ãŠü_jñ ‡ãŠāñ Pāā‡āiŠ Ôāñ ‡ãŠā>òý ‡ã³/āā
°ñĒā|āñ Öö ?

Ôāñāā_j³/ā¹/₂ā £āā|āi ‡ãŠā >ì‡ãŠü_jā ,āāÔāāĴāāē Ôāñ ‡ãŠ> •āā|āā Ööý ,ā°ā
ÊāāñŌā, ‡ãŠā'āÀ, āā•āā‡ãŠ ,āāāā ‡āñŠ >ì‡ãŠü_jñ ‡ãŠāñ ¼āāē Pāā‡āiŠ Ôāñ
‡ãŠk>say ‡ã³/āā °ñĒā|āñ Öö ? £āā|āi†â 'āĒā³/ā: ‡ãŠÿāñÀ Ôāñ|āāē Öö
,ā|ā: „ĴÖò ‡ãŠā>Ĵāā ,ā³/āUr ‡ãŠāāÿĴā Ôāñ|āā Ööý

Ôāñāā_j³/ā¹/₂ā,'āāñ>ôāāĴā³/ā¹/₂ā,½āòŌĴāāēāāĴā³/ā¹/₂ā |ā©āā 'āāÀā
‡ãŠāñ œāñü_j‡ãŠÀ ,āĴ³/ā Ôā¹/āāē £āā|āi†â ‡ãŠÿāñÀ Ôāñ|āāē Öö ý

Pā¹/₂ā‡ãŠ

³/āāā° ,āā'ā £āā|āi,āāò ‡ãŠāē Ôā|āÖ ‡ãŠāñ „ĴÖò ‡ãŠā>Ĵāñ ‡āñŠ |ā|‡ãŠāÊā
°āā° °ñĒāò |āāñ ,āā'ā 'āā³/āòŌāñ āā‡ãŠ ĴāÖ āāĒāĴāñ ½āò Pā¹/₂ā‡ãŠāÀ
Ôāñ|āāē Ööý fÔāñ £āāāā|Ĵā‡ãŠ Pā¹/₂ā‡ãŠ ‡ãŠŌ|āñ Ööý £āā|āi,āāò ‡ãŠāē
³/āÖ Pā¹/₂ā‡ãŠ „ĴÖò ,āā¹/āiŌā¥ā ,āāōÀ Ôā•āāĴā> ‡ãŠāē ĴāÖ|āi†â °āĴāāĴāñ
‡āñŠ āāÊā† „'ā³/āāñŌāāē °āĴāā|āāē Ööý

,āÜāā|āĴā£e&veer³/ā|āā ('āāē>Ĵāñ 'āÀ £āā|āi,āāò ‡ãŠ āñŠ
'āōŠÊāĴāñ ‡ãŠā Ōāi¥ā)

□ āā%āŠ³/āā ‡ãŠÊāā'ā 3.3

†Ê³/āi¹/₂āāēāāĴā³/ā¹/₂ā, ‡ãŠāü'āÀ |ā©āā ,āā³/āÀĴā ‡ãŠā œāñ>ā >ì‡ãŠü_jā Êāñ
‡ãŠÀ „Ôāñ Ö©āāōü_jñ Ôāñ 'āāē>òý ‡ã³/āā °ñĒā|āñ Öö ? Ö©āāōü_jñ Ôāñ
'āāē>Ĵāñ 'āÀ £āā|āi ‡āñŠ >ì‡ãŠü_jñ 'āŌÊāñ ‡ãŠāē ,ā'āñāāā ,āāōÀ ,āāā£ā‡ãŠ
Pā'ā>ñ Ôāñ •āā|āñ Öö ý £āā|āi,āāò ‡ãŠāñ 'āāē> ‡ãŠÀ (,āāÜāā|ā 'āŌüiPāā
‡ãŠÀ) Pāā'Àāò ‡ãŠ Ā'ā ½āò 'āāāÀĴāāā|āĴā ‡ãŠĀĴāñ ‡ãŠ Ōāi¥ā
‡ãŠāñ `` ,āÜāā|āĴāOe&veerÜelee" ‡ãŠŌ|āñ Ööý Pāāü'āē |ā©āā ÔāāñĴāā
½āò ,āÜāā|āĴā£e&veerÜelee ‡ãŠā Ōāi¥ā ,āāā£ā‡ãŠ Ōāñ|āā Öö •ā°āāā‡ãŠ
•āŌ|āā ‡ãŠ¹/₂ā ,āÜāā|āĴā£āĴāāē³/ā Ööý

|āĴ³/ā|āā

£āā|āi,āāò ‡ãŠāñ ĒāāēPā ‡ãŠÀ |āāÀ °āĴāā³/āā •āā Ōā ‡ãŠ|āā Öö ý
£āā|āi,āāò ‡ãŠāñ |āāÀ ‡āñŠ Ā'ā ½āò 'āāāÀĴāāā|āĴā ‡ãŠĀĴāñ ‡ãŠ Ōāi¥ā
‡ãŠāñ ``|āĴ³/ā|āā" ‡ãŠŌ|āñ Öö ý

,āā'āĴāñ |āāü°āñ ,Ykqehfu,e ,āāōÀ ,āā³/āÀĴā ‡ãŠ |āāÀ °ñĒāò ŌāòŌāñý
Ō¹/₂āāĀñ ÜāÀāò ½āò āāĴā²āi|ā Ōā¹/₂°āĴāāē ‡ãŠā³/āāò ½āò |āāü°āñ

l̥ā©āā ,Ykqehfu,e †āñŠ l̥āāÀāò †āŠā „l̥ā³⁄₄āāñŌā Ōāñl̥āā Ōōý l̥āāÀ •āāÊāāè
 †āŠāñ °āāāāāñ †āñŠ āāÊā † ÊāāñŌñ †āñŠ l̥āāÀāò †āŠā l̥āÆ³⁄₄āāñŌā
 āā†āŠ³⁄₄āā •āāl̥āā Ōōý

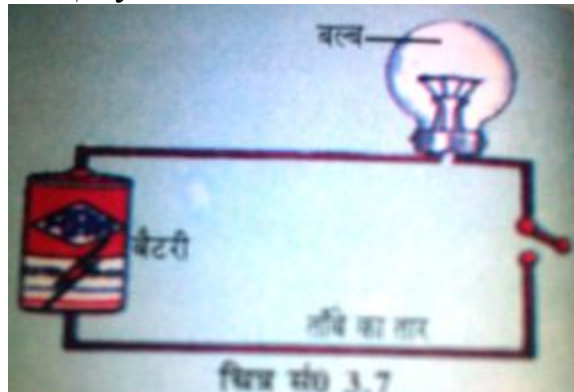
†āiŠœ ,āāōÀ ¼āāè •āāāñ

- Ōāāñāñ †āŠāè f|āāāè l̥āl̥āÊāāè PāāÀ °āāāā³⁄₄āāè •āā Ōā †āŠl̥āāè Ōō
 āā †āŠ 20 ÊāāÊā PāāÀāò †āŠāè ½āāñ>āfĀ †āñŠl̥āÊā † †āŠ
 Ōāñāāè½āāè>À ŌāñŌāāè ý
- † †āŠ ŌāÆā½ā Ōāāñāñ Ōāñ ÊāŌā¼āŌā 2 āā †āŠÊāāñ½āāè>À Êā½āā
 l̥āāÀ °āāāā³⁄₄āā •āā Ōā†āŠl̥āā Ōōý

PāāÊā†āŠl̥āā

āā%āŠ³⁄₄āā †āŠÊāā'ā 3.4

† †āŠ >āùPāĀ °āÊā †āŠāñ l̥āāú°āñ †āñŠ l̥āāÀ 'āĀ † †āŠ °āō>Āāè Ōāñ
 (āāPāā 3.7) •āāñüj °ōý †ā³⁄₄āā °ñÊāāñ Ōō ? °āÊā l̥āÆ †āŠāāāl̥āā Ōāñ
 •āāl̥āā Ōō ý ,ā°ā l̥āāú°āñ †āñŠ l̥āāÀ †āñŠ Ō©āāā l̥āĀ ,Ykqehfu,e ,āā³⁄₄āĀā
 ,āāāā †āŠā l̥āāÀ ÊāŌāā†ā ý



†ā³⁄₄āā Ōāñl̥āā Ōō ? Ōā¼āāè āāŌ©āāāl̥ā³⁄₄āāò ½āò °āÊā l̥āÆ †āŠāāāl̥āā
 Ōāñ •āāl̥āā Ōōý

Ōā¼āāè fāāl̥āi†ā āāl̥ā²āi l̥ā †āŠāè ŌāiPāāÊā†āŠ Ōōý †ā³⁄₄āāòāā†āŠ fāāŌāñ
 āāl̥ā²āi l̥ā †āŠā l̥āÆl̥āāŌ ŌāÆ¼āl̥ā Ōōý

āā%āŠ³⁄₄āā †āŠÊāā'ā 3.5

ÊāāñŌñ †āŠāè œüj †āñŠ † †āŠ āāŌāĀñ †āŠāñ Ōā©ā Ōāñ l̥ā †āŠüj †āŠĀ
 °iŌāĀñ āāŌāĀñ †āŠāñ ŌāĀ¼ā †āŠĀñā ý †āiŠœ Ōā½ā³⁄₄ā °āā †ā³⁄₄āā
 ,āāl̥ā¼āl̥ā Ōāñl̥āā Ōō ?

œüj †āŠā °iŌāĀ āāŌāĀ ¼āāè ŌāĀ¼ā Ōāñ •āāl̥āā Ōō ý ,ā°ā fŌāāè
 l̥āÆ³⁄₄āāñŌā †āŠāñ †āŠāùl̥āĀ, āā•āā†āŠ, ,Ykqehfu,e †āñŠ œüj 'āĀ ¼āāè
 °āñŌāā†āý †ā³⁄₄āā Ōāñl̥āā Ōō ? Ōā¼āāè œüj ŌāĀ¼ā Ōāñ •āāl̥āñ Ōōý

fÔã†ãŠã,ã©ãÃ Öð œüj †ãñŠ ††ãŠ ããÔãÀñ 'ãÀ ºãè ØãfÃ ...Ó½ãã ºiÔãÀñ ããÔãÀñ |ã†ãŠ 'ãÖiúPã •ãã|ããè Öð, ,ã|ã: œüjñã ...Ó½ãã †ãŠãè PããÊã†ãŠ Ööý

£ãã|ãi,ããò †ãñŠ ÀãÔãã¾ããã¶ã†ãŠ Ôã|ã :-

1. ,ããù†ã<Ôããè•ã¶ã Ôãñ ,ããã¾ããã%ãŠ¾ãã :-

£ãã|ãi ,ããù†ã<Ôããè•ã¶ã Ôãñ ãã%ãŠ¾ãã †ãŠÀ†ãñŠ ,ããù†ã<Ôããfj ºã¶ãã|ãñ Ööý Ôããñããj¾ã½ã |ã©ãã 'ããñ>ôããíã¾ã½ã †ãŠ½ãÀñ †ãñŠ Ôãã½ãã¶¾ã |ãã'ã 'ãÀ ãã%ãŠ¾ãã †ãŠÀ†ãñŠ ,ããù†ã<Ôããfj ºã¶ãã|ãñ Ööý



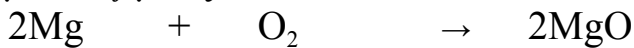
Ôããñããj¾ã½ã ,ããù†ã<Ôããè•ã¶ã Ôããñããj¾ã½ã ,ããù†ã<Ôããfj

†ã¾ãã ,ãã'ã •ãã¶ã|ãñ Öö ?

Ôããñããj¾ã½ã |ã©ãã 'ããñ>ôããíã¾ã½ã †ãñŠ ,ããã£ã †ãŠ ãã%ãŠ¾ããíããèÊã Ôãñ¶ãñ †ãñŠ 'ãŠÊãÔiãÁ'ã f¶Öò ,ããù†ã<Ôããè†ãŠÀã (,ããù†ã<Ôããè•ã¶ã †ãñŠ Ôãã©ã •ãiüj¶ãã) Ôãñ ºãPãã¶ãñ †ãñŠ ããÊã†ãã½ãããè †ãñŠ |ãñÊã½ãò jìºãã †ãŠÀ ÀÊã|ãñ Ööý

ãã%ãŠ¾ãã †ãŠÊãã'ã 3.6

½ãòØ¶ããèããíã¾ã½ã †ãŠã ††ãŠ |ããÀ Êãòý ,Ôãñ ããPã½ãñ †ãŠãè ÔãÔã¾ã|ãã Ôãñ 'ã †ãSüj †ãŠÀ •ãÊãã †ãý †ã¾ãã ºñÊã|ãñ Öö ? ½ãòØ¶ããèããíã¾ã½ã †ãŠã |ããÀ •ãÊã †ãŠÀ Ôã'ãñŠª 'ãã,,jÀ ½ãò 'ãããÀíããã|ãÃ|ã Ôãñ •ãã|ãã Ööý ¾ãÖ Ôã'ãñŠª 'ãã,,jÀ ½ãòØ¶ããèããíã¾ã½ã ,ããù†ã<Ôããfj Ööý



½ãòØ¶ããèããíã¾ã½ã ,ããù†ã<Ôããè•ã¶ã ½ãòØ¶ããèããíã¾ã½ã ,ããù†ã<Ôããfj

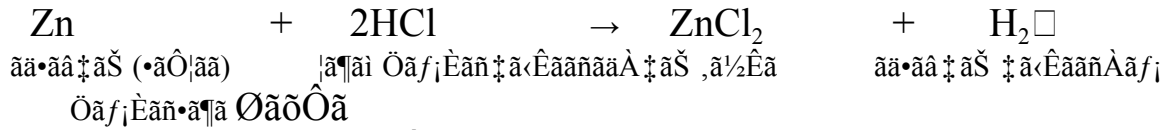
2. •ãÊã †ãñŠ Ôãã©ã ,ããã¾ããã%ãŠ¾ãã :-

meefkeäÇàÙe £ãã|ãi •ãÊã †ãñŠ Ôãã©ã ãã%ãŠ¾ãã †ãŠÀ†ãñŠ £ãã|ãi ÔãfjÊã†ã<ùÔããfj / ,ããù†ã<Ôããfj |ã©ãã ÔãfjÊãñ•ã¶ã ØãòÔã ºã¶ãã|ãñ Ööý

ãã%ãŠ¾ãã †ãŠÊãã'ã 3.7

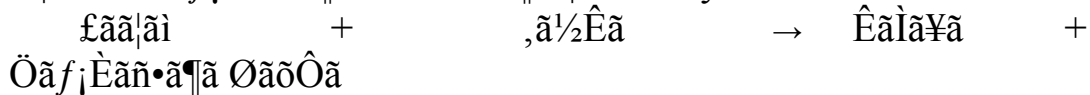
Ôããñããj¾ã½ã £ãã|ãi †ãŠã ††ãŠ œãñ>ã >ì†ãSüjã Êãñ†ãŠÀ œ¶ãã †ãŠãØã•ã Ôãñ ÔãìÊãã Êãòý †ãŠãúPã †ãñŠ ††ãŠ ºã|ãÃ¶ã †ãŠãñ 'ãã¶ããè Ôãñ ,ãã£ãã¾ãÀ |ã©ãã Ôããñããj¾ã½ã †ãñŠ >ì†ãSüjñ †ãŠãñ 'ãã¶ããè ½ãò jãÊã ºý †ã¾ãã ããªÊããfÃ ºñ|ãã Öð ? £ãã|ãi †ãŠã >ì†ãSüjã •ãÊã †ãŠãè ÔããÖ 'ãÀ |ããèíãÆ Øããã|ã Ôãñ f£ãÀ-,£ãÀ Üãì½ã|ãã Öì,ãã ããªÊãã¾ããè ºñ|ãã Ööý Ôããñããj¾ã½ã £ãã|ãi •ãÊã †ãñŠ Ôãã©ã |ããèíãÆ Øããã|ã Ôãñ ,ããã¾ããã%ãŠ¾ãã †ãŠÀ†ãñŠ Ôããñããj¾ã½ã ÔãfjÊãù †ã<Ôããfj |ã©ãã ÔãfjÊãñ•ã¶ã ØãòÔã ºã¶ãã|ãñ Ööý

•ãÔ|ãã ÖãfjÈãñ†ãĖÊãñããÀ†ãŠ ,ã½Êã †ãñŠ Ôãã©ã ãã%ãŠ¾ãã †ãŠÀ†ãñŠ
ãã•ãã†ãŠ †ãĖÊãñÀãfj |ã©ãã ÖãfjÈãñ•ãĴã ØãðÔã °ãĴãã|ãã Öö ý



fÔããè ãã %ã Š¾ãã †ãŠÊãã'ã †ãŠãñ ,Ykqehfu;e, ,ãã¾ããĴã |ã©ãã
½ãðØĴããèããíã¾ã½ã †ãñŠ ›ì†ãŠüjñ †ãñŠ Ôãã©ã ¼ããè °ãñÔãã†ã ý

'ãÆã¾ã: Ôã¼ããè ãã|ãì |ãĴãì ,ã½Êã Ôãñ ,ãã¾ãããã %ã Š¾ãã †ãŠÀ †ãñŠ
ÊãìãŸã |ã©ãã ÖãfjÈãñ•ãĴã ØãðÔã °ãĴãã|ãñ Ööâ ý



keâgÚ Deewj Yeer peeves :

|ã|ããð †ãŠãñ ãã|ãì |ã©ãã ,ãããã|ãì ½ãð ÌãØããè †ãðŠ|ã ãã †ãŠ¾ãã Øã¾ãã
Ööý •ãÀ½ãñããĴã¾ã½ã ,ããÔãóããĴã†ãŠ |ã©ãã †Ĵãè½ãĴããè †ñÔãñ |ã|ã Öö
ãã•ãĴã½ãð ãã|ãì |ã©ãã ,ãããã|ãì °ãñĴããð †ãñŠ Öãè ØãìŸã 'ãã¾ãñ •ãã|ãñ Öö
ý fĴã |ã|ããð †ãŠãñ ``,'ãããã|ãì' †ãŠÖ|ãñ Öö ý

ãã|ãì,ããð †ãŠã ÜãÀñÊãì †Ìãã ,ããð²ããñããØã†ãŠ ,,'ã¾ããñÔã

°ãããĴã†ãŠ •ããèãĴã ½ãð ,ãĴãñ†ãŠ GodosMÜeesb †ãñŠ ããÊã† ãã|ãì,ããð
†ãŠã ,,'ã¾ããñÔã Ôãñ|ãã Ööý ÌããÖĴããð, ÖÌããfÃ •ãÔã•ããð,
ÀñÊãØãããüj¾ããð, ,,'ãÔãÆÖãð, ,ããð²ããñããØã †ãŠ ,,'ã †ãŠÀŸããð ,ããããª
†ãŠãñ °ãĴããĴãñ ½ãð ,ã¾ãããããã †ãŠ ½ãããã ½ãð ãã|ãì †ú 'ãÆ¾ãì †ãĖ
Ôãñ|ããè Ööý ÊããñÔã Ôã°ãÔãñ ,ãããããã †ãŠ ,,'ã¾ããñÔã ½ãð ,ããĴãñ ÌããÊããè
ãã|ãì Ööý ¾ãÖ •ãÖãü †ãŠ ,ããñÀ ãã'ãĴã ,†ãŠãèÊã ,ããããª œãñãè ÌãÔ|ãì†ú
°ãĴããĴãñ †ãñŠ ããÊã† ,,'ã¾ããñÔã †ãŠãè •ãã|ããè Öö ÌãÖãè °ÌãÀãè ,ããñÀ
¼ããÀãè ,,'ã †ãŠÀŸããð †ãñŠ ããĴã½ãããŸã ½ãð ¼ããè fÔã†ãŠã ,,'ã¾ããñÔã
ãã †ãŠ¾ãã •ãã|ãã Ööý,Ykqehfu;e ¼ããè †ãŠ ,ãĴ¾ã ,ã¾ãããããã †ãŠ
,,'ã¾ããñÔã ½ããð ,ããĴãñ ÌããÊããè ãã|ãì Öö fÔã †ãŠã ,,'ã¾ããñÔã
,ãããããã†ãŠããíã ÜãÀñÊãì °ã|ãÃĴããð †ãŠãñ °ãĴããĴãñ †ãñŠ ããÊã† ãã†ãŠ¾ãã
•ãã|ãã Ööý

ãã|ãì†ú ...Ó½ãã †ãŠãè ÔãìãããÊã†ãŠ Öãñ|ããè Öö ,ã|ã: ,,'ã †ãŠã °ã|ãÃĴã
,ããðÀ °ããü¾ããÊãÀ °ãĴããĴãñ †ãñŠ ããÊã† ,,'ã¾ããñÔã ãã†ãŠ¾ãã •ãã|ãã Ööý
fÔã †ãŠ¾ã¾ã †ãñŠ ããÊã† ÊããñÔã, †ãŠãü'ãÀ |ã©ãã ,Ykqehfu;e †ãŠã
,,'ã¾ããñÔã ãã †ãŠ¾ãã •ãã|ãã Ööý |ããü°ãñ †ãŠã Ôã°ãÔãñ ½ãÖ|ã'ãìŸãÃ
,,'ã¾ããñÔã ããìã²ãì|ã ,,'ã †ãŠÀŸã °ãĴããĴãñ ½ãð ãã †ãŠ¾ãã •ãã|ãã Ööý
,ãã•ã †ãŠÊã ããìã²ãì|ã †ãñŠ°ãÊã °ãĴããĴãñ †ãñŠ ããÊã† ,Ykqehfu;e †ãñŠ
|ããÀãð †ãŠã ¼ããè ,,'ã¾ããñÔã ÔãñĴãñ ÊãØãã Ööý

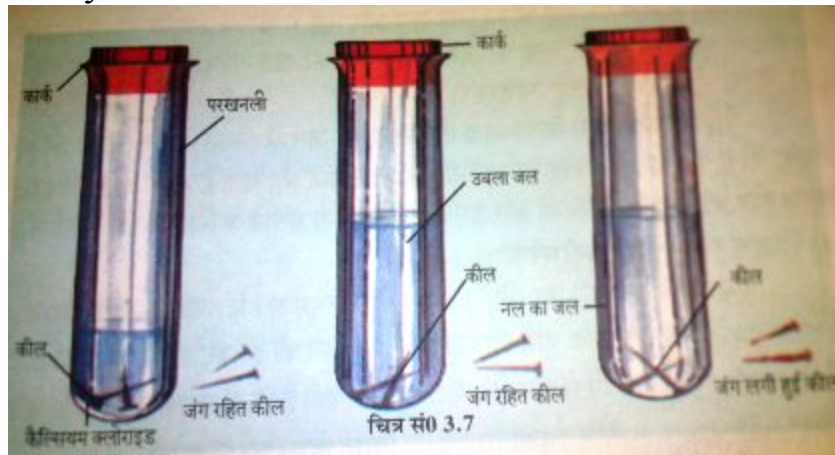
3.4

£ãã|àì,ãão ‡ãŠã ÔãâàããÀ¥ã

ãä%ãŠ³/₄ãã ‡ãŜÊãã¹ã 3.9

|ããè¶ã ¹ãÀÇã¶ãÊããè Êãòý ¹ãÆ|¾ãñ‡ãŠ ¹ãÀÇã¶ãÊããè ½ãò ºãñ ¾ãã |ããè¶ã
 ÊããñÕñ ‡ãŠãè ‡ãŠãèÊã |ãÊã ºòý‡‡ãŠ ¹ãÀÇã¶ãÊããè ½ãò ©ããñü,ã Ôãã
 ‡ãõŠããÊÔã¾ã½ã ‡ãÊããñÀãf, Êãòý (‡ãõŠããÊÔã¾ã½ã ‡ãÊããñÀãf,
 |ãã¾ãì ½ãò „ãããÔ©ã|ã ¶ã½ããè ‡ãŠãñ ,|ã|ããñããÔã|ã ‡ãŠÀ|ãã Õõ)
 ºÌÔÀãè ¹ãÀÇã¶ãÊããè ½ãò „ãÊãã Õì,ãã ¹ã¶ããè(,ããü ‡ãÊããè•ã¶ã

$\text{ããlãÖãë}\text{¶ã} \cdot \text{ãÊã})\text{Êãò} \text{¶ã©ãã} \text{¶ããëÖãÀñ} \frac{1}{2}\text{ãò} \text{ÔããfããÀ¥ã} \text{¶ãÊã} \ddagger \text{ãŠã} \text{'ãã¶ããë}$
 $\text{Êãòý} \text{¶ããë}\text{¶ããò} \text{'ãÀÇã¶ãããÊã}^{\frac{3}{4}}\text{ããò} \ddagger \text{ãñŠ} \frac{1}{2}\text{ãìÇã} \ddagger \text{ãŠãñ} \ddagger \text{ãŠã}\ddagger \text{ãÃŠ} \text{'ãÀã} \text{'ã¶ã}$
 $\ddagger \text{ãŠÀ} \ddagger \text{ãñŠ} \text{ÀÇã} \text{'òý} \text{PããÀ-}\text{'ããúPã} \text{ãã}^{\text{a}}\text{¶ã} \text{'ãã}^{\text{a}} \text{¶ããë}\text{¶ããò} \text{'ãÀÇã¶ãããÊã}^{\frac{3}{4}}\text{ããò}$
 $\ddagger \text{ãŠã} \text{,ãìãÊããñ}\ddagger \text{ãŠ¶ã} \ddagger \text{ãŠÀòý} \ddagger \text{ã}^{\frac{3}{4}}\text{ãã} \text{ãã}^{\text{a}}\text{ÇããfÃ} \text{'ñ}\text{¶ã} \text{Öò} ?$
 $\text{'ãÖÊããë} \text{¶ã©ãã} \text{'ìÖãÀãë} \text{'ãÀÇã¶ãÊããë} \ddagger \text{ãŠãë} \ddagger \text{ãŠãëÊããò} \frac{1}{2}\text{ãò} \cdot \text{ããÖã} \text{¶ãÖãë}$
 $\text{ÊãÖã}\text{¶ãã} \text{Öò} \cdot \text{ã}^{\text{a}}\text{ããã} \ddagger \text{ãŠ} \text{¶ããëÖãÀãë} \text{'ãÀÇã¶ãÊããë} \ddagger \text{ãŠãë} \ddagger \text{ãŠãëÊããò} \frac{1}{2}\text{ãò}$
 $\cdot \text{ããÖã} \text{ÊãÖã} \cdot \text{ãã}\text{¶ãã} \text{Öò} \text{ý} \text{fÔãÔãñ} \frac{3}{4}\text{ãÖ} \text{ãã}\text{¶ãÖ} \ddagger \text{ãŠÓãÃ} \text{ãã}\text{¶ã} \ddagger \text{ãŠÊã}\text{¶ãã} \text{Öò}$
 $\text{ãã}\ddagger \text{ãŠ} \cdot \text{ããÖã} \text{Ìãã}^{\frac{3}{4}}\text{ãì} \text{(,ããù}\ddagger \text{ã}^{\text{a}}\text{Ôããë} \cdot \text{ã}\text{¶ã}) \text{¶ã©ãã} \text{¶ã}\frac{1}{2}\text{ããë} \ddagger \text{ãŠãë} \text{,,}\text{'ãããÖ} \text{©ããã}\text{¶ã}$
 $\frac{1}{2}\text{ãò} \text{ÊãÖã}\text{¶ãã} \text{Öòý}$



$\text{ÊããñÖñ} \text{¶ã©ãã} \text{,Ykqehfu,e} \ddagger \text{ãŠã} \text{ÔãããããÀ¥ã} \text{Ìãã}^{\frac{3}{4}}\text{ãì}\frac{1}{2}\text{ãã;Êããë}^{\frac{3}{4}}\text{ã}$
 $\text{,ããù}\ddagger \text{ã}^{\text{a}}\text{Ôããë} \cdot \text{ã}\text{¶ã} \ddagger \text{Ìãã} \text{¶ã}\frac{1}{2}\text{ããë} \ddagger \text{ãŠãë} \text{,,}\text{'ãããÖ} \text{©ããã}\text{¶ã} \frac{1}{2}\text{ãò} \text{,ããù}\ddagger \text{ã}^{\text{a}}\text{Ôããf;}$
 $\text{'ã}\text{¶ã}\text{¶ãñ} \ddagger \text{ãñŠ} \ddagger \text{ãŠãÀ¥ã} \text{Öãñ}\text{¶ãã} \text{Öòý}$
 $\text{¶ããú}^{\text{a}}\text{ãñ} \ddagger \text{ãñŠ} \text{'ãÀ}\text{¶ã}\text{¶ã} \text{'ãÀ} \text{ÖÀñ} \text{ÀãÖã} \ddagger \text{ãŠãë} \ddagger \text{ãŠãù}\text{'ãÀ} \ddagger \text{ãŠã}^{\text{a}}\text{ãó}\text{¶ãñ} \ddagger \text{ãŠãë}$
 $\text{'ãÀ}\text{¶ã} \text{¶ã©ãã} \text{Pããú}^{\text{a}}\text{ãë} \ddagger \text{ãñŠ} \dots \text{'ãÀ} \ddagger \text{ãŠãÊãñ} \text{ÀãÖã} \ddagger \text{ãŠãë} \text{ããÖãÊìãÀ}$
 $\text{ÔãÊìãŠãf; \ddagger} \text{ãŠãë} \text{'ãÀ}\text{¶ã} \text{'ã}\text{¶ã}\text{¶ãñ} \ddagger \text{ãñŠ} \ddagger \text{ãŠãÀ¥ã} \text{f¶ã} \text{fãã}\text{¶ãì,ããò} \ddagger \text{ãŠã}$
 $\text{ÔãããããÀ¥ã} \text{Öãñ}\text{¶ãã} \text{Öò} \text{ý}$

$\text{ãã}^{\text{a}}\text{ãŠ}^{\frac{3}{4}}\text{ãã} \ddagger \text{ãŠÊãã}^{\text{a}} \text{3.10}$

$\text{,Ykqehfu,e} \text{,¶ããú}^{\text{a}}\text{ãã} \text{,ÊããñÖã} \text{¶ã©ãã} \cdot \text{ãÔãã} \ddagger \text{ãŠã} \ddagger \text{ãŠ} \text{»ì} \ddagger \text{ãŠù}\text{¶ã} \text{Êãò} \text{ý}$
 $\text{Ôã}\frac{1}{4}\text{ããë} \text{»ì} \ddagger \text{ãŠù}\text{¶ãò} \text{'ãÀ} \ddagger \text{ãìŠœ} \text{'ãú}^{\text{a}}\text{ñ} \text{¶ã}\text{¶ãì} \text{Öãf;Êãñ}\ddagger \text{ã}^{\text{a}}\text{ÊããñããÀ}\ddagger \text{ãŠ} \text{,ã}\frac{1}{2}\text{Êã}$
 $\text{¶ãÊãòý} \ddagger \text{ã}^{\frac{3}{4}}\text{ãã} \text{Öãñ}\text{¶ãã} \text{Öò} ? \text{fãã}\text{¶ãì} \ddagger \text{ãŠãë} \text{Ôã}\text{¶ãÖ} \text{'ãÀ} \text{çããÖã} \text{(}^{\text{a}}\text{ìÊã}^{\text{a}}\text{ìÊãã} \text{)}$
 $\text{Ôãã} \text{,,Y}\text{¶ãã} \text{ãã}^{\text{a}}\text{ÇããfÃ} \text{'ñ}\text{¶ãã} \text{Öòý}$
 $\text{,ã}^{\text{a}} \text{fãã}\text{¶ãì} \ddagger \text{ãñŠ} \text{»ì} \ddagger \text{ãŠù}\text{¶ãò} \ddagger \text{ãŠãñ} \cdot \text{ãÊã} \text{Ôãñ} \text{fããñ} \ddagger \text{ãŠÀ} \text{,,Ôã}\ddagger \text{ãŠãë} \text{Ôã}\text{¶ãÖ}$
 $\ddagger \text{ãŠãñ} \text{,,Ôããë} \text{Ô} \text{©ãã}\text{¶ã} \text{'ãÀ} \text{œì} \ddagger \text{ãŠÀ} \text{'ñÇãñò} \cdot \text{ãÖãú} \text{,ãã}^{\text{a}} \text{¶ãñ} \text{,ã}\frac{1}{2}\text{Êã} \ddagger \text{ãŠãë}$
 $\text{'ãìú}^{\text{a}} \text{ããÖãÀã}^{\frac{3}{4}}\text{ããë} \text{©ããëý} \ddagger \text{ã}^{\frac{3}{4}}\text{ãã} \text{'ñÇã}\text{¶ãñ} \text{Öòò} ? \text{fãã}\text{¶ãì} \ddagger \text{ãŠãë} \text{Ôã}\text{¶ãÖ}$
 $\text{ÇãìÀ}^{\text{a}}\text{ìÀãë} \text{Öãñ} \cdot \text{ãã}\text{¶ããë} \text{Öòý}$
 $\text{fãã}\text{¶ãì} \text{,ã}\frac{1}{2}\text{Êã} \ddagger \text{ãñŠ} \text{Ôãã} \text{©ã} \text{ãã} \% \text{ãŠ}^{\frac{3}{4}}\text{ãã} \ddagger \text{ãŠÀ} \ddagger \text{ãñŠ} \text{Êãìã¥ã} \text{¶ã©ãã}$
 $\text{Öãf;Êãñ} \cdot \text{ã}\text{¶ã} \text{ÖãòÖã} \text{'ã}\text{¶ãã}\text{¶ãñ} \text{Öò} \text{ý} \cdot \text{ãòÖãñ} \text{,-Ykqehfu,e} \text{fãã}\text{¶ãì}$

$$2\text{Al} + 6\text{HCl} \rightarrow 2\text{AlCl}_3 + 3\text{H}_2 \square$$

£ãā|ãì,ãào ‡ ãŠãñ ÔãâããÀ¥ã Ôãñ ‡ ãõŠÔãñ °ãPãã¾ãã •ãã
Ôã‡ãŠ|ãã Öõ ?

(1) ¹ãò> ‡ãŠã Êãñ¹ã Þãü¤ã ‡ãŠÀ :-

(2) ØãÆãèÔã ¾ãã |ãñÊã ÊãØãã‡ãŠÀ :-

(3) ØãõÊĭãñŋŋããè:ãŠÀŸã (Łãã|ãĭ Þãüœãŋŋãã) :-

ØāōÊlāāñ¶āāē ‡ āŠÀẏā ‡ āōŠÔāñ āā ‡ āŠ¾āā •āā|āā Öō ? ÊāāñÖā ‡ āŠāñ
 •āāØā Ôāñ °āPāā¶āñ ‡ āñŠ āāÊā¾āñ ÊāāñÖñ ‡ āŠāē Pāā°À ¾āā ,ā¶¾ā 'āā'ā
 ‡ āŠāñ āā'āÜāÊāñ Òì † •āÔ|āñ ½āō ÿ°āā °ñ|āñ Öō, āā•āÔā ‡ āñŠ ‡ āŠāÀẏā
 ÊāāñÖñ 'āÀ •āÔ|āñ ‡ āŠāē † ‡ āŠ 'ā|āÊāāē 'āÀ|ā •ā½ā •āā|āāē Öō ý fÔāñ
 ØāōÊlāāñ¶āāē ‡ āŠÀẏā ‡ āŠÔ|āñ Öōý ÜāÀāō ‡ āŠāē œ|āñ °ā¶āā¶āñ ‡ āñŠ

ããÊã† 'ãÆ³⁄⁴ãì ‡ ã<|ã ÊãñÑÕñ ‡ ãŠãè ÞããªÀãò, °ããããÊ³⁄⁴ããò ,ããòÀ ¡Ê¹⁄²ããò
‡ ãŠãñ ÔããããªÀãã Ôãñ °ãÞãã¶ãñ ‡ ãñŠ ããÊã † „¶ã ‡ ãŠã
ÕãòÊìãñ¶ããè‡ãŠÀãã ãã‡ãŠ³⁄⁴ãã •ãã|ãã Ööý

(4) ããìã²ãì|ã Êãñ¹ã¶ã (fÊãñ‡ã<Êãñ¹Êãñãã>ãÕã) :-

‡ ãìŠöe ããã|ãì •ãòÔãñ % ãŠãñãã¹⁄²ã³⁄⁴ã¹⁄²ã, ãã¶ããã ‡ ãŠÊã |ã©ãã ãã>¶ã
ìãã³⁄⁴ãì¹⁄²ãã|Êã ¹⁄²ãò „¹ãããÔ©ã|ã ,ããù ‡ ã<Ôããè•ã¶ã † ìãã ¶ã¹⁄²ããè Ôãñ
'ãÆ¹⁄⁴ããããìã|ã ¶ãÕãé Ôãñ|ãñ Öö ý ÊãñÑÕñ ‡ ãŠã ããªÀãã Àãñ‡ãŠ¶ãñ ‡ ãñŠ
ããÊã † „Ôã ‡ ãñŠ ÞããªÀãò ,ããñÀ % ãŠãñãã¹⁄²ã³⁄⁴ã¹⁄²ã ³⁄⁴ãã ãã>¶ã ‡ ãŠãè
fÊãñ ‡ ã<Êãñ¹Êãñãã>ãÕã ‡ ãŠãè •ãã|ããè Ööý,Ykqehfu;e ‡ ãñŠ ...
'ãÀ ,Ykqehfu;e ,ããù ‡ ã<Ôããf¡ ‡ ãŠãè 'ãÀ|ã •ã¹⁄²ã •ãã¶ãñ Ôãñ „Ôã ‡ ãŠãè
Þã¹⁄²ã ‡ ãŠ ¶ãÓ> Ôãñ •ãã|ããè Öö ãã ‡ ãŠ¶ãì „Ôã ‡ ãŠã ããªÀãã Á ‡ ãŠ •ãã|ãã
Ööý ,Ykqehfu;e ‡ ãŠãñ ããªÀãã Ôãñ °ãÞãã¶ãñ ‡ ãñŠ ããÊã † „Ôã ‡ ãñŠ ...
'ãÀ ,Ykqehfu;e,ããù‡ã<Ôããf¡ ‡ ãŠã ããìã²ãì|ã Êãñ¹ã¶ã ‡ ãŠÀ ããª³⁄⁴ãã •ãã|ãã Öö
ý

(5) ãã¹⁄²ãÑã ããã|ãì °ã¶ãã ‡ãŠÀ :-

‡ ãŠ¹⁄⁴ããè- ‡ ãŠ¹⁄⁴ããè † ‡ ãŠ ããã|ãì ¹⁄²ãò °ÔãÀãè ããã|ãì ³⁄⁴ãã ,ããã|ãì
ãã¹⁄²ãÊãã¶ãñ 'ãÀ ìãÖ ,ããããã ‡ãŠ ‡ãŠÝãñÀ, Ô©ãã³⁄⁴ããè |ã©ãã ÔããããªÀãã
Ôãñ ÔãìÀãããã|ã Ôãñ •ãã|ãã Öö ý Ô>ñ¶ãÊãñÔã Ô>ãèÊã, ÊãñÑÔã |ã©ãã
‡ ãŠãªÀã¶ã ‡ ãŠã ãã¹⁄²ãÑã ããã|ãì Öö ãã•ãÔã¹⁄²ãò ,ããÔãã¶ããè Ôãñ •ããÔã
¶ãÕãé ÊãÕã|ãã ý

ãã¹⁄²ãÑã ããã|ãì

,ã¶ãñ ‡ãŠ °ããÀ ìãì® Â¹ã ¹⁄²ãò ããã|ãì ‡ãŠãñ ,ããìãì³⁄⁴ã ‡ãŠ „ñì³⁄⁴ããò ‡ãñŠ
ããÊã † „¹ã³⁄⁴ããñÔã ¹⁄²ãò ¶ãÕãé Êãã³⁄⁴ãã •ãã Ôã‡ãŠ|ãã Ööý ããã|ãì ¹⁄²ãò ,ã¶³⁄⁴ã
ããã|ãì,ããò ,ã©ãìãã ,ãããã|ãì,ããò ‡ãŠãè „ããÞã|ã ¹⁄²ãããã ãã¹⁄²ãÊãã ‡ãŠÀ
„Ôã¹⁄²ãò ìããããããè|ã Ôãìãã-ã¹⁄²ãÃ 'ãÆã¹|ã ãã ‡ãŠ³⁄⁴ãñ •ãã Ôã ‡ãŠ|ãñ Ööý
†ñÔãñ ãã¹⁄²ãÑããã ‡ãŠãñ ãã¹⁄²ãÑã ããã|ãì ‡ãŠÖ|ãñ Ööý ,ã©ããÃ|ã ãã¹⁄²ãÑã
ããã|ãì °ãñ ³⁄⁴ãã ,ããããã‡ãŠ ããã|ãì,ããò ³⁄⁴ãã ,ãããã|ãì ‡ãŠã Ôã¹⁄²ãããÔããè
ãã¹⁄²ãÑããã Ööý °ãñ ³⁄⁴ãã °ãñ Ôãñ ,ããããã‡ãŠ ããã|ãì,ããò ‡ãŠãñ ãã¹ãÜãÊããè
ÖìfÃ ,ãìãÔ©ãã ¹⁄²ãò ãã¹⁄²ãÊãã¶ãñ 'ãÀ ãã¹⁄²ãÑã ããã|ãì 'ãÆã¹|ã Ôãñ|ãã Öö ý
ãã¹⁄²ãÑã ããã|ãì ‡ãñŠ ¹⁄⁴ããòãã|ã ‡ãŠ † ìãã ããããã|ã ‡ãŠ Ôãìãã ,ã¹ã¶ãñ ¹⁄²ãìÊã
ããã|ãì ‡ãñŠ Ôãìãããò Ôãñ ãã¹⁄⁴ã¶ã † ìãã ÑãñÓÝ Ôãñ|ãñ Ööý Ô©ãããã³⁄⁴ã|ã,
Þã¹⁄²ã ‡ãŠ † ìãã ÑãñÓÝ Ôãìãããò ‡ãñŠ ‡ãŠãªÀãã °ããã¶ã ‡ãŠ •ããèìã¶ã ¹⁄²ãò
f¶ã ‡ãŠã ,ããããã‡ãŠ ããã|ãì „¹ã³⁄⁴ããñÔã Ôãñ|ãã Ööý ‡ãìŠöe 'ãÆÞãããÊã|ã ãã¹⁄²ãÑã
ããã|ãì,ããò ‡ãŠã ÔããÔãÝ¶ã fÔã 'ãÆ‡ãŠãÀ Ööý

!ããããÊã‡ãŠã 3.5

(i) Êã†ãŠü|ãè †ãŠãè ½ãñ•ã (ii) Ô>ãèÊã †ãŠãè †ãìŠÔããè
 (iii) ĄãìÊããè Ô©ãã¶ãò 'ãÀ ÀĄããè ÊãñŎñ †ãŠãè œü| (iv) |ãñÊã
 Êãñãã'ã|ã ÊãñŎñ †ãŠãè œü|

(Ąã) °ãù †ãĄÔããf> ãã †ãŠÔã †ãŠã ,ã¾ãÔ †ãŠ Ŏö - **Àã0 'ãĄ0 ĄãñŎ**
'ãÀãèãã 2006

(i) Ôãñãã¾|¾ã½ã (ii) ÊãñŎã
 (iii), Ykqehfu;e (iv) †ãŠãù'ãÀ
 (Øã) f¶ã½ãò Ôãñ †ãŠãō¶ã Ôããè Ôãã¶ã †ãŠãè ããìãããfã ¶ãŎãé Ŏö?
 (i) 'ãñŠ¶ã 'Êããìã¶ã ããìãããfã (ii) Þãì½°ã†ãŠãè¾ã 'ãð©ã†ãĄ†ãŠÀã
 (iii) ãã¶ãÔ|ãã'ã¶ã (iv) ØãìÁ|ìãã¾ã 'ãð©ã†ãĄ†ãŠÀã

2. ããÀ†ãĄ|ã Ô©ãã¶ãò †ãŠãè 'ãñã|ãã †ãŠãèãã•ã† -
 (†ãŠ) Ôãñãã¾|¾ã½ã ãã|ãì †ãŠãñ ½ãò ÀĄã|ãñ Ŏö ý
 (Ąã) •ãøã Êãøã¶ãñ †ãñŠ ããÊã† |ã©ãã
 ,ããìã¾ã†ãŠ Ŏö ý
 (Øã) ãã|ãì Ôãñ |ããÀ °ã¶ãã¶ãñ †ãŠã Øãìãã †ãŠŎÊãã|ãã
 Ŏö ý

(Üã) ãã•ã¶ã Ąããã¶ã•ããò Ôãñ ãã|ãì †ãŠã ãã¶ãÓ †ãŠÓããã ãã †ãŠ¾ãã
 •ãã|ãã Ŏö „¶Ŏò †ãŠŎ|ãñ Ŏö ý

3. ãã¶ã½¶ãããÊãããĄã †ãŠ©ã¶ãò ½ãò ÔãŎãè †ãŠ©ã¶ã †ãñŠ ,ããøãñ
 ÔãŎãè (□) |ã©ãã ØãÊã|ã †ãŠ©ã¶ã †ãñŠ ,ããøãñ ØãÊã|ã (✱) †ãŠã
 ããÞãŎ Êãøããf†-

(†ãŠ) ŎãèÀã †ãŠã°ãã¶ã †ãŠã Á'ã Ŏöý ()
 (Ąã) Ŏñ½ãñ>ãf> , Ykqehfu;e †ãŠã ,ã¾ãÔ†ãŠ Ŏöý ()
 (Øã) ãã|ãì ,ãù †ãĄÔããè•ã¶ã Ôãñ ,ãã¾ããã %ã Š¾ãã †ãŠÀ †ãñŠ ãã|ãì
 ,ãù†ãĄÔããf| °ã¶ãã|ãñ Ŏö ý ()

(Üã) †ãĄìããÁã•ã ãããã|ã†ãŠ Ąããã¶ã•ã Ŏöý ()
 (Ý) Ôããøã½ãÀ½ãÀ Þãì¶ãñ †ãñŠ 'ã|©ãÀ Ôãñ °ã¶ã|ãã Ŏöý ()
 (Þã) ãã¶ãÔ|ãã'ã¶ã †ãŠãè ãã%ãŠ¾ãã ½ãò ,ã¾ãÔ†ãŠ †ãŠãñ ìã¾ãì †ãŠãè
 „ìããÔ©ããã|ã ½ãò ØãÀ½ã ãã†ãŠ¾ãã •ãã|ãã Ŏöý ()

4. †ãŠãùÊã½ã A †ãñŠ Íã^{oa}ãò †ãŠã †ãŠãùÊã½ã B †ãñŠ Íã^{oa}ãò Ôãñ ÔãŎãè
 ãã½ãÊãã¶ã †ãŠãèãã•ã† -

†ãŠãùÊã½ã A **†ãŠãùÊã½ã B**

°ãù †ãĄÔããf>

,ã¾ãÀ¶ã (ÊãñŎã)

ØãøÊãñ¶ã

Êãñ|

(ÔããèÔãã)

Öñ¹/₂ãñ>ãf>

,Ykqehfu;e

¹ããfÀãñÊãìÔããf>

¹/₂ãöÔã¶ããè•ã

5. ãã¶ã¹/₂¶ãããÊãããĈã|ã ¹ãÆÍ¶ããö ðãŠã Ôããããã¹|ã „||ãÀ ³ãèãã•ã† -

(ðãŠ) Ĉããã¶ã•ã |ã©ãã ,ã³/₄ãÔðãŠ ¹/₂ãö ðã<³/₄ãã ,ã¶|ãÀ Öö ?

(Ĉã) ããã|ãìðãŠ¹/₂ãÃ Ôãñ ðã<³/₄ãã Ôã¹/₂ãçã|ãñ Öö ?

(Øã) ããã|ãì,ããö ðãŠãè ,ãÜãã|ãÌãĈã¶ããè³/₄ã|ãã |ã©ãã |ã¶³/₄ã|ãã ðãñŠ ØãìŸã
ðãŠã ðã<³/₄ãã ,ã©ãÃ Öö ?

(Üã) ããã|ãì,ããö ðãŠã ÔãããããÃŸã ðã<³/₄ãã Öö ?

(Ý) ¹/₂ãìðã<|ã ,ãÌãÔ©ãã ¹/₂ãö ¹ãã† •ãã¶ãñ ÌããÊãñ ããðãŠ¶Öãè ³ãñ ããã|ãì,ããö
ðãñŠ ¶ãã¹/₂ã ããÊãããĈã†ý

(Pã) ãã¹/₂ãÑã ããã|ãì ðã<³/₄ãã Ôãñ|ããè Öö ?

(œ) ,ã³/₄ãÔðãŠãö ðãŠã Ôãã¶Ÿã ðã<³/₄ããñã ããðãŠ³/₄ãã •ãã|ãã Öö ?

(•ã) ããðãŠÔããè †ðãŠ ³Ìã ããã|ãì ðãŠã ¶ãã¹/₂ã ããÊãããĈã†ý

6. ãã¶ã¹/₂¶ãããÊãããĈã|ã ¹ãÆÍ¶ããö ðãŠã „||ãÀ ³ãèãã•ã† :-

(ðãŠ) ããã|ãì,ããö ðãŠãè ,ããùðã<Ôããè•ã¶ã Ôãñ ,ããã¹/₄ããã‰ãŠ³/₄ãã ðãŠãñ
„³ãÖÃŸã ÔãããÖ|ã Ô¹ãÓ> ðãŠãèãã•ã†ý

(Ĉã) Ôãã¶Ÿã ðãŠãè ããÌããã¹/₄ã¶ã ããÌãããĈã³/₄ããö ðãŠã ÔãããPãã ÌãŸãÃ¶ã
ðãŠãèãã•ã†ý

(Øã) ããã|ãì,ããö ðãñŠ ÍããñĈã¶ã Ôãñ ðã<³/₄ãã Ôã¹/₂ãçã|ãñ Öö ? ÍããñĈã¶ã
ðãŠãè ããÌãããĈã ðãŠã ÔãããPãã ÌãŸãÃ¶ã ðãŠãèãã•ã†ý

(Üã) ããã|ãì,ããö ðãŠãè •ãÊã ðãñŠ Ôãã©ã ,ããã¹/₄ããã‰ãŠ³/₄ãã ðãŠãñ ³ãñ
„³ãÖÃŸã ³ãÃ Ô¹ãÓ> ðãŠãèãã•ã† ý

(Ý) Ôããñãã¹/₄ã¹/₂ã ããã|ãì ðãŠã •ãÊã |ã©ãã ,ããùðã<Ôããè•ã¶ã Ôãñ
ãã‰ããŠ³/₄ãã ðãŠã ÀãÔãã³/₄ããã¶ãðãŠ Ôã¹/₂ããèðãŠÃŸã ããÊãããĈã†ý

(Pã) ¹/₄ã•ãÃ¶ã |ã©ãã ãã¶ãÔ|ãã¹ã¶ã ¹/₂ãö ,ã¶|ãÀ Ô¹ãÓ> ðãŠãèãã•ã†ý

(œ) ããã|ãì ðãñŠ ÔãããããÃŸã ðãŠãè Àãñ ðãŠ©ãã¹/₂ã ðãñŠ ããÊã³/₄ãñ
,ã¹ã¶ã³/₄ããè •ãã¶ãñ ÌããÊããè ããÌããã¹/₄ã¶ã ããÌãããĈã³/₄ããö ðãŠã ÌãŸãÃ¶ã
ðãŠãèãã•ã†ý

(•ã) |ãÌãñ ðãŠãè ÖöããŸ|Êã ¹/₂ãö ÊãðãŠü|ãè ÊãØããè Öãñ|ããè Öö, ðã<³/₄ããöý

(çã) ããã|ãì,ããö ðãñŠ ¹ãÆ¹/₂ãìĈã ,¹ã³/₄ããñØã ããÊãããĈã†ý

7.ãã¶ã¹/₂¶ãããÊãããĈã|ã ¹ãÆÍ¶ããö ¹/₂ãö PããÀ-PããÀ ¹ã Ööý ¹ãÆ¹/₄ãñ ðãŠ
¹ãÆÍ¶ã ¹/₂ãö |ããè¶ã ¹ã ããðãŠÔããè ¶ã ããðãŠÔããè Á¹ã ¹/₂ãö †ðãŠ Ôãñ Öö
,ããöÃ ðãŠ ¹ã ,ã¶³/₄ã |ããè¶ããö Ôãñ ãã¹/₄ã,ã Ööý ,ã¶³/₄ã Ôãñ ãã¹/₄ã,ã ¹ã
ðãŠãè ¹ãÖPãã¶ã ðãŠÀ ,ã¹/₄³/₄ããÔã ¹ãÌããÔ|ãðãŠ ¹/₂ãö ããÊãããĈã† ã- Àã0
¹ãÆ0 Ĉããñ0 ¹ãÃãèããã

(‡ăŠ)û 'ăăè|ăÊă, ‡ăŠăùÔăă, Ô›ñ¶ăÊăñÔă Ô›ăèÊă, ÊăăñÖă
(Œă)û Ôăăñ¶ăă, pkúnh, ÖăèÀă, 'Êăăăă›¶ă½ă
(Øă) °ăăù‡ă‹Ôăăf›, ØăăÊăă¶ăă, Öñ½ăă›ăf›, ‡ăŠăù'ăÀ
(Ûă) äă¶ăÔăăă'ăă¶ă, ¼ă•ăĂ¶ă, Ôăă¶ªÆ¥ă, ÔăăàăăÀ¥ă

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f‡ãŠãfÃ : 4



- ½ãã¶ãlã ãã¶ããã½ãÃ|ã lãÔ|ãl,ããò ‡ãŠãè „¹ã³ããñããÔã|ãã ý
- ÔããlÊãñããÔã|ã Àñlãñ ý
- ¹ÊããããÔ>‡ãŠ ‡ãñŠ ¹ãÆ‡ãŠãÀ, ÔãlÝã †lãã „¹ã³ããñÔã ý
- ‡ãŠãúPã ý
- ½ãðããlã‡ãŠã †lãã „Ôã‡ãñŠ „¹ã³ããñÔã ý
- Ôãã°ãl¶ã ý
- „lãÃÀ‡ãŠ †lãã ÀãñÔããÝãl¶ããlã‡ãŠ ý

‡ã³⁄ãã ãã¹ã¶ãñ ‡ãŠ¹⁄ããè ÔããñPãã Öò ãã ‡ãŠ •ããñ ‡ãŠ¹ãüjñ
 (³⁄ãlãã¶ã¹ãŠã½ãÃ) ¹ãÖ¶ã ‡ãŠÀ,ãã¹ã Ô‡ãlŠÊã •ãã|ãñ Öò „Ôãñ ãã‡ãŠÔã¶ãñ
 °ã¶ãã³⁄ãã Öò ? ‡ãŠ¹ãüjã °ãüjãè-°ãüjãè ‡ãŠ¹ãüjã ãã½ãÊããò ½ãò ½ãlããè¶ããò
 ‡ãñŠ ¹ãÃã ½ã¶ãlÔ³⁄ããò ¶ãñ °ã¶ãã³⁄ãã Ööý,ãã¹ã‡ãñŠ ½ãã|ãã-ãã¹ã|ãã fÔãñ
 ÆãÀãèª ‡ãŠÀ >ñÊãÀ-½ããÔ>À Ôãñ,ãã¹ã ‡ãñŠ ããÊã³⁄ãñ jÊñÔã |ãò³⁄ããÀ
 ‡ãŠÀã|ãñ Ööý fÔããè ¹ãÆ‡ãŠãÀ •ãlãã-½ããñ•ãã, °ãñÊ>, °ãÔ|ãã,ããããª ¹⁄ããè
 ãã‡ãŠÔããè ¶ã ãã‡ãŠÔããè ‡ãŠãÀÆãã¶ãñ ½ãò Ö½ããÀñ ããÊã³⁄ãñ ‡ãlŠlãÊã
 ‡ãŠãÀãèÔãÀãò ¶ãñ °ã¶ãã³⁄ãñ Ööý ‡ãŠãÔã•ã ‡ãŠãè ÊãlÔãªãè Ôãñ
 ‡ãŠãÔã•ã, ÀªÀ ‡ãñŠ ¹ããðfããò Ôãñ ½ãlÊãã³⁄ã¹⁄ã ÀªÀ, ÔãÆñ¹ãŠãf> Ôãñ
 ¹ãñãã¶ÔãÊã, ÊããñÖñ, Êã ‡ãSüjãè ³⁄ãã ¹ÊããããÔ> ‡ãŠ Ôãñ ¹ã>Àãè,ããããª
 Ôã¹⁄ããè Ôãã½ãã¶ã ‡ãŠPãñ ½ããÊã ¹ãÃã ‡ãŠãÀÆãã¶ããò ½ãò ½ã¶ãlÔ³⁄ããò
 ‡ãñŠ ¹ãÃã |ãò³⁄ããÀ ãã ‡ãŠ³⁄ãã •ãã|ãã Ööý³⁄ãñ Ôã¹⁄ããè ½ãã¶ãlã
 ãã¶ããã½ãÃ|ã lãÔ|ãl†ú Ööý

Ôããúlããò, ‡ãŠÔããò ½ãò ÀÖ¶ãñ lããÊãñ ãã‡ãŠÔãã¶ã,ã¹ã¶ãñ ‡ãðŠããÔã
 ‡ãŠã³⁄ãÃ ‡ãñŠ ããÊã† ÖúããÔã³⁄ãã, ÆãlÀ¹ããè, ¹ãŠãlãüjã, ‡ãlŠªãÊã,ããããª
 ÊãlÔãÀ ‡ãñŠ ³⁄ãÔãú Ôãñ ³⁄ãã °ãã•ããÀ Ôãñ ÆãÀãèª ‡ãŠÀ Êãã|ãñ Ööý
 fÔãñ Ôãª ½ã¶ãlÔ³⁄ãã Öãè °ã¶ãã|ãñ Ööý Ôã¹⁄ããè ¹ãÆ‡ãŠãÀ ‡ãñŠ °ãlãÃ¶ã,
 Üãüjãè, Ôããfãã ‡ãŠÊã, Ô‡ãlŠ>À, ‡ãlŠÔããè, ½ãñ•ã, ¹ãŠ¶ããèPãÀ,ããããª
 °ããã¶ã‡ãŠ •ããèlã¶ã ½ãò „¹ã³ããñÔããè lãÔ|ãl†ú ½ãã¶ãlã ãã¶ããã½ãÃ|ã Ööý



ããbãã Ôãã0 4.1

,ãã'ã ‡ ãñŠ PããÀãò ,ããñÀ ããCEããfÃ ãñ¶ãñ ÌããÊãñ •ããèÌã-ã¶¶ãì, 'ãñü;-
 'ããõfãñ, ãã½ã>á>ãè, CEãã¶¶ã•ã ,ããããª Ôã¼ããè 'ãÆ ‡ ãðŠãã|ã 'ãÆ¶¶ã Ööý
 ½ã ‡ ãŠ¶ã, Øããüãè, Ôããfãã ‡ ãŠÊã, ããCEãÊããõ¶¶ã, Ôãã°ãì¶ã, ‡ ãŠ'ãüã,
 „ÌãÃÀãŠ, ‡ãŠãüPã ,ããããª ¼ããè ‡ã<¾ãã 'ãÆ‡ãðŠãã|ã 'ãÆ¶¶ã Öö ? ¶ãÖãé ý
 ¾ãñ Ôã¼ããè ½ãã¶¶ã ãã¶¶ãã½ãÃ|ã Öö ý ãè Øã¾ããè |ãããÊã‡ãŠã ½ãò ãÔã
 'ãÆ ‡ ãðŠãã|ã 'ãÆ¶¶ã |ã©ãã ãÔã ½ãã¶¶ã ãã¶¶ãã½ãÃ|ã ÌãÔ|ãì,ããò ‡ ãñŠ
 ¶ãã½ã ããÊãCEã ‡ãŠÀ |ãããÊã‡ãŠã 4.1‡ãŠãñ 'ãìÀã ‡ãŠãèãã•ã†-

!ãããÊã‡ãŠã - 4.1

% ãŠ0Ôãã0 'ãÆ ‡ ãðŠãã|ã 'ãÆ¶¶ã ½ãã¶¶ã-ãã¶¶ãã½ãÃ|ã
 % ãŠ0Ôãã0 'ãÆ ‡ ãðŠãã|ã 'ãÆ¶¶ã
 ½ãã¶¶ã-ãã¶¶ãã½ãÃ|ã
 ÔããÔããfã¶ã ÌãÔ|ãì ‡ ú
 ÔããÔããfã¶ã

ÌãÔ|ãì†ú

1.	ãã½ã>á>ãè	½ããñ>À	
6.	--	--	
2.	--	--	7.
	--	--	
3.	--	--	8.
	--	--	
4.	--	--	9.
	--	--	
5.	--	--	10.
	--	--	

½ãã¶¶ã-ãã¶¶ãã½ãÃ|ã ÌãÔ|ãì,ããò ‡ãŠãè „ã¾ããñããØã'ãã :

'ãÆ‡ãðŠãã|ã Ôãñ Ö½ãò ,ã¶¶ã‡ãŠ ÔããÔããfã¶ã 'ãÆã'ã Öö, ãã'ãŠÀ ¼ããè
 ½ãã¶¶ã-ãã¶¶ãã½ãÃ|ã ÌãÔ|ãì,ããò ‡ãŠãè ,ããÌã¼ã‡ãŠãã ãü¶ããè •ãã ÀÖãè
 Öö ‡ñÔãã ‡ã<¾ããò ?

,ããããª‡ãŠãÊã ½ãò ½ã¶ãìÓ³⁄₄ã ‡ãŠãè ,ããìãí³⁄₄ã‡ãŠ|ãã†ú Ôããèãã½ã|ã ©ããè ý
 ,,¶ã‡ãŠã •ããèìã¶ã ½ããªã ¹ãÆã‡ãðŠãã|ã‡ãŠ Ôããñ|ããò ¹ãÀ Ôãè ãã¶ã¹⁄₄ãÃÃ
 ©ãã ý Ôã¹⁄₄³⁄₄ã|ãã ‡ãŠã ããìã ‡ãŠãÔã, •ã¶ãÔããÆ³⁄₄ãã ìãðãã® †ìãã ìãð—
 ãããã¶ã‡ãŠ ¹ãÆÔããã|ã ‡ãñŠ ‡ãŠãÀ¥ã ½ã¶ãìÓ³⁄₄ã ‡ãŠãè ,ããìãí³⁄₄ã‡ãŠ|ãã†ú
 £ããèÃñ-£ããèÃñ °ãü|ããè Øã³⁄₄ããé, ãã•ã¶ã ‡ãŠãè ¹ãíãã|ãÃ ‡ãŠÃ¶ãã
 ¹ãÆã‡ãðŠãã|ã‡ãŠ ÔããÔãã£ã¶ããò ´ãÀã ,ãÔã¹⁄₂¹⁄₄ãìã ©ããý ,ã|ã: ½ã¶ãìÓ³⁄₄ã
 ¶ãñ ,ã¹ã¶ããè °ãìãã® †ìãã ‡ãŠãðìãÊã Ôãñ ,ã¶ãñ ‡ãŠ ìãÔ|ãì,ããò ‡ãŠã
 ãã¶ã¹⁄₂ããÀ¥ã ‡ãŠÃ¶ãã ,ããÀ¹⁄₂¹⁄₄ã ãã‡ãŠ³⁄₄ãã ý fÔã ¹ãÆ‡ãŠãÀ ½ãã¶ãìã-
 ãã¶ããã½ãÃ|ã ìãÔ|ãì,ããò ‡ãŠã ããìã ‡ãŠãÔã Ôãñ|ãã Øã³⁄₄ããý ½ã¶ãìÓ³⁄₄ã
 ‡ãŠãè ¹ãÆ½ãìÆã ,ããìãí³⁄₄ã‡ãŠ|ãã³⁄₄ãò ¼ããñ•ã¶ã, ìãÔªã |ã©ãã ,ããìããÔã Ööý
 f¶ã ,ããìãí³⁄₄ã ‡ãŠ|ãã,ããò ‡ãŠãè ¹ãíãã|ãÃ ‡ãŠ³⁄₄ãã ¹ãÆã‡ãðŠãã|ã ‡ãŠ
 ÔããÔãã£ã¶ããò ´ãÀã Ôã¹⁄₂¹⁄₄ãìã Ôõ ? ,ããf† ½ã¶ãìÓ³⁄₄ã ‡ãŠãè ¹ãÆ½ãìÆã
 ,ããìãí³⁄₄ã ‡ãŠ|ãã ¼ããñ•ã¶ã, ìãÔªã |ã©ãã ,ããìããÔã Ôñ|ãì ,,¹ã³⁄₄ããñÔããè
 ½ãã¶ãìã ãã¶ããã½ãÃ|ã ìãÔ|ãì,ããò ‡ãŠãè ÞãÞããÃ ‡ãŠÃ|ãñ Ööý

(‡ãŠ) ìãÔªã :-

‡ãŠ³⁄₄ãã ,ãã¹ã °ã|ãã Ôã‡ãŠ|ãñ Öö ãã‡ãŠ ìãÀãèÀ ‡ãŠãñ □‡ãŠ¶ãñ |ã©ãã
 ÔãìÀããã ‡ãñŠ ããÊã† ãã‡ãŠ¶ã-ãã‡ãŠ¶ã ìãÔ|ãì,ããò ‡ãŠã ,,¹ã³⁄₄ããñÔã
 ãã‡ãŠ³⁄₄ãã •ãã|ãã Öö ? Ö½ã Ôã¹⁄₄ããè •ãã¶ã|ãñ Öö ãã‡ãŠ ìãÀãèÀ ‡ãŠãñ
 □‡ãŠ¶ãñ ‡ãñŠ ããÊã†‡ãŠ¹ãü|ãò ‡ãŠã ,,¹ã³⁄₄ããñÔã ãã‡ãŠ³⁄₄ãã •ãã|ãã Ööý Ö½ã
 ¹ãð¶ã, ìã>Ã, ‡ãìŠ|ããÃ, Ôããü|ãè, ÔãÊãìããÀ, ¹ã³⁄₄ã•ãã¹⁄₂ãã, •ãããããÜã³⁄₄ãã,
 °ããã¶ã³⁄₄ããf¶ã ,ããããª ‡ãŠã ,,¹ã³⁄₄ããñÔã ‡ãŠÃ|ãñ Ööý Ôãªè Ôãñ °ãÞã¶ãñ
 ‡ãñŠ ããÊã† ...¶ããè ‡ãŠ¹ãü|ñ, Ôìãñ>Ã, ìããÊã, ‡ãŠããã|ÃÔã¶ã,
 ‡ããŠªãÊã,ÊããñfÃ ,ããããª ‡ãŠã ¹ãÆ³⁄₄ããñÔã ‡ãŠÃ|ãñ Ööý
 ‡ãŠ³⁄₄ãã ,ãã¹ã °ã|ãã Ôã‡ãŠ|ãñ Öö ãã‡ãŠ ³⁄₄ãñ ìãÔªã ãã‡ãŠÔã ¹ãÆ‡ãŠãÀ
 |ãð³⁄₄ããÀ ãã‡ãŠ³⁄₄ãñ •ãã|ãñ Öö ? Ôãì|ããè ìãÔªã ‡ãŠ¹ããÔã ‡ãñŠ Àñìããò Ôãñ,
 ...¶ããè ìãÔªã ¼ããñü| ‡ãñŠ °ããÊã Ôãñ Uee mebMuesef<ele jsMeesb
 mes |ãð³⁄₄ããÀ ãã‡ãŠ³⁄₄ãñ •ãã|ãñ Ööý ,ããf† ‡ãìŠœ †ñÔãñ ìãÔªãò ‡ãñŠ
 °ããÀñ ½ãò •ãã¶ãò •ããñ ,ã¶³⁄₄ã ¹ãÆ‡ãŠãÀ ‡ãñŠ Àñìããò Ôãñ °ã¶ãñ Öö
 (|ããããÊã‡ãŠã 4.2)

यस्त्र	प्रयुक्त रेशे	स्त्रोत
सूती	सूती धागे	कपास
ऊनी	ऊनी धागे	जन्तुओं के बाल
रेशमी	रेशमी धागे	रेशम की कीट
टेरीलीन	संश्लेषित रेशे	मानव निर्मित

!ããããÊã‡ãŠã - 4.2

,ãã•ã‡ãŠÊã ½ã¶ãìÓ³⁄₄ã ¶ããü³⁄₄ãÊãã¶ã, >ñããÀÊããè¶ã
 (†ñ%ãŠãü¶ã) Deefo ¹ããüããÊãÔ>À £ããðããò Ôãñ °ã¶ãñ ìãÔªãò ‡ãŠã

,ã¹³/₄ãããfã†ãŠ „,¹ã³/₄ããñØã †ãŠÀ ÀÖã Öö ý ³/₄ãñ fããØãñ ÔããÍÊãñããÖã|ã
 ÀñÍããò Öãñ |ãö³/₄ããÀ ãã†ãŠ³/₄ãñ •ãã|ãñ Ööý f¶ã fããØããò Öãñ ãã¶ããã¹/₂ãÃ|ã
 ÌãÖã,ãããfã†ãŠ,ãã†ãŠÓãÃ†ãŠ †Ìãã ãã>†ãŠã... Öãñ|ãñ Ööý

(Cã) ¹/₄ãÌã¶ã ãã¶ã¹/₂ããÃ¶ã :-

,ã¹ã¶ãñ,ããÖã-¹ããÖã,ãã¹ã¶ãñ ¹/₄ãÌã¶ã òã¶ã|ãñ,ãÌãÍ³/₄ã ñCãñ ÖãòØãñý
 †ã<³/₄ãã,ãã¹ã òã|ãã Öã†ãŠ|ãñ Öö ãã†ãŠ ¹/₄ãÌã¶ã ãã¶ã¹/₂ããÃ¶ã ¹/₂ãò ãã†ãŠ¶ã-
 ãã †ãŠ¶ã ¹ãã©ããò †ãŠã „,¹ã³/₄ããñØã ãã †ãŠ³/₄ãã •ãã|ãã Öö ? ¹/₄ãÌã¶ã
 ãã¶ã¹/₂ããÃ¶ã ¹/₂ãò ¹ãÆã³/₄ã: fÃ>,¹ã|©ãÀ,ÊããñÖñ †ãñŠ Øã;ÃÀ,ÔãããÀ³/₄ãã,
 Ôããè¹/₂ãñ¶>, ¹/₂ããñÀ¹/₂ã, òããÊãì |ã©ãã ãã¹/₂ãã>ãè †ãŠã „,¹ã³/₄ããñØã ãã†ãŠ³/₄ãã
 •ãã|ãã Ööý f¶ã¹/₂ãò fÃ>, ÔãããÀ³/₄ãã, Øã;ÃÀ, Ôããè¹/₂ãñ¶> ¹/₂ãã¶ãÌã
 ãã¶ããã¹/₂ãÃ|ã ÌãÖ|ãì † ú Öö ý Ôããè¹/₂ãñ¶> Öãñ ñæÌããÀ †ãŠãè •ãìü;ãfÃ,
 ¹ÊããÖ>À, ÔÊãòã |ã©ãã ¹ãŠÍãÃ,ãããã òã¶ãã¶ãñ †ãñŠ ¹ãÍPãã|ãã †ãìŠce
 ãã¶ããò |ã†ãŠ ÊãØãã|ããÀ ¹ãã¶ãè †ãŠã ããœü;†ãŠãÌã „,¶ã†ãŠãè ¹/₂ã•òãìãè
 †ãñŠ ããÊã† ãã†ãŠ³/₄ãã •ãã|ãã Öö (ããPãã 4.1)ý



ããPãã Ôããã0 4.1 Ôããè¹/₂ãñ¶> Öãñ •ãìü;ãfÃ †ãñŠ òãã ñæÌããÀ ¹ãÀ ¹ãã¶ãè †ãŠã ããœü;†ãŠãÌã

†ãìŠce,ããòÀ ¹/₄ããè •ãã¶ãñ :

¹ãã¶ãè †ãñŠ ÊãØãã|ããÀ ããœü; †ãŠãÌã †ãŠÀ¶ãñ Öãñ Ôããè¹/₂ãñ¶> ¹/₂ãò
 ÔãìfÃ †ãñŠ Ôã¹/₂ãã¶ã ÀÌãñ (ãã%ãŠÖ>Êã) òã¶ã|ãñ Ööý ³/₄ãñ ãã%ãŠÖ>Êã
 ,ãã¹ãÖã ¹/₂ãò Øãìã©ã †ãŠÀ Ôããè¹/₂ãñ¶> †ãŠãñ †ãŠÝãñÀ †Ìãã ¹/₂ã•òãì|ã
 òã¶ã|ãñ Öö ý fÔã ãã%ãŠ³/₄ãã †ãŠãñ ¹ãÍ¶ãÃ Öãñ¶ãñ ¹/₂ãò ÊãØã¹/₄ãØã †ãŠ
 Ôã¹ããÖ †ãŠã Ôã¹/₂ã³/₄ã ÊãØã|ãã Öö ý fÔã †ãŠãÀ¶ã ¹/₂ã †ãŠã¶ã,ã©ãÌãã
 f¹/₂ããÀ|ããò †ãŠãñ òã¶ã¶ãñ †ãñŠ ¹ãÍPãã|ãã ÊãØã¹/₄ãØã †ãŠ Ôã¹ããÖ |ã†ãŠ
 ¹ãã¶ãè †ãŠã ããœü; †ãŠãÌã,ããÌãÍ³/₄ã †ãŠ Öãñ|ãã Ööý ³/₄ããã ñÔãã ¶ã
 ãã †ãŠ³/₄ãã •ãã³/₄ãñ |ããñ ÀãÖãã³/₄ããã¶ã †ãŠ ãã%ãŠ³/₄ãã ¹ãÌãè ¶ã Öãñ¶ãñ
 †ãñŠ †ãŠãÀ¶ã ¹/₂ã †ãŠ¶ã †ãŠ¹/₂ã•ããñÀ ÀÖ •ãã|ãã Ööý ¹ãã¶ãè
 ããœü;†ãŠ¶ãñ †ãŠã †ãŠ,ã¶³/₄ã Êãã¹ãã ³/₄ãÖ Öãñ|ãã Öö ãã†ãŠ ñæÌããÀ ³/₄ãã
 ¹ãŠÍãÃ †ãŠãè ¹/₄ããè|ããè Ôã|ãÖ ¹ãÖÊãñ ÔãìCã|ããè Öö |ã©ãã òããÖÀãè
 Ôã|ãÖ òãã ¹/₂ãòý ³/₄ããã ñÔãã ¶ã Öãñ |ããñ ¹/₄ããè|ããè Ôã|ãÖ
 †ãñŠ lwCã¶ãñ Öãñ òã¶ãè •ãÊã ÌããÖ¹ã òããÖÀ ãã¶ã †ãŠÊã¶ãñ †ãŠñ

(Øã) ÜãÀñÊãî ‡ãŠã¾ãÃ ½ãò :-

4.3

Ôããè½ãñ¶, 'ãñ¶, 'ÊããããÔ> ‡ ãŠ, ‡ ãŠáúPã † Îãã ƒãã|ãì,ããò Ôãñ °ã¶ãñ °ã|ãÃ¶ã, Ôããõ¶^{a3}/ãÃ 'ã/ÊÔããƒã¶ã, ãã°ã•ãÊããè ‡ ãñŠ „, 'ã ‡ ãŠÀ¥ã ,ãããã° ,ã¶ãñ‡ãŠ ½ãã¶ãìã ãã¶ããã½ãÃ|ã ÎãÔ|ãì†ú Öö ãã•ã¶ã‡ãŠã °õãã¶ã‡ãŠ •ããèìã¶ã ‡ãñŠ ‡ãŠã³/ããò ½ãò ,ãì³/ãããƒã‡ãŠ „, 'ã³/ããñÔã ãã‡ãŠ³/ãã •ãã|ãã Öö ý

(Üã) ‡ãđŠãäÓã ‡ãŠã³ãÃ ½ãò

,āā'ā •āā¶ā|āñ Öö āā ‡ āŠ āā ‡ āŠÔāā¶ā ‡ āōŠāāÔā ‡ āŠā³/₄āĀ ‡ āñŠ āāĒā †
 ÖúāāÔā³/₄āā, ĄāīÀ'āāē, 'āŠāīāūjā, ‡ āīŠ'āĒĒā ,āāāā^a ‡ āŠā 'āĒ³/₄āāñŌā
 ‡ āŠĀ|āñ Ööý ‡ āōŠāāÔā ‡ āŠā³/₄āĀ ½āò „'ā³/₄āāñŌā ,āā¶āñ ĩāāĒāāē ½āā¶ā|ā
 āā¶āāā½āĀ|ā ĩāÔ|āī,āāò ‡ āŠāē ÔāīPāāē |āāāĒĒā ‡ āŠā -4.4 ‡ āñŠ ,ā¶āīÔāāĀ
 ,ā'ā¶āāē „||āĀ 'āīāāÔ|ā ‡ āŠā ½āò °ā¶āā³/₄āōý

ãããÊã‡ãŠã - 4.4

Œāñ|ā •āāñ|ā¶āñ, ¹āŠÔāÊā ‡ āŠā¶āñ, āāÔāâPāāfÃ ‡ āŠÀ¶āñ, ½āü;āfÃ
‡āŠÀ¶āñ ,āāāāª ‡āðŠāāÓā ‡āŠā³⁄₄āāô ½āò ,ā¶āñ‡āŠ ,¹ā³⁄₄āāñŒāāè ½āā¶āā-

ãã¶ããã½ãÃ|ã ìãÔ|ãì,ããò ‡ãŠã „¹ã³⁄⁴ããñØã ãã‡ãŠ³⁄⁴ãã •ãã|ãã Öö ý

(.) ,ããôÓãããfã³⁄⁴ããò ½ãò

°ããè¹⁄²ããÀ 'ãü|¶ãñ 'ãÀ ,ãã¹ã ‡ã<³⁄⁴ãã Êãñ|ãñ Öö ? °ããè¹⁄²ããÀ 'ãü|¶ãñ 'ãÀ ,ãã¹⁄²ã|ããòÀ 'ãÀ ,ãã¹ã ,ããôÓãããfã³⁄⁴ããò ‡ãŠã „¹ã³⁄⁴ããñØã ‡ãŠÀ|ãñ Ööý ½ãã¶|ãìã 'ãÆ‡ãðŠãã|ã ½ãò „¹ãÊã°fã 'ãñü|-'ããðfããò ‡ìãã •ãü|ãè-'ãìãã³⁄⁴ããò Ôãñ ãã¶ãã½ãÃ|ã ,ããôÓãããfã³⁄⁴ããò ‡ãŠã „¹ã³⁄⁴ããñØã Ôããã³⁄⁴ããò Ôãñ ‡ãŠÀ|ãã ÞãÊãã ,ãã ÀÖã Öö ý ,ãã•ã ‡ãŠÊã ,ã¶ãñ ‡ãŠ ÀãñØããñã Ôãñ Ôã½°ãã¶fã|ã ,ããôÓãããfã³⁄⁴ããò ‡ãŠã ãã¶ã¹⁄²ããÃ¶ã ããìããã¹⁄⁴ã¶¶ã ÀÔãã³⁄⁴ã¶¶ãò Ôãñ ¼ããè ãã‡ãŠ³⁄⁴ãã •ãã¶ãñ ÊãØãã Öö ý ‡ãìŠöc Ôãã¹⁄²ãã¶³⁄⁴ã ÀãñØããò ‡ìãã „Ôã‡ãñŠ fÊãã•ã ½ãò 'ãÆ³⁄⁴ãì‡ã<|ã ,ããôÓãããfã³⁄⁴ããò ‡ãñŠ °ããÀñ ½ãò FkêaeF&-lcesb hetJe& JeefCe&le |ããããÊã ‡ãŠã 1.2 ‡ãŠã ,ãìãÊããñ‡ãŠ¶ã ‡ãŠÀ •ãã¶ã‡ãŠãÀãè 'ãÆã¹|ã ‡ãŠÀòý

‡ãìŠöc ,ããôÀ ¼ããè •ãã¶ãñ:

,ã¶ãñ ‡ãŠ ,ãÔããf³⁄⁴ã ÀãñØã •ãôÔãñ >ãè0°ããè0 (|ã¹ãñããª ‡ãŠ), Öö•ãã, ãã¶ã¹⁄²ããñãã¶ã³⁄⁴ãã, ãã¹⁄²ã³⁄⁴ããªãè °ãìcããÀ, ,ããããª ÀãñØããò ‡ãŠãè ¼ããè ‡ã>ãè°ãã³⁄⁴ããñãã>‡ãŠ (•ãôìã 'ãÆãã|ãÀãñfããè) °ìãã‡ú ,ãã•ã ‡ãñŠ ¾ãìØã ½ãò ãã¶ããã½ãÃ|ã ‡ãŠÀ Êããè Øã³⁄⁴ããè Öö ý ãã ‡ãŠÔããè ,ããôÓãããfã ‡ãŠã „¹ã³⁄⁴ããñØã ‡ãŠÀ¶ãñ Ôãñ 'ãÖÊãñ ããÞããã‡ãŠ|Ôã‡ãŠ (|ãù‡ã>À) ‡ãŠãè ÔãÊããÖ Êãñ¶ãã ,ããìãì³⁄⁴ã‡ãŠ Öö ý 'ãÀã¹⁄²ãìãÃ ‡ãñŠ ãã°ã¶ãã ãã‡ãŠÔããè ¼ããè ,ããôÓãããfã ‡ãŠã „¹ã³⁄⁴ããñØã Ôããã¶ã‡ãŠãÀ‡ãŠ ããÔã® Ôãñ Ôã‡ãŠ|ãã Öö ý

ÔããìÊãñããÔã|ã Àñìãñ

•ãôÔãã ãã‡ãŠ ,ãã¹ã¶ãñ 'ãüãã Öö ãã‡ãŠ ,ãã•ã‡ãŠÊã Ö½ã ÔããìÊãñããÔã|ã ìãÔããò ‡ãŠã •³⁄⁴ããª 'ãÆ³⁄⁴ããñØã ‡ãŠÀ|ãñ Ööý ÔããìÊãñããÔã|ã ìãÔãã ÔããìÊãñããÔã|ã Àñìããò Ôãñ °ã¶ãñ Ôãñ|ãñ Ööý ,ããf‡ f¶ã ÔããìÊãñããÔã|ã Àñìããò ‡ãñŠ °ããÀñ ½ãò ÞãÞããÃ ‡ãŠÀ|ãñ Ööý ¶ããù³⁄⁴ãÊãã¶ã, 'ããùããÊãÔ>À, |ñ%ãŠãù¶ã, Àñ³⁄⁴ããù¶ã ,ããããª ½ãã¶|ã ãã¶ãã½ãÃ|ã Àñìãñ Öö ý f¶ã¹⁄²ãò Ôãñ °ãÖì|ã Ôãñ Àñìãñ 'ãñ>ÊãñããÊã³⁄⁴ã¹⁄²ã 'ãª©ããò Ôãñ 'ãÆã¹|ã ãã‡ãŠ³⁄⁴ãñ •ãã|ãñ Öö ý fÔã 'ãÆ ‡ãŠãÀ ‡ãñŠ Àñìããò ‡ãŠãñ ÔããìÊãñããÔã|ã Àñìãñ ‡ãŠÖ|ãñ Öö ý ÔããìÊãñããÔã|ã Àñìãñ „Þã ,ã¶ãì¹⁄⁴ããÀ ìããÊãñ °ãÖìÊã‡ãŠ ¾ããðããØã‡ãŠ Ööã ý (•ãôÔãñ |ñ%ãŠãù¶ã ,ã©ãìãã >ñããÀÊããè¶ã, ‡ãã©ãÊããè¶ã ØÊããùf ‡ãŠã@Êã |ã©ãã |ãf¹⁄²ãñãã©ãÊã >À©ãðÊãñ> ‡ãŠã Ôãñ °ãÖìÊã‡ãŠ Ööý) ,ããf‡ f¶ãÔãñ °ã¶ãñ ‡ãŠ¹ãü|ãò ‡ãŠãè ÞãÞããÃ ‡ãŠÀ|ãñ Ööý

ãã%ãŠ³⁄⁴ãã ‡ãŠÊãã¹ã 4.1

Ôaî|ããè, ÀñÍã½ããè, ¶ããù¾ãÊãã¶ã, 'ããùããÊãÔ>À, >ñÀãè¶ã ,ããããª fããØããò
 Ôãñ °ã¶ãñ ÍãÔããò ‡ ãŠã ,ãÍãÊããñ ‡ ãŠ¶ã ‡ ãŠÀò ý ¶ããù¾ãÊãã¶ã,
 'ããùããÊãÔ>À, >ñÀãè¶ã ,ããããª Ôãñ °ã¶ãñ ÍãÔãã Ôaî|ããè ÍãÔããò ‡ ãŠãè
 ,ã¹ãñãã ,ããããã‡‡ãŠ ,ãã‡‡ãŠÓãÃ‡ãŠ ããªCEãã¾ããè ¢ñ|ãñ Ööý f¶Öò °ãÀãè-
 °ãÀãè Ôãñ 'ãŠãü;¶ãñ ‡ ãŠã 'ãÆ¾ããÔã ‡ ãŠÀò ý ‡ ã<¾ãã ¢ñCEã|ãñ
 Öö ? Ôaî|ããè ‡ ãŠ¹ãü;ñ ‡ ãŠãñ Öã©ã Ôãñ 'ãŠãü;ã •ãã Ôã ‡ ãŠ|ãã Öö ý
 ¶ããù¾ãÊãã¶ã 'ããùããÊãÔ>À, >ñããÀÊããè¶ã ÀñÍããò Ôãñ °ã¶ãñ ‡ ãŠ¹ãü;ãò
 ‡ ãŠãñ Öã©ã Ôãñ 'ãŠãü;¶ãã ‡ ãŠããÝ¶ã Öãñ|ãã Ööý ¾ãñ ,ãããã‡‡ãŠ
 ½ã•ã¹|ã ‡ Íãããã‡‡ãŠã... Öãñ|ãñ Öö ý fÔããè ãã%ãŠ¾ãã ‡ ãŠÊãã¹ã ‡ ãŠãñ
 Íãì® ...¶ã (Pure wool) ,ããòÀ ‡ ãòŠããÍ½ãÊããü¶ã ‡ ãñŠ Ôãã©ã ¼ããè
 ‡ ãŠÀ ‡ ãñŠ ¢ñCEãòý ¶ããù¾ãÊãã¶ã ...¶ã ,ã©ããÃ|ã ‡ ãòŠããÍ½ãÊããü¶ã Ôãñ
 °ã¶ãñ ÍãÔãã ‡ ãñŠ ÀñÍãñ ‡ ãŠãñ |ããü;¶ãã ‡ ãŠããÝ¶ã Öãñ|ãã Öö ý

ãã%ãŠ¾ãã ‡ãŠÊãã¹ã 4.2

¶ããù¾ãÊãã¶ã, 'ããùããÊãÔ>À, >ñããÀÊããè¶ã ‡ Íãã Ôaî|ããè ‡ãŠ¹ãü;ñ Ôãñ °ã¶ãñ
 ‡ ‡ ãŠ- ‡ ‡ ãŠ Á½ããÊã Êãò ý f¶Öò 'ãã¶ããè Ôãñ ãã¼ãØããñ¾ãò ,ããòÀ
 ÔaîCEãã ‡ úý ‡ ã<¾ãã ¢ñCEã|ãñ Öö ? ¶ããù¾ãÊãã¶ã, 'ããùããÊãÔ>À,
 >ñããÀÊããè¶ã ‡ ãñŠ Á½ããÊã •ãÊãè ÔaîCEã •ãã|ãñ Ööý Ôaî|ããè ‡ãŠ¹ãü;ñ ¢ñÀ
 ½ãò ÔaîCEã|ãñ Ööý

ãã%ãŠ¾ãã ‡ãŠÊãã¹ã 4.3

¶ããù¾ãÊãã¶ã, 'ããùããÊãÔ>À, >ñÀãè¶ã ‡ Íãã Ôaî|ããè ‡ãŠ¹ãü;ñ ‡ ãñŠ œãñ>ñ
 ›‡ãŠü;ñ Êãò ý f¶Öò °ãÀãè-°ãÀãè Ôãñ ½ãì>áÝãè ½ãò ¢ãã ‡ãŠÀ ¢ñCEãòý
 ‡ ã<¾ãã ¢ñCEã|ãñ Öö ? Ôaî|ããè ›‡ãŠü;ñ 'ãÀ ããÔã ‡ ãìSü;¶ã ããªCEãã¾ããè
 ¢ñ|ããè Öö ý ¶ããù¾ãÊãã¶ã, 'ããùããÊãÔ>À |ã©ãã >ñããÀÊããè¶ã ‡ ãñŠ
 ›‡ãŠü;ãò 'ãÀ ããÔã ‡ ãìSü;¶ã ¶ãÖãé ããªCEãã¾ããè ¢ñ|ããè Ööý ,ãª f¶ã
 ›‡ãŠü;ãò ‡ ãŠãñ •ãÊãã¾ãò ý ‡ ã<¾ãã ¢ñCEã|ãñ Öö ? ¶ããù¾ãÊãã¶ã,
 'ããùããÊãÔ>À, |ã©ãã >ñããÀÊããè¶ã ‡ ãñŠ ›‡ãŠü;ñ |ãñ•ããè Ôãñ ,ããØã
 'ã‡ãŠü; ‡ãŠÀ •ãÊãè •ãÊã •ãã|ãñ Ööý

ÔããÍÊããããÔã|ã ÀñÍããò Ôãñ °ã¶ãñ ‡ãŠ¹ãü;ñ Ôaî|ããè ‡ãŠ¹ãü;ãò ‡ãŠãè
 ,ã¹ãñããã •ãÊãè ,ããØã 'ã ‡ãŠü;|ãñ Öö ý f¶Öò 'ãÖ¶ã ‡ãŠÀ ,ããØã Ôãñ
 ÔããÍããã¶ããè °ãÀ|ã¶ããè ÞããããÖ‡ ý f¶ã ÀñÍããò ½ãò ‡ãŠ¹ããÔã ,ããòÀ ...¶ã
 ãã½ãÊãã ‡ãŠÀ %ããŠ½ãÍã: >ñÀãè‡ãŠãü> |ã©ãã >ñÀãèÍãÍÊã °ã¶ãã¾ãã •ãã|ãã
 Öö ý

¹ÊããããÔ>‡ãŠ ‡ã<¾ãã Öö ?

Ö½ã ¢ãã¶ã‡ãŠ •ããèÍã¶ã ½ãò ,ã¶ãñ‡ãŠ 'ãÆ‡ãŠãÀ ‡ãŠãè ÍãÔ|ãì,ããò ‡ãŠã
 „¹ã¾ããñØã ‡ãŠÀ|ãñ Ööý ãã•ã¶ã½ãò Ôãñ ‡ãìŠœ •ãòÔãñ °ããÊãè, ½ãØã,
 ¢ãü|ã Ôãã¹ãŠ ‡ãŠÀ¶ãñ ‡ãŠã °ãÆÍã ,ããããª ÍãÔ|ãì ‡ ú ¹ÊããããÔ> ‡ãŠ ‡ãŠãè

°āāāē Ōāñ Ōā † āš|āāē Ōōý ¾āÖ 'ĒāāāāŌ> † āš † ā<¾āā Ōō ?
 ĀāŌāā¾āāāā † āš Ā'ā ½āō ,āŌāā|āō'ā Ōāf|Ēāñ † āšā°āĀāāō •āōŌāñ
 †āā©āĒāāēāā, †āāŌā>Ēāāēāā ,āāāā° †āñš „pā ,āāāi¼āāĀ †āñš °āŌiĒā†āš
 'ĒāāāāŌ> † āš 'ā°ā©āĀ Ōāñ|āñ Ōōý °āñ † āñšĒāāf>, āāū¾āĒāāā,
 'āāūĒāāē©āāēāā, >ñ'āĒāāūāā, 'āāūĒāāē ĪāāfāāāĒā † ā<ĒāāñĀāf| ,āāāā°
 'ĒāāāāŌ>†āš 'ā°ā©āāō †āñš „āŌĀāā Ōōý fāā Ōā'¾āāē 'ĒāāāāŌ>†āš †āñš
 Ōāā½āāāāō ½āō ,āā'ā † āšāñ † ā<¾āā āā¼āāāāā āāāāāfĀ °ñ|āāē Ōō ?
 † āišœ 'ĒāāāāŌ> † āš † āšāē ĪāŌ|āi,āāō † āšāñ Ōā½āĀ † āšĀāāñ 'āĀ Īāñ
 |āiĀāā āā'āŪāĒā •āā|āāē Ōō, •ā°āāā†āš †āišœ 'āĀ ...Ō½āā †āšā 'āĒ¼āāiĪā
 †āš½ā 'āū|āā Ōōý •āōŌāñ 'ĒāāāāŌ>†āš †āšāē °āāĒāē ...Ō½āā 'āāāñ 'āĀ
 āā'āŪāĒāāñ ĒāŌā|āāē Ōō, •ā°āāā † āš † āiš † āšĀ † āñš ŌōāāāĒā ,āāāā°
 ,āāŌāāāāē Ōāñ āāŌāē āā'āŪāĒāāñý 'ĒāāāāŌ>†āš †āšāē †āšŸāñĀ|āā †Īāā
 ŌāĒāāāā†āš †āñš ,āāāāāĀ 'āĀ fāāŌō °āñ ĪāŌāāō ½āō °āū'ā •āā|āā Ōōý

1. ©ā½āāō'ĒāāāāŌ>†āš

fŌā 'āĒ†āšĀ †āñš 'ĒāāāāŌ>†āš ŌāĀ½ā †āšĀāāñ 'āĀ ½āiĒāā¾ā½ā Ōāñ
 •āā|āñ Ōō ,āāōĀ •ā°ā fāāŌō Ÿājā āā†āš¾āā •āā|āā Ōō |ā°ā ¾āñ †āšūjñ Ōāñ
 •āā|āñ Ōō ý ¾āÖ āā%āš¾āā °āāĀ-°āāĀ °āñŌāā¾āāē •āā Ōā†āš|āāē Ōō ý
 fŌāāē †āšĀāāā ©āā½āāō'ĒāāāāŌ>†āš †āšāñ 'āiāā: pā%āšāā †āšĀ†āñš
 fŌā † āšā „ā¾āāñŌā āā † āš¾āā •āā Ōā † āš|āā Ōōý 'āāūĒāāē©āāēāā,
 'āāūĒāāē ĪāāfāāāĒā † ā<ĒāāñĀāf| ('āāēŌĪāāēŌŌāāēŌ) ,āāāā°
 ©ā½āāō'ĒāāāāŌ>†āš †āñš „āŌĀāā Ōōý

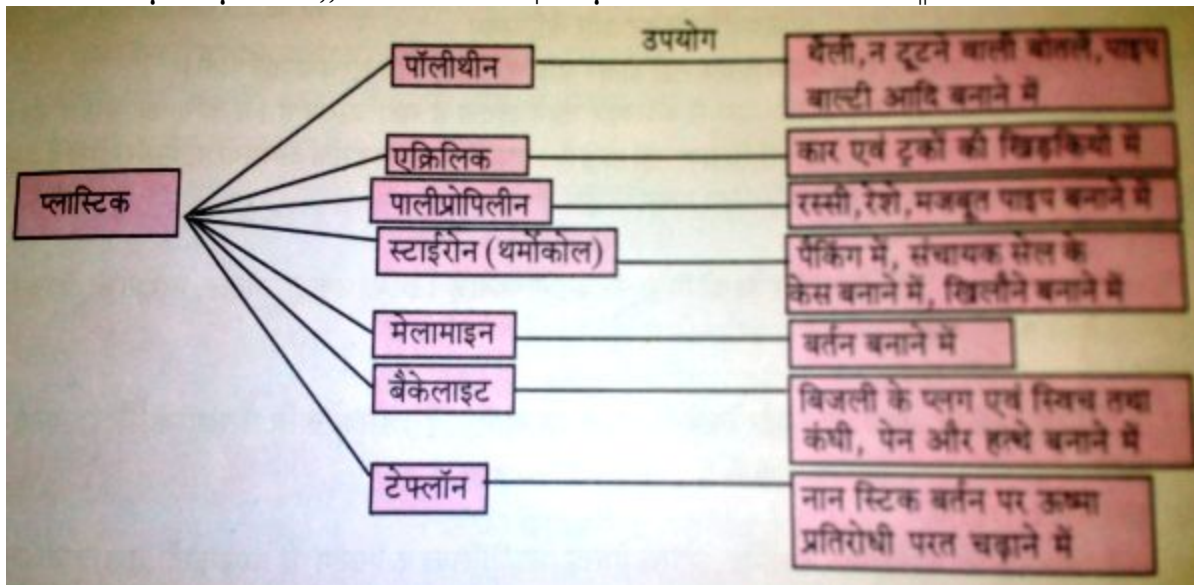
2. ©ā½āāōŌāñāā>āŌā 'ĒāāāāŌ>†āš

fŌā 'āĒ † āšĀ † āñš 'ĒāāāāŌ> † āš ¾āāē ŌāĀ½ā † āšĀāāñ 'āĀ
 ½āiĒāā¾ā½ā |ā©āā Ÿājā †āšĀāāñ 'āĀ †āšŸāñĀ †Īāā ĄāiĀ°Āñ Ōāñ •āā|āñ
 Ōō, āā † āšāāi fāāŌō ŌāĀ½ā † āšĀ † āñš 'āiāā: ½āiĒāā¾ā½ā āāŌāē
 āā † āš¾āā •āā Ōā † āš|āā Ōō ý °āō † āñšĒāāf> † †āš ©ā½āāōŌāñāā>āŌā
 'ĒāāāāŌ> † āš Ōōý ©ā½āāōŌāñāā>āŌā 'ĒāāāāŌ> † āš † āšā °āñ°āāĀā
 „ā¾āāñŌā āāŌāē āā†āš¾āā •āā Ōā † āš|āā Ōō ,āāāāāā fāā † āšā 'āiāā:
 pā%āšāā Ōāā¼āiā āāŌāē Ōōý

'ĒāāāāŌ>†āš †āšāē „ā¾āāñāāŌā|āā

āā%āš†āñš> ĄāñĒāāāñ †āñš āāĒā† āā•āŌā Ōāō° †āšā „ā¾āāñŌā ,āā'ā
 †āšĀāāñ Ōō ĪāŌ Ōāā½āāā¾āā: āā†āšŌā 'ā°ā©āĀ †āšāē °āāāē Ōāñ|āāē Ōō
 ? Ōāō° Ōāā½āāā¾āā: 'ĒāāāāŌ> † āš ¾āā † āšā † āšš † āšāē °āāāē Ōāñ
 Ōā†āš|āāē Ōōý ŪāĀ ½āō „ā¾āāñŌā †āšāē •āāāāñ ĪāāĒāāē °āāĒāē, >i©ā
 °āĒĪā, †āāšŪāñ ,āāāā° ¾āāē 'ĒāāāāŌ>†āš †āšñ °āāāñ Ōāñ|āñ Ōōāý ,āā•ā
 'ĒāāāāŌ> † āš † āšāē °āāāē ĪāŌ|āi,āāō † āšā Ō½āāĀñ °āāāā†āš † āš •āāēĪāā

1/2ãò „1ã³/4ããñØã °ãü|ãã Öãè •ãã ÀÖã Ööý,ããf† °öãã¶ã‡ãŠ •ããèlã¶ã 1/2ãò
 1ÊããããÖ>‡ãŠ ‡ãŠãè „1ã³/4ããñããØã|ãã ‡ãñŠ °ããÀñ 1/2ãò •ãã¶ãò -



‡ãìŠœ ,ããòÀ 1/4ããè •ãã¶ãñ

lã|ãÃ1/2ãã¶ã 3/4ãìØã 1/2ãò 1ÊããããÖ>‡ãŠ ‡ãŠ ,ããlãl³/4ã‡ãŠ|ãã Ööý ‡ãŠãñfÃ
 àãñã fÔãÖãñ ,ãœl|ãã ¶ãÖãé Ööý >ñ¹ã<Êããü¶ã, >ñ>Êã¹ãÊããñÀãñ
 fãã©ãÊããè¶ã ‡ãŠã 1ããwÊããè1/2ãÀ Ööý fÔã‡ãŠã ieueveebkeâ °ãÖlã ...
 úPãã Öãñ|ãã Ööý 3/4ãÖ ,ã¹ãÊã¶ãlããèÊã Öö ý fÔããè Øãl¥ã ‡ãñŠ ‡ãŠãÀ¥ã
 fÔã‡ãŠã „1ã³/4ããñØã lãÖlãl,ããò 1ãÀ 1ãÀlã Pãü|ããñ 1/2ãò ãã‡ãŠ³/4ãã •ãã|ãã
 Ööý

ÜesleeJever :-

1ÊããããÖ>‡ãŠ Ö1/2ããÀñ ããÊã ‡ããÖlã „1ã³/4ããñØããè Öö ãã‡ãŠ¶ãlã
 fÔã‡ãŠã ¹l¹ã³/4ããñØã °ãÖlã Öãã¶ã‡ã‡ãŠãÀ‡ãŠ ããÖã® Öãñ ÀÖã
 Ööý 1ããüÊããè©ããè¶ã •ãÊãã¶ãñ Öãñ fÔã‡ãŠã £ãlú,ãã lãã³/4ãl1/2ãã;Êã
 1/2ãò 1ãöŠÊã ‡ãŠÀ 1ã³/4ããÀlãÀ¥ã ‡ãŠãñ ¹ããÓãlã ‡ãŠÀ ÀÖã
 Ööý1ããüÊããè©ããè¶ã ‡ãŠãè ©ãöããÊã³/4ããò 1/2ãò °ãPããè ÖlfÃ Œãã²ã
 Ôãã1/2ãÖãÆãè 1ãÆã³/4ã: ŒãlÊãñ Ô©ãã¶ããò 1ãÀ 1ãöŠ‡ãŠ ¹ãè •ãã|ããè
 Ööý •ãã¶ãlãÀ f¶Öò Œãã ‡ãŠÀ °ããè1/2ããÀ Öãñ ÀÖñ Öö ý
 1ÊããããÖ>‡ãŠ 1ãÀ 1ãã¶ããè ‡ãŠã ‡ãŠãñfÃ 1ãÆ1/4ããlã ¶ãÖãé 1ãü|ãã
 Ööý ,ãlã: 3/4ãÖ Ôãü;-ØãÊã ‡ãŠÀ ¶ãÓ¶ãÖãé Öãñ 1ãã|ããè Ööãý
 „1ã³/4ããñØã ‡ãŠãè Øã³/4ããè 1ããüÊããè©ããè¶ã ‡ãŠãè ©ãöããÊã³/4ããò
 ,ãããã³ ‡ãŠãñ 3/4ãã- |ãã 1ãöŠ‡ãŠ¶ãñ 1ãÀ 3/4ãñ ÔããèlãÀ Êããf¶ã ,ããòÀ
 ¶ããããÊã³/4ããò 1/2ãò 1ãŠÖã ‡ãŠÀ 1ãã¶ããè ‡ãñŠ 1ãÆlããÖ ‡ãŠãñ Àãñ‡ãŠ
 ¹ñlããè Ööã ,ããòÀ 1ãã¶ããè ‡ãŠ Ô©ãã¶ã 1ãÀ Öãè 1ãöŠÊã ‡ãŠÀ
 1ã³/4ããÀlãÀ¥ã ‡ãŠãñ ¹ããÓãlã ‡ãŠÀlã ÀÖlãã Ööý ,ãlã: 1ã³/4ããÀlãÀ¥ã

‡āŠāñ ºīāāŌā|ā Ōāñ¶āñ Ōāñ ºāPāā¶āñ ‡āñŠ āāĒā† ºāāūĒāāē©āāē¶ā
 ‡āŠā ŌāŌāē º, ºā³⁄₄āāñŌā ‡āŠÀ fŌā ‡āñŠ ºĀ¹ā³⁄₄āāñŌā ‡āŠāñ
 Āāñ‡āŠ¶āā Ō½ā Ōā¹⁄₄āāē ‡āŠā ‡āŠ||āĀ¹⁄₄ā Ōōý

‡āŠāúPā :-

āā³⁄₄āñ Ōā³⁄₄āñ āāPā·ā 4.3 ‡āŠā ,āīāĒāāñ‡āŠ¶ā ‡āŠÀōý fŌā½āō āāªĒāāfĀ
 ºñ¶āñ ĪāāĒāē ĪāŌ|āī, āāō ‡āñŠ āā¶ā½āāĀ¥ā ½āō ,āāāā‡āŠāāīā|ā: āā‡āŠŌā
 ºª©āĀ ‡āŠā º, ºā³⁄₄āāñŌā āā ‡āŠ³⁄₄āā Ōā³⁄₄āā Ōō ? f¶ā ĪāŌ|āī, āāō ‡āñŠ
 āā¶ā½āāĀ¥ā ½āō ‡āŠāúPā ‡āŠā º, ºā³⁄₄āāñŌā ,ā¶āñ‡āŠ Ā¹āāō ½āō āā‡āŠ³⁄₄āā
 Ōā³⁄₄āā Ōōý fŌā ‡āŠā º, ºā³⁄₄āāñŌā āāĒāū| ‡āŠāē ‡āñŠ ĪāāēĪāñ, Īāō—
 āāāā¶ā ‡āŠ º, ºā ‡āŠĀ¥ā |ā©āā ‡āŠāúPā ‡āñŠ ºā|āĀ¶ā ,āāāªª ºā¶āā¶āñ ½āō
 āā ‡āŠ³⁄₄āā •āā|āā Ōōý ‡āŠāúPā ‡āŠāē ºāāªāāĪāĀ|āā ‡āñŠ Ōāī¥ā ‡āñŠ
 ‡āŠāĀ¥ā fŌā‡āŠā º, ºā³⁄₄āāñŌā ºāĒ‡āŠāāīā‡āŠ ¾āā·ā ‡āā Ēāñ¶Ōā ‡āñŠ
 āā¶ā½āāĀ¥ā ½āō āā‡āŠ³⁄₄āā •āā|āā Ōōý

‡āŠāúPā ‡ā³⁄₄āā Ōō ?

‡āŠāúPā ‡āŠāñfĀ ¾āāōāāŌā ‡āŠ ¶āŌāē Ōōý ‡āŠāúPā āā|āī, āāō ‡āñŠ
 āāŌāāāĒā ‡āñŠ·āō ‡āŠā āāĪāĒā³⁄₄ā¶ā (āā½āNā¥ā) Ōāñ|āā Ōōý ŌāāāāĀ¥ā
 ‡āŠāúPā āāŌāāāĒā ‡āŠā, Ōāāñāā|¾ā½ā āāŌāāāĒā ‡āñŠ, āāōĀ
 ‡āōŠāāĒŌā³⁄₄ā½ā āāŌāāāĒā ‡āñŠ ‡āŠā āā½āNā¥ā Ōāñ|āā Ōōý ‡āŠāúPā
 ‡āŠā āā¶āāāĪPā|ā ŌāĒā¶āā ‡āŠ ¶āŌāē Ōāñ|āāý ‡āŠāúPā ‡āŠāē
 āāªāŠŌ·Ēāāē¾ā ŌāāĀPā¶āā ¶āŌāē Ōāñ|āāēý
 Ōā½āĀ ‡āŠĀ¶āñ ºā ĪāŌ ¶ā½āĀ Ōāñ •āā|āā Ōō ,āāōĀ ³Īā ½āō ºªĒā‡āŠÀ
 ºāŌ¶āñ ĒāŌā|āā Ōō ¾āŌāē ‡āŠāĀ¥ā Ōō āā‡āŠ ‡āŠāāPā ‡āŠāñ ŸāñŌā ¶ā
 ‡āŠŌ ‡āŠÀ ,āāā|āīāāēāā|ā|ā ºĪā ‡āŠŌ|āñ Ōōý ‡āŠāúPā ‡āŠāē ‡āŠāñfĀ
 āā¶āāāĪPā|ā ŌāāĀPā¶āā ¶āŌāē Ōāñ|āāē Ōō ý fŌā ‡āŠāē Ōāī¥āĪā|āā
 fŌā‡āñŠ ,āīā³⁄₄āĪāāō ºā āā¶ā¼āĀ ‡āŠĀ|āāē Ōōý ‡āŠāúPā ‡āñŠ f¶Ōāē
 Ōāī¥āāō ‡āā ŌāāĀPā¶āā ‡āñŠ ,āāāāā ºā ¾āñ āā¶ā½ā¶āāĒāāĒāĒā
 ºāĒ‡āŠĀ ‡āñŠ Ōāñ|āñ Ōō -

ŌāāāāĀ¥ā ¾āā ½āōªī ‡āŠāúPā

¾āŌ Ōāāñāā|¾ā½ā ‡āŠāªāō¶āñ, Pāñ¶āā ºā|©āĀ ,āāōĀ Āñ|ā ‡āŠāñ
 āā½āĒāā ‡āŠÀ ºā¶āā¾āā •āā|āā Ōō ý f¶ā ‡āŠā º, ºā³⁄₄āāñŌā ºāāñ|āĒā,
 ºāĒā¶āĒāē, āāĒāū| ‡āŠāē ‡āñŠ ĪāāēĪāñ ,āāāªª ºā¶āā¶āñ ½āō āā‡āŠ³⁄₄āā
 •āā|āā Ōō ý

‡āŠŸāñĀ ‡āŠāúPā

¾āŌ ºāāñ·ōāāīā³⁄₄ā½ā ‡āŠāªāō¶āñ, Pāñ¶āā ºā|©āĀ ,āāōĀ Āñ|ā ‡āñŠ
 āā½āNā¥ā Ōāñ ºā¶āā¾āā •āā|āā Ōō ý fŌā‡āŠā º, ºā³⁄₄āāñŌā ºāĒāāūŌ ‡āŠ,

°ãæ ÷ ãŠÀ, 'ãÀÆã¶ãÊãæ ,ãããª 'ãÆ³ããñØãÍããÊã ÷ ãñŠ „ã ÷ ãŠÀ¶ã
°ã¶ãã¶ãñ ½ãò ãã÷ãŠ³ãã •ãã|ãã Öö ý

ãã'ã<Êã¶> ¾ãã 'ãÆ÷ãŠãÍããè¾ã ÷ãŠãúPã

¾ãÖ Öãñãã;¾ã½ã ÷ ãŠã°ããó¶ãñ>, 'ããñ>ðããÍã³ã½ã ÷ ãŠã°ããó¶ãñ>,
°ããñããÀ÷ãŠ ÷ñããÖã; |ã©ãã ããÖãããÊã÷ãŠã ÷ãñŠ ãã½ãÑã¶ã ÷ãŠãñ ØãÀ½ã
÷ãŠÀ ÷ãñŠ 'ãÆã¹|ã ãã ÷ãŠ³ãã •ãã|ãã Ööý fÔãÖãñ ãã'ãÆ•½ã |ã©ãã
'ãÆ÷ãŠãããÍã÷ãŠ ¾ããª ÷ãñŠ ÊãòÖã °ã¶ãã¾ãñ •ãã|ãã Öö ý ÖããÖ> °ãñÓããò
÷ãŠãñ °ãÀ ÷ãŠÀ¶ãñ ÷ãñŠ ããÊã÷ PãÍ½ãò ÷ãñŠ ÊãòÖã ¼ããè ãã'ã<Êã¶>
÷ãŠãúPã Öãñ Öãè ãã¶ããã½ãÃ|ã ãã÷ãŠ³ãã •ãã|ãã Öö ý

÷ãñŠœ ,ããöÀ ¼ããè •ãã¶ãñ :



£ã¹ã ÷ãñŠ PãÍ½ãñ ÷ã<¾ããò ÊãØãã¾ãñ •ãã|ãã Öö ?

£ã¹ã ÷ãñŠ PãÍ½ãò ,ããúÆããò ÷ãŠãñ Öã¹¾ãÃ ÷ãŠãè Øã½ããè Öãñ °ãPãã¶ãñ
÷ãñŠ ããÊã÷ ÊãØãã¾ãñ •ãã|ãã Öö ý f¶ã PãÍ½ãò ÷ãñŠ ÷ãŠãúPã ½ãò
©ããñüã Öãã ÖããèããÀ¾ã½ã ,ããú ÷ã<Öããf; ãã½ãÊãã Öãñ|ãã Öö
ãã•ãÖãÖãñ ÌãÖ Ö©ãã¾ããè Á¹ã Öãñ ÀãØããè¶ã Öãñ •ãã|ãã Ööý £ã¹ã ½ãò
¾ãñ PãÍ½ãò ,ããúÆããò ÷ãŠãñ ÀãÖ|ã °ñ|ãã Öö, Êãñãã ÷ãŠ¶ã £ã¹ã Öãñ
œã¾ãã ½ãò ,ãã¶ãñ 'ãÀ Öãã¹ãŠ ¶ã ããªÆããfÃ °ñ¶ãñ ÷ãñŠ ÷ãŠãÀ¶ã ¾ãñ
,ã¶ã¹ã³ããñØããè Öãñ •ãã|ãã Ööý ,ãã•ã ÷ãŠÊã 'ãŠãñ>ãñ% ãŠãñãã½ã ÷ãŠ
÷ãŠãúPã ÷ãñŠ ÊãòÖããò ÷ãŠã „ã³ããñØã ãã÷ãŠ³ãã •ãã|ãã ÊãØãã Öö ý
fÔã ÷ãŠãúPã ½ãò ããÖãÊãÀ ,ãã¾ããñãf; ãã½ãÊãã Öãñ|ãã Öö ý £ã¹ã
½ãò ããÖãÊãÀ ,ãã¾ããñãf; ããÌãÜããã|ã Öãñ÷ãŠÀ ããÖãÊãÀ (Pããúªè) Ìã
,ãã¾ããñãf; °ã¶ãã|ãã Ööý ããÖãÊãÀ ÷ãŠãè ¾ãÖ 'ãÀ|ã PãÍ½ãò ÷ãñŠ
Êãñ¶Öããò ÷ãŠãñ ØãÖÀã ÀãÖã 'ãÆª¶ã ÷ãŠÀ|ããè Ööý œã¾ãã ½ãò
ããÖãÊãÀ |ã©ãã ,ãã¾ããñã¾ã; 'ã¶ã: Öãã¾ããñØã ÷ãŠÀ ããÖãÊãÀ
,ãã¾ããñãf; °ã¶ãã Êãñ|ãã Öö ãã•ãÖãÖãñ ÊãòÖã 'ãÖÊãñ ÷ãŠãè |ãÖ
ÖÊ÷ãñŠ ÀãÖã ÷ãñŠ Öãñ •ãã|ãã Öö

Ô©ãã³⁄⁴ããè Â¹ã Ôãñ ÀâØããè¶ã ‡ãŠãúPã °ã¶ãã¶ãñ ‡ãñŠ ããÊã† ‡ãŠPpãñ
 ½ããÊã ‡ãŠãñ ¼ã>áYãè ½ãò ØãÀ¹⁄²ã ‡ãŠÀ¶ãñ Ôãñ ¹ãÔÊãñ „Ôã¹⁄²ãò
 £ãããã|lã ‡ãŠ ,ããù ‡ã<Ôããf; ãã¹⁄²ãÊãã|ãñ Öö, •ãöÔãñ- ‡ãŠãñ°ããÊ>
 ,ããù ‡ã<Ôããf; Ôãñ ¶ããèÊãñ ÀâØã, ¹ãñŠããÀ ‡ãŠ ,ããù ‡ã<Ôããf; Ôãñ
 ÔÊ ‡ãñŠ ¶ããèÊãñ ÀâØã |ã©ãã %ã Šãñãã¹⁄²ã³⁄⁴ã¹⁄²ã ,ããù ‡ã<Ôããf; Ôãñ
 ÔÊ ‡ãñŠ Ôãñ ÀâØã, ÔããèããÀ³⁄⁴ã¹⁄²ã ,ããù ‡ã<Ôããf; |ã©ãã ‡ã<³⁄⁴ã¹⁄²ãÀÔã
 ,ããù ‡ã<Ôããf; Ôãñ ¹ããèÊãñ ÀâØã ‡ãŠã ‡ãŠãúPã °ã¶ãã³⁄⁴ãã •ãã|ãã Öö ý
 ‡ã<³⁄⁴ãã ,ã°ã ,ãã¹ã ‡ãŠãúPã Ôãñ °ã¶ããè ÀâØããè¶ã lãÔ|ãì,ããò •ãöÔãñ
 Pãlããù;³⁄⁴ããò ‡ãŠãè °ã¶ãã¶ãñ ‡ãŠãè ããlãããfã ‡ãŠã ,ã¶ãì¹⁄²ãã¶ã ÊãØãã
 Ôã‡ãŠ|ãñ Öö ?

½ãðãã|ã‡ãŠã :-

½ãðãã|ã‡ãŠã ãã‡ãŠÔãñ ‡ãŠÖ|ãñ Öö ? ¼ãÆ¹⁄²ãYã ¹ãÀ •ãã‡ãŠÀ ‡ãìŠ¹⁄²ÖãÀ
 ¹ãÀã °ã¶ãã³⁄⁴ãñ ‡ãŠPpãñ ‡lãã ¹ã‡ãŠã³⁄⁴ãñ Öì† ãã¹⁄²ã>ãè ‡ãñŠ °ã|ãÃ¶ããò
 ,ããããã ‡ãŠã ,ãlãÊããñ‡ãŠ¶ã ‡ãŠÀöý f¶Öò °ã¶ãã¶ãñ ‡ãñŠ ããÊã† ‡ãìŠ¹⁄²ÖãÀ
 ‡ãŠ ããlãlãñÓã ¹ãÆ‡ãŠãÀ ‡ãŠãè ãã¹⁄²ã>ãè ‡ãŠã „¹ã³⁄⁴ããñØã ‡ãŠÀ|ãñ Öö
 ãã•ãÔãñ ããPã ‡ãŠ¶ããè ãã¹⁄²ã>ãè ³⁄⁴ãã ‡ãÊãñ ‡ãŠÖ|ãñ Ööý Øãúì©ããè
 ÖìfÃ ããPã‡ãŠ¶ããè ãã¹⁄²ã>ãè Ôãñ Pãã‡ãŠ ¹ãÀã ¹ãÔÊãñ ‡ãŠPpãñ °ã|ãÃ¶ã
 °ã¶ãã³⁄⁴ãñ •ãã|ãñ Öö (ããPãã 4.4)ý ãã¹ãŠÀ „¶Öò „Ppã |ãã¹ã ¹ãÀ ¼ã>ãè ½ãò
 ¹ã ‡ãŠã³⁄⁴ãã •ãã|ãã Ööý ¹ã ‡ãñŠ Öì† f¶ã °ã|ãÃ¶ããò ‡ãŠãñ Ôãè
 ½ãðãã|ã‡ãŠã ‡ãŠÖã •ãã|ãã Ööý



ããPãã Ôããã0 4.4

Pããè¶ããè ãã¹⁄²ã>ãè ¼ããè ‡ãŠ ¹ãÆ‡ãŠãÀ ‡ãŠãè Ôã¹ãñŠ¹ ½ãðãã|ã‡ãŠã
 Ööý fÔãÔãñ Pããè¶ããè ãã¹⁄²ã>ãè ‡ãñŠ ‡ãŠ¹ã-¹Êãñ, ‡ãñŠ|ãÊããè,
 Øããããù;³⁄⁴ããò ‡ãñŠ Ô¹ãã‡ãŠ ¹ÊãØã ‡ãñŠ ÔãñÊ;À |ã©ãã ãã°ã•ãÊããè ‡ãñŠ
 ¹ã<³⁄⁴ã¹⁄²ã ÔãñÊ;À °ã¶ãã³⁄⁴ãñ •ãã|ãñ Öö ý
 ,ããØ¶ãñ³⁄⁴ã Pã>ãã¶ããò ½ãò ¹ãñŠÊãÔ¹ããÀ Çããã¶ãã ‡ãñŠ ããÀYã Ôãñ ‡ãŠ
 ããlãlãñÓã ¹ãÆ‡ãŠãÀ ‡ãŠãè ãã¹⁄²ã>ãè ¹ãÆã¹ã ‡ãŠãè •ãã|ããè Ööý fÔã
 ãã¹⁄²ã>ãè ‡ãŠãñ °ããÀãè‡ãŠ œ¶ã¶ããè Ôãñ œ¶ã ‡ãŠÀ •ãÊã ‡ãñŠ Ôãã©ã
 ,ããñ ‡ãŠãè |ãÀÖ Øãúì©ãã •ãã|ãã Öö ,ããòÀ fÔãñ ‡ãìŠœ ãã¶ããò ‡ãñŠ
 ããÊã† ÀÇã ãã³⁄⁴ãã •ãã|ãã Ööý ¹ãŠÊãÔlã:¹ã ³⁄⁴ãÖ ãã¹ãÜãÊãñ ¹ÊããããÔ‡ãŠ
 ‡ãŠãè |ãÀÖ ÊãPããèÊããè °ã¶ã •ãã|ããè Ööý ,ã°ã fÔãñ ½ã¶ãPããÖñ ÔããùPããò
 ½ãò ããÊã ‡ãŠÀ ããÇãÊããò¶ãñ, ½ãlãã|ãÃ³⁄⁴ããú, °ã|ãÃ¶ã |ã©ãã >ãfÊÔã

,ããããª ºã¶ãã³⁄ããè •ãã|ããè Ööâý f¶Öò ,ãã‡ãŠÓãÃ‡ãŠ †lãã Ôãì¶ªÀ ºã¶ãã¶ãñ
‡ãñŠ ããÊã † ºã¶ãã|ãñ Ôã¹⁄ã³⁄ãã ãã¹⁄ã>ã>ãè ½ãñ ÀãÖããè¶ã ããããã|lã ‡ãŠ
³⁄ããöããÖã‡ãŠ ãã¹⁄ãÊãã ããª³⁄ãã •ãã|ãã Öö ý

|ãö³⁄ããÀ lãÖ|ãì,ããò ‡ãŠãñ ÔãìÇãã¶ãñ ‡ãñŠ ºããª f¶Öò †‡ãŠ ¼ã>ãÝãè ½ãò
l³⁄ãlãããÖ©ã|ã Á¹ã Ôãñ ÀÇã ‡ãŠÀ „Pãã |ãã¹ã ¹ãÀ ¹ã‡ãŠã³⁄ãã •ãã|ãã Ööý
fÔã ¹ãÆ‡ãŠãÀ ¹ãÆã¹|ã lãÖ|ãì†ú ÔãÀ¶ãÆ(Porous)Öãñ|ããè Ööý f¶ã ¹ãÀ
,ã¶³⁄ã ÀÖãã³⁄ã¶ããò •ãöÔãñ Êãñ,ããù ‡ã<Ôããf,ã©ãlãã ãã¶ã
,ããù‡ã<Ôããf ‡ãŠã Êãñ¹ã Pãüã ‡ãŠÀ ,ããöÀ ,ãããã‡ãŠ ÖãÀ¹⁄ã ãã‡ãŠ³⁄ãã
•ãã|ãã Öö,ãã•ãÖãÔãñ ...¹ãÀ ‡ãŠã Êãñ¹ã ãã¹ãÜãÊã ‡ãŠÀ Pã¹⁄ã‡ãŠãèÊããè
¹ãÀ|ã ‡ãñŠ Á¹ã ½ãò ããö³ãò ‡ãŠãñ ã‡ãŠ ‡ãŠÀ f¶Öò •ãÊãÀãñã‡ãŠ (Water
proof) ºã¶ãã ãñ|ãã Öö ý

Ôããºãì¶ã ‡ã<³⁄ãã Öö ?

ãã%ãŠ³⁄ãã‡ãŠÊã¹ã 4.4

ããlããã¹ã¶ã ¹ãÆ‡ãŠãÀ ‡ãñŠ Ôããºãì¶ããò ‡ãŠã ,ãlãÊããñ ‡ãŠ¶ã ‡ãŠÀãñ
|ã©ãã ¶ãÖã¶ãñ, ‡ãŠ¹ãü|ã ãããñ¶ãñ †lãã ºã|ãÃ¶ã Ôãã¹ãŠ ‡ãŠÀ¶ãñ lããÊãñ
Ôããºãì¶ã ‡ãŠãè ÔãìPããè ºã¶ãã†ú -

lãããÊã‡ãŠã - 4.5

क्रमांक	नहाने का साबुन	कपड़ा धोने का साबुन अपमार्जक	बर्तन साफ करने का साबुन
1.			
2.			
3.			
4.			
5.			

‡ãìŠö Ôããºãì¶ã ,ããöÔãããã‡ã ‡ãñŠ Á¹ã ½ãò ¼ããè ¹ãÆ³⁄ããñÖã ãã‡ãŠ³⁄ãñ
•ãã|ãñ Öö, •ãöÔãñ -lãPãã ‡ãñŠ ÀãñÖããè ,ãããã‡ã ‡ãŠãÁlã: ãã•ã¶ã
Ôããºãì¶ããò ‡ãŠã „¹ã³⁄ããñÖã ‡ãŠÀ|ãñ Öö „¶ã¹⁄ãò ‡ãìŠö ½ãããã ½ãò
‡ãŠãããöããÊã‡ãŠ ,ã¹⁄ãÊã, Öã¶ã‡ã‡ãŠ, ¶ããè¹⁄ã ‡ãŠã |ãñÊã ,ãããª ãã¹⁄ãÊãñ
Öãñ|ãñ Ööý ÀãÖãã³⁄ãã¶ã‡ãŠ Á¹ã ½ãò Ôããºãì¶ã „Pãã lãÖããè³⁄ãã ,ã¹⁄ãÊãò
‡ãñŠ Ôããñãã¹⁄ã¹⁄ãã |ã©ãã ¹ããñ>öããlã³⁄ã¹⁄ã Êãlããã Öãñ|ãñ Ööý f¶Öò
¹ãÆã³⁄ãã: Ôããñãã¹⁄ã¹⁄ãã ,ã©ãlãã ¹ããñ>öããlã³⁄ã¹⁄ã Öãf;Êãù‡ã<Ôããf |ã©ãã
lã¶ãÖ¹ããã|ã |ãñÊã ‡ãŠãè ¹ããÀÖ¹ãããÀ‡ãŠ ãã%ãŠ³⁄ãã ¹ãÀ ºã¶ãã³⁄ãã •ãã|ãã
Ööý

,ã¹⁄ãã•ãÃ‡ãŠ ‡ã<³⁄ãã Ööã ?

ºãã•ããÀ Ôãñ •ãª ,ãã¹ã ‡ãŠ¹ãü|ã ãããñ¶ãñ ‡ãñŠ ããÊã† Ôããºãì¶ã ÇãÀãè¶ãñ
•ãã|ãñ Öö |ãª ¹l‡ãŠ¶ãªÀ Ôããºãì¶ã ‡ãŠãè •ããñ ãã>ãã‡ãŠ³⁄ãã ãñ|ãã Öö „Ôã
¹ãÀ Ôãã¹⁄ãã¶ã: Ôããºãì¶ã ,ãããã ‡ãŠlã ¶ãÖãè ÀÖ|ãã Ööý ãã>ãã ‡ãŠ³⁄ãã
‡ãñŠ Àö¹ãÀ ¹ãÀ ãã|ã>ãó¶ã ãã>ãã ‡ãŠ³⁄ãã ããÊãÇãã Öãñ|ãã Ööý ,ãã¹ã ¶ãñ

‡ãŠ¼ããè ÔããñPãã Öö äã ‡ãŠ ¾ãÖ äã¡•ãó¶ ‡ã<¾ãã Öö ? ¾ãÖ äã¡•ãó¶
 Ôãè ‚ã¹½ãã•ãÃ ‡ãŠ Öö •ããñ ‡ãŠYãñÀ •ãÊã ‡ãñŠ Ôãã©ã ¼ããè ¢ããØã
 ¢ñ¶ãñ ÎããÊãã ÀãÔãã¾ããã¶ã ‡ãŠ ¹ãªã©ãÃ Öãñ|ãã Ööý ¾ãÖ ‡ãŠ¹ãüã
 £ããñ¶ãñ ½ãò ‡ãŠã¹ãŠãè ½ãªØããÀ Öãñ|ãã Öö ¹ãÀ¶ãì ÀãÔãã¾ããã¶ã ‡ãŠ
 ÔããÓ> Ôãñ Ôãã°ãì¶ã Ôãñ äã¹¾ã¶¶ã Öãñ|ãã Ööý

ãã%ãŠ¾ãã ‡ãŠÊãã¹ã 4.5

ãñ œãñ>ãè °ããÊ>ãè ¾ãã ½ãØã Êãò ý ãñ¶ããò °ããããÊ>¾ããò ½ãò ‚ã£ãñ
 ¼ããØã |ã‡ãŠ ¹ã¶ããè ¼ãÀò ý ¹ãÖÊããè °ããÊ>ãè ½ãò Ôãã°ãì¶ã ‡ãŠã PãîYãÃ
 |ã©ãã ¢îÔãÀãè ½ãò ‚|ã¶ããè Öãè ½ãããã ½ãò ‚ã¹½ãã•ãÃ ‡ãŠ ÜããñÊãòý
 ‡ã<¾ãã ¢ñ¶ãñ Öö ? äã‡ãŠÔã °ããÊ>ãè ½ãò ¢ããØã ‚ãã£ã‡ãŠ °¶ã|ãã Öö ?
 ‚ã¹½ãã•ãÃ ‡ãŠ Ôãã°ãì¶ã ‡ãŠãè ‚ã¹ãããã ‡ãŠYãñÀ •ãÊã ½ãò ‚ãã£ã‡ãŠ
 ¢ããØã ¢ñ¶ãñ Öö ‚ããØÀ f¶ãÔãñ ‡ãŠ¹ãüñ ‚ãã£ã‡ãŠ Ôãã¹ãŠ £ãìÊã|ãñ Öö ý

„ÎãÃÀ‡ãŠ :-

ãã%ãŠ¾ãã ‡ãŠÊãã¹ã 4.6

ãñ Øã½ãÊãñ Êãò ý ãñ¶ããò Øã½ãÊããò ½ãò äã¹½ã>á>ãè ¼ãÀòý †‡ãŠ
 Øã½ãÊãñ ‡ãŠãè äã¹½ã>á>ãè ½ãò ¶ããª äã½ãÊãã¾ãñây ¢îÔãÀñ Øã½ãÊãñ
 ‡ãŠãñ ÎãòÔãã Öãè ÀÖ¶ãñ ¢öý ãñ¶ããò Øã½ãÊããò ½ãò †‡ãŠ •ãòÔãã
 ¹ããò£ãã ÊãØãã¾ãòý ¹ããò£ãã ÊãØãñ Øã½ãÊããò ‡ãŠãñ £ãì¹ã ½ãò À¶ãò ý
 ¹ãÊãã|ããª¶ã f¶ã½ãò Ôã½ãã¶ã ½ãããã ½ãò ¹ã¶ããè ¢ñ|ãñ ÀÖöý †‡ãŠ ½ããÖ
 °ããª ãñ¶ããò Øã½ãÊããò ‡ãñŠ ¹ããò£ããò ‡ãŠã ‚ãìÊããñ‡ãŠ¶ã ‡ãŠÀòý ‡ã<¾ãã
 äã¶ãã¾ããè ¢ñ|ãã Öö ?

‡ã<¾ãã ¶ããª ÎããÊãñ Øã½ãÊãñ ‡ãŠã ¹ããò£ãã ‚ãã£ã‡ãŠ ÔìãÖ©ã †Îãã °ãüã
 äã¶ãã¾ããè ¢ñ|ãã Öö ?

¹ãñü-¹ããò£ããò ‡ãŠãè ‚ãPã|ã Îãðãã® ‡ãñŠ äãÊã † ‚ãPã|ã ¶ããª ‡ãŠãè
 ‚ãì¹¾ã ‡ãŠ|ãã Öãñ|ããè Öö ý ¹ãñü-¹ããò£ããò ‡ãŠãè Îãðãã® ‡ãñŠ äãÊã †
 ¹ãÆ½ãì¶ã ¹ããñÓã ‡ãŠ |ã|ã ¶ããf>Êãñ•¶ã, ¹ãŠãüÔ¹ãŠãñÀÔã |ã©ãã
 ¹ããñ>ôãã¹¾ã½ã Ööã ý f¶ã½ãò Ôãñ ‚ãã£ã‡ãŠãã¹ã |ã|ããò ‡ãŠãñ ¹ããò£ãñ
 äã¹½ã>á>ãè Ôãñ Öãè ¹ãÆã¹ã ‡ãŠÀ|ãñ Öö ý †‡ãŠ Öãè •ã½ããè¶ã ¹ãÀ °ããÀ-
 °ããÀ ¹ãŠÔãÊã ‚Øã¶ãñ Ôãñ äã¹½ã>á>ãè ½ãò f¶ã ¹ããñÓã‡ãŠ |ã|ããò ‡ãŠãè
 ‡ãŠ½ããè Öãñ|ããè ÀÖ|ããè Öö äã•ãÔãÔãñ äã¹½ã>á>ãè ‡ãŠãè „ÎãÃÀã
 Îããã‡ã<|ã ‡ãŠ½ã Öãñ •ãã|ããè Ööý ¼ãìãã¹½ã ½ãò ‚ãì¹¾ã‡ãŠ |ã|ããò ‡ãŠãè
 |ã| ‡ãŠãÊã ¹ãìãã|ãÃ ‡ãñŠ äãÊã † äãìããã¹¾ã¶ã ÀãÔãã¾ããã¶ã ‡ãŠ ¶ããª
 „¹ã¾ããñØã ‡ãŠãè •ãã|ããè Öö, f¶ãÖö „ÎãÃÀ‡ãŠ ‡ãŠÖ|ãñ Ööý „ÎãÃÀ‡ãŠ
 ½ãã¶ãìã äã¶ããã½ãÃ|ã Öãñ|ãñ Ööã f¶ã ‡ãŠã äã¶ã½ããYã °ãüñ
 ‡ãŠãÀ¶ãã¶ãò ½ãñ â äã ‡ãŠ¾ãã •ãã|ãã Öö- ¾ãìããÀ¾ãã, äãÔããØãÊã
 Ôãì¹ãÀ ¹ãŠãüÔ¹ãñŠ>, ÍããñÀã, äã½ãããÑã|ã (†¶ã0¹ããè0‡ãñŠ0), ¡ãè0†0¹ããè0
 ‚ãããª ‡ãìŠœ ¹ãÆ½ãì¶ã „ÎãÃÀ‡ãŠ Ööý „ÎãÃÀ‡ãŠãò ‡ãñŠ äã¶ã½ããYã

‡āñŠ āāÊā† Ö½āāĀñ ºñĪā ½āò ‡āŠfĀ ‡āŠĀĀĒāā¶āñ Öö ý ¼āāĀā ‡āñŠ
 ‡āĪŠce ¹āĒ½āĪĒā „ĪāĀĀ ‡āŠ ‡āŠĀĀĒāā¶āñ ‡āŠÖāú āāÖ©āĪā Öö ? ¾āÖ
 •āā¶ā¶āñ ‡āñŠ āāÊā† ĪāāāĒā†āŠā 4.6 ºñĒāòý

¹āŠÖāĒā †Īāā ,ā¶āā•ā ¼āā;āĀā SJob jesieeCegveeMekeā :-

¹āŠÖāĒāāò †Īāā ,ā¶āā•āāò ‡āñŠ ¼āā;āĀā ‡āŠāè ,āāĪāĪ¼ā ‡āŠĪāā ‡ā<¾āāò
 Öö ?

•ā¶āÖāĀĒĒ¾āā āāĪāÖ¹āŠāñ> ‡āñŠ ‡āŠĀĀā ,āāāā ‡āŠ „¹ā•ā ¼āāāĪāÖ¾ā
 ‡āŠāè ,āāĪāĪ¼ā ‡āŠĪāā Öö ý ,āĪā: ¹āŠÖāĒā †Īāā ,ā¶āā•āāò ‡āŠā ¼āā;āĀā
 ,āāĪāĪ¼ā ‡āŠ Öāñ Øā¾āā Öö ý Öāāº•ā¾āāò, ¹āŠĒāāò ,āāāā ‡āŠāñ ĪāāèĪā
 ØāðÖāò ½āò ĀĒā ‡āŠĀ ,āāāā ‡āŠ āā¶āāò Īā ‡āŠ ÖāĪĀāāāĪā ĀĒāā •āā
 Öā ‡āŠĪāā Öö ý ,ā¶āā•āāò ‡āŠāñ ‡āŠāè>āò, ÞāĪÖāò ,āāòĀ ºāÖāāĪā Öāñ
 ºāÞāā¶āñ ‡āñŠ āāÊā† ºāūĵñ-ºāūĵñ ¼āā;āĀāØāðÖ Ö©āāāā¹āĪā āā ‡āŠ¾āāñ
 Øā¾āāñ Öö, •āÖāú ¹āĀ ĒāāĒāāò >¶ā ,ā¶āā•ā ‡āĪŠce ĀāÖāā¾āāā¶ā ‡āŠ
 ¹āā©āāò ‡āñŠ „¹ā¾āāñØā Öāñ ÖāĪĀāāāĪā ĀĒāñ •āāĪāñ Öö ý ØāāúĪāāò
 ½āò ,ā¶āā•āāò ‡āŠāñ ÖāĪĀāāāĪā ĀĒā¶āñ ‡āñŠ āāÊā† ‡āĪŠŸĒāñ ¾āā ĪĒ½ā
 „¹ā¾āāñØā āā ‡āŠ¾āāñ •āāĪāñ Öö ý f¶ā½āñā ,ā¶āā•ā ‡āŠāñ ÖāĪĒāā ‡āŠĀ
 ¼āĀā •āāĪāā Öö ý f¶ā½āò ¶āāè½ā ‡āŠāè ÖāĪĒāāè ¹āāāĪ¾āāú ,ā©āĪāā
 ‡āŠāè>¶āāĪā ‡āŠ ¹Īāāf¾āāò ‡āŠāñ ĀĒā ‡āŠĀ ,ā¶āā•ā ‡āŠā ÖāĀĀāāāā
 āā†āŠ¾āā •āā Öā†āŠĪāā Ööý

,ā¶āā•āāò †Īāā ¹āŠÖāĒāāò ‡āŠāñ ºāāè½āāāĀ¾āāò ,āāòĀ ‡āŠāè>āò Öāñ
 ºāÞāā¶āñ ‡āñŠ āāÊā† āāĪāā¾ā¶ā ĀāñØāāāāĪāĪā†āŠ ĀÖāā¾ā¶ā •āöÖāñ
 - ĵāè0ĵāè0>āè0([eF& keäueesjes [eF& heāsefveue š^eF& keäueesjes
 SLeve) ºāāè0 † Þā0Öāāè0 (yesvpeerve nskeāmee keäueesjeF[]) Īā©āā
 āā½ā©āāfĒā ¹āñĀāāā©ā¾āā¶ā ,āāāā ‡āŠā „¹ā¾āāñØā āā†āŠ¾āā •āāĪāā Öö
 ý f¶ā ĀÖāā¾ā¶āāò ‡āñŠ ,āāāā ‡āŠ ½āāāā ½āò Īā©āā ĒāØāāĪāĀ
 „¹ā¾āāñØā ‡āŠā ¹āĒ¼āāĪā •āāèĪāāò ‡āŠāè Ēāā²ā ĪāðāĒāĒā ‡āŠāñ ¼āāè
 ¹āĒ¼āāāāĪā ‡āŠĀ ĀÖā Ööý

¹āŠÖāĒāāò SJob efĪyyee yevo KeeĀe heoeLees&b ‡āŠāñ Öāāā¶ā†āŠĀā†āŠ
 •āāèĪāāāāĪāāò Öāñ ºāÞāā¶āā ,ā¾ā¶ā ,āāĪāĪ¼ā ‡āŠ Öö ý fÖā†āñŠ āāÊā¾āāñ
 ĀāñØāāāāĪāĪā†āŠ ‡āŠā „¹ā¾āāñØā ‡āŠĀ¶āā ¼āāè ,āāĪāĪ¼ā ‡āŠ ÖāñĪāā
 Ööý f¶ā •āāèĪāāāāĪāĪā ‡āŠ ¹Īāāf¾āāò ‡āŠā Þā¾ā¶ā †Īāā „¹ā¾āāñØā
 ºāūĵāè ÖāāĪāāā¶āāè Öāñ āā ‡āŠ¾āā •āā¶āā ÞāāāāÖ † āā•āÖāÖāñ
 ¹ĪāØāā½āāè ¹Ö¹āāāĀāā½āāò Öāñ ºāÞāā •āā Öā†āñŠ ý

¹āāāĒā ‡ā

3. ¶āāēPāñ āā^{3/4}āñ Øā^{3/4}āñ Īā^{0a}āò ‡ āŠāē ŌāÖā^{3/4}ā|āā Ōāñ āāÀ ‡ ā<|ā
 Ō©āā¶āāò ‡ āŠāē 'āīāā|āĀ ,ā¹ā¶āāē ,ā^{1/4}āāŌā 'āīāāŌ|ā ‡ āŠā ½āò
 ‡āŠāēāā•ā† -

(Ōāā°āi¶ā, 'āÆā‡āðŠāā|ā‡āŠ, °ā|ā&¶ā, ŌāāĪĒāñāāŌā|ā, 'āĀā°āōŌā¶āāē)
 (‡āŠ) ½āñĒāā½āāf¶ā ‡āŠā ,, 'ā^{3/4}āāñŌā 'ĒāāāāŌ> ‡āŠ ‡āñŠ

°ā¶āā¶āñ ½āò āā‡āŠ^{3/4}āā •āā|āā Ööý
 (Ēā) Ōāī|ā, ĀñĪā½ā, ...¶ā ĀñĪāñ Ööý

(Ōā) £āī'a ‡āñŠ PāĪ½āò Ōāī^{3/4}āĀ ‡āŠāē āā‡āŠÀŸāāò Ōāñ
 ,āāúĒāāò ‡āŠāñ °āPāā|āñ Öö ý

(Üā) Ōāāñāāj^{3/4}ā½ā ÖāfĪĒāù ‡ā<ŌāāfĪ ,āāōÀ Īā¶āŌ'āāā|ā |āñĒā ‡āŠāē
 āā%āŠ^{3/4}āā Ōāñ 'āÆā¹|ā āā‡āŠ^{3/4}āā •āā|āā Ööý

(ü) ĀñĪāāò Ōāñ °ā¶āñ ‡āŠ¹āüjñ ,āāā£ā‡āŠ āā>‡āŠā... ,āāōÀ
 ŌāŌ|āñ Ōāñ|āñ Ööý

4. Ōāāāāñ'ā ½āò ,,||āĀ °āēāā•ā† -

(‡āŠ) 'āÆā‡āðŠāā|ā‡āŠ †Īāā ½āā¶āĪā-āā¶āāā½āĀ|ā ĪāŌ|āi,āāò Ōāñ ‡ā<^{3/4}āā
 Ōā½āçā|āñ Öö ?

(Ēā) āā‡āŠ¶Ōāē PāāÀ 'āÆā‡āŠāÀ ‡āñŠ ‡āŠāúPā ‡āŠā ¶āā½ā āāĒāāāĒā†ý
 (Ōā) 'āāūĒāāē©āāē¶ā, >ñ'āĒāāū¶ā, †āā%āŠāāĒāēā‡āŠ |ā©āā °āñ‡āñŠĒāāf>

‡āñŠ †‡āŠ-†‡āŠ ,, 'ā^{3/4}āāñŌā āāĒāāāĒā†ý
 (Üā) Ōāā°āi¶ā ,āāōÀ ,ā'ā½āā•āĀ‡āŠ ½āò ‡ā<^{3/4}āā ,ā¶āĀ Öö ?

(ü) ½āðāā|ā‡āŠā ‡ā<^{3/4}āā Öö ?

(Pā) ŌāāĪĒāñāāŌā|ā ĀñĪāñ ‡ā<^{3/4}āā Öö ?

5. Ēāāj ` ‡āŠ' ‡āñŠ ,ā£āīĀñ Īāā ‡ā<<sup>3/4</sup>āāò ‡āŠāñ Ēāāj `Ēā' ‡āŠāē
 ŌāÖā^{3/4}ā|āā Ōāñ 'āīĀā ‡āŠāēāā•ā† -

Ēāāj ‡āŠ'
 Ēāāj; `Ēā'

(i) ½ā¶āiŌ^{3/4}ā ,ā©āĪāā ½āĪāāē¶āāò 'āĀā |āō^{3/4}āāĀ ‡āŠāē Øā^{3/4}āāē
 ĪāŌ|āi †ú (i) ,,ĪāĀĀ ‡āŠāò ‡āŠā ,, 'ā^{3/4}āāñŌā

āā‡āŠ^{3/4}āā •āā|āā Ööý
 (ii) ½ā ‡āŠā¶ā °ā¶āā¶āñ ½āò
 (ii) 'āā¶āāē ‡āŠā

āāceüj‡āŠāĪā ,āāĪāĪ^{3/4}ā‡āŠ Ōāñ|āā Ööý
 (iii) Ōāāē½āñ¶ā> ‡āñŠ ¶ā^{3/4}āñ 'ĒāāŌ>À 'āĀ

(iii) ½āā¶āĪā-āā¶āāā½āĀ|ā
 ĪāŌ|āi†ú ‡āŠÖĒāā|āāē Öö ý

(iv) ‡āðŠāāŌā ,,||āā¶ā °āüā¶āñ ‡āñŠ āāĒā †
 (iv) ‡āðŠāā'ā½ā ĀñĪāā ¼āāē

‡ãŠÕã •ãã|ãã Ööý

(v)

Àñ³⁄₄ãã¶ã

ÀñÍããò

‡

ãŠãñ

(v)

fÄ>

Ôããè¹⁄₂ãñ¶ã, ÔãããÀ³⁄₄ãã ,ããããª ‡ãŠã „¹ã³⁄₄ããñØã ãã‡ãŠ³⁄₄ãã •ãã|ãã Öö ý

6. ãã¶ã¹⁄₂¶ãããÊãããĈã|ã ¹ãÆÍ¶ããò ‡ãñŠ „||ãÀ ªãèãã•ã† -

(‡ãŠ) ,ã¶ãã•ã ‡ãñŠ ¹⁄₄ãã|ãÀ¥ã ‡ãŠãè ‡ã<³⁄₄ãã ,ããÍãÍ³⁄₄ã ‡ãŠ|ãã Öö |ãĈãã
³⁄₄ãÖ ãã‡ãŠÔã ¹ãÆ‡ãŠãÀ Ôã¹⁄₂¹⁄₄ãÍã Öö ?

(Ĉã) ¹⁄₂ãÍĈ³⁄₄ã „ÍãÃÀ ‡ãŠ ‡ãŠãõ¶ã- ‡ãŠãõ¶ã Ôãñ Öö ? ãã¹⁄₂ãããÑã|ã
„ÍãÃÀ‡ãŠ Ôãñ ‡ã<³⁄₄ãã Ôã¹⁄₂ãĉã|ãñ Öö ?

(Øã) ¹⁄₄ãÍãã¹⁄₂ã ¹⁄₂ãñâ ¹ãñÓã ‡ãŠ |ã|Íããò ‡ãŠãè ¹ãÍãã|ãÃ ‡ãñŠ ããÊã †
‡ãŠãõ¶ã-‡ãŠãõ¶ã Ôãñ „¹ã³⁄₄ã ãã‡ãŠ³⁄₄ãñ •ãã Ôã‡ãŠ|ãñ Öö ?

(Üã) £ãÍ¹ã ¹⁄₂ãò ºããÖÀ ãã¶ã‡ãŠÊã¶ãñ ¹ãÀ Ö¹⁄₂ã £ãÍ¹ã ‡ãñŠ ÞãÍ¹⁄₂ããò ‡ãŠã
¹ãÆ³⁄₄ããñØã ‡ã<³⁄₄ããò ‡ãŠÀ|ãñ Öö ?

(ü) ÔããÍÊãñããÔã|ã ÀñÍããò Ôãñ ºã¶ãñ ÍãÔªã •ãÊªãè ‡ã<³⁄₄ããò ÔãwĈã
•ãã|ãñ Öö ?

ÜãÀ ¹ãÀ ‡ãŠÀò

(‡ãŠ) ,ããÔã-¹ããÔã ‡ãñŠ Ĉãñ|ããò ‡ãŠã ¹⁄₄ãÆ¹⁄₂ã¥ã ‡ãŠÀòý ãã‡ãŠÔãã¶ã
Ôãñ ¹ã|ãã ÊãØãã³⁄₄ãò ãã‡ãŠ ÍãÖ ãã‡ãŠÔã „ÍãÃÀ ‡ãŠ ‡ãŠã „¹ã³⁄₄ããñØã
‡ãŠÀ|ãã Öö ,ããõÀ „Ôã¹⁄₂ãò ‡ãŠãõ¶ã- ‡ãŠãõ¶ã Ôãñ ¹ãñÓã ‡ãŠ |ã|Íã
„¹ãããĈã|ã Öñ|ãñ Öö ? ,ã¹ã¶ããè ,ã¹⁄₄³⁄₄ããÔã ¹ãÍããÔ|ã‡ãŠã ¹ãÀ ,ãããã‡ãŠ|ã
‡ãŠÀò -

(Ĉã) Ôãããª•ã³⁄₄ããò †Íãã ¹ãŠÊããò ‡ãñŠ ããœÊã‡ãñŠ, ÔãÍĈããè ¹ããã||ã³⁄₄ããú,
Þãã³⁄₄ã ‡ãŠãè „¹ã³⁄₄ããñØã ‡ãŠãè Øã³⁄₄ããè ¹ã||ããè ,ããããª ‡ãŠãñ †‡ãŠ
¹ãÍÀã¶ããè ¹ÊããããÔ> ‡ãŠ ‡ãŠãè ºããÊ>ãè ¹⁄₂ãò ÀĈãòý ºããÊ>ãè ¹ãÀ †‡ãŠ
▯‡ã<‡ãŠ¶ã ÀĈã ºý fÔã ºããÊ>ãè ‡ãŠãñ ÔãÍÀãããã|ã ĈãÍÊãñ ÔĈãã¶ã ¹ãÀ
ÀĈãòý †‡ãŠ ¹⁄₂ãÖãè¶ãñ ºãã fÔãñ ĈããñÊãñòý ,ãªã Ĉããª |ã³⁄₄ããÀ Öñ
•ãã³⁄₄ããñØãèý fÔãñ ,ãã¹ã ,ã¹ã¶ãñ ºãØããèÞãñ ¹⁄₂ãò „¹ã³⁄₄ããñØã ‡ãŠÀ
Ôã‡ãŠ|ãñ Ööý

[back](#)

f†ãŠã*f*Ã - 5

°ãÊã |ã©ãã °ã°ã



- °ãÊã ‡ã<¾ãã Öö ?
- °õãã¶ã‡ãŠ •ããèlã¶ã ½ãò °ã°ã ‡ãŠã °ãÆ¼ããlã ý
- °lã ½ãò ;w°ããè ÕifÃ lãÔ|ãì ‡ãŠã ¼ããÀ ý
- |ãÀÊã °ã°ã©ããô ½ãò °ã°ã ý

,ãã¹ã ãã¹ãœÊããè ‡ãŠããã ½ãò °ãü⊗ Pãì‡ãñŠ Öö ãã‡ãŠ ãã‡ãŠÔããè lãÔ|ãì
‡ãŠãñ ÇããéPã¶ãñ ¾ãã £ã‡ã<‡ãŠã °ñ¶ãñ ½ãò °ãÊã ‡ãŠã °ãÆ¼ããñØã Öãñ|ãã
Öö ý lãÔ|ãì °ãÀ °ã¾ããÃ¹ã °ãÊã ÊãØã¶ãñ Ôãñ lãÔ|ãì ‡ãŠãè ããÔ©ããã|ã ½ãò
°ããÀlã|ãÃ¶ã Öãñ|ãã Öö ý lãÔ|ãì ããÔ©ãÀ Ôãñ Øããã|ã½ãã¶ã ,ãlãÔ©ãã
½ãò Öãñ Ôã ‡ãŠ|ããè Öö, „Ôã ‡ãŠãè Øããã|ã |ãñ•ã ¾ãã £ããè½ããè Öãñ
Ôã‡ãŠ|ããè Öö, „Ôã‡ãŠãè Øããã|ã ‡ãŠãè ãã¹ãã °ãÊã Ôã‡ãŠ|ããè Öö ý

**,ããf† •ãã¶ãò ãã‡ãŠ °ãÊã ‡ãŠãè ,ã¶¾ã ããlãlãñÓã|ãã†ã ‡ã<¾ãã
Ööã ?**

ãã%ãŠ¾ãã ‡ãŠÊãã¹ã 5.1

□ ‡ãŠ *f*Ã> „ÿã¾ãòý □ ‡ãŠ Ôãã©ã °ãñ *f*Ã> „ÿã¾ãò ý
‡ã<¾ãã ,ã¶ãì¼ãlã Öãñ|ãã Öö ? ‡ãŠ *f*Ã> ‡ãŠãè ,ã¹ãñãã °ãñ *f*Ã> „ÿã¶ãñ
½ãò ,ããã£ã‡ãŠ °ãÊã ÊãØã¶ãñ °ãü|ãã Ööý
‡ã<¾ãã ãã¶ãÓ‡ãŠÓãÃ ãã¶ã ‡ãŠÊã|ãã Öö ? °ãÊã ½ãò °ããÀ½ããÿã Öãñ|ãã
Öö ý

ãã%ãŠ¾ãã ‡ãŠÊãã¹ã 5.2

□ ½ãñ•ã °ãÀ |Ô>À ÀÇãò ý
□ |Ô>À ‡ãŠãñ ,ã Ôãñ °ã ‡ãŠãè ,ããñÀ ããlãÔ©ããã¹ã|ã ‡ãŠÀò (ããPã¹ã 5.1)ý

ã

°ã



ããPã"ã Ôããã0 5.1

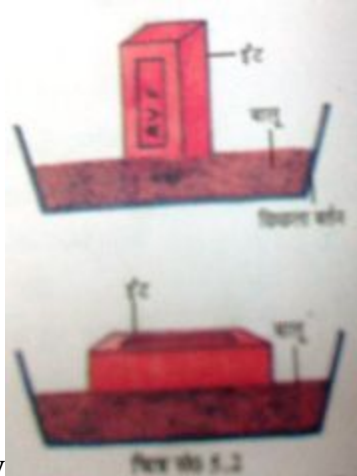
- °ãÊã ãã‡ãŠÔã ããªÍãã ½ãò ÊãØãã³⁄⁴ãã Øã³⁄⁴ãã ? (,ã Ôãñ °ã ‡ãŠãè ããªÍãã ½ãò)
- 'ãì¶ã: ¡Ô>À ‡ãŠãñ °ã Ôãñ °ã ‡ãŠãè ,ããñÀ ããÍãÔ©ãããã'ã|ã ‡ãŠÀò ý
- °ãÊã ãã‡ãŠÔã ããªÍãã ½ãò ÊãØãã³⁄⁴ãã Øã³⁄⁴ãã ? (°ã Ôãñ °ã ‡ãŠãè ããªÍãã ½ãò) fÔãÔãñ ‡ã<³⁄⁴ãã ãã¶ãÓ ‡ãŠÓãÃ ãã¶ã ‡ãŠÊã|ãã Öõ ? °ãÊã ½ãò ããªÍãã Ôãñ|ããè Öõ ý

°ãÊã ½ãò 'ãããÀ½ãã¥ã ,ããòÀ ããªÍãã Öãñ|ããè Öõ |ã©ãã °ãÊã ‡ãŠã ½ãã"ã‡ãŠ ¶³⁄⁴ãñ¶ã Öõý

ãã‡ãŠÔããè |ãÊã 'ãA °ãÊã ÊãØãã¶ãñ ‡ãŠã ‡ã<³⁄⁴ãã 'ãÆ¹⁄⁴ããÍã Öãñ|ãã Öõ ? ,ããf‡ ‡ãŠÀ‡ãñŠ °ñÆãò ãã‡ãŠ Ôã½¹⁄²ã‡ãŠ |ãÊã ‡ãñŠ ããñ"ã'ãŠÊã ½ãò 'ãããÀÍã|ãÃ¶ã Ôãñ °ãÊã ‡ãñŠ 'ãÆ¹⁄⁴ããÍã ½ãò ‡ã<³⁄⁴ãã 'ãããÀÍã|ãÃ¶ã Öãñ|ãã Öõ ?

ãã%ãŠ³⁄⁴ãã ‡ãŠÊãã'ã 5.3

- ‡‡ãŠ ããœœÊãã °ã|ãÃ¶ã Êãò ý fÔã½ãò ÊãØã¹⁄⁴ãØã 6 Ôãñ¶ãè½ããè>À ... úPããè °ããÊãì ‡ãŠãè |ãÖ ãã°ãœã³⁄⁴ãò ý
- ‡‡ãŠ fÃ> Êãò ý
- 'ãÖÊãñ fÔãñ °ããÊãì ½ãò Æãü|ã ‡ãŠÀ‡ãñŠ ÀÆãò, fÔã‡ãñŠ °ããª fÔãñ



Êãñ>ã ‡ãŠÀ ÀÆãò (ããPã"ã 5.2) ý ‡ã<³⁄⁴ãã ããªÆãã³⁄⁴ããè °ñ|ãã Öõ ?

fÃ> ‡ãŠãñ Êãñ>ã ‡ãŠÀ ÀÆã¶ãñ ‡ãŠãè ,ã'ãñããã fÃ> ‡ãŠãñ Æãü|ã ÀÆã¶ãñ 'ãÀ ³⁄⁴Ö °ããÊãì ½ãò ,ããã£ã ‡ãŠ ØãÖããfÃ |ã ‡ãŠ £ãúÔã •ãã|ããè Öõ ý ‡ã<³⁄⁴ãò ?

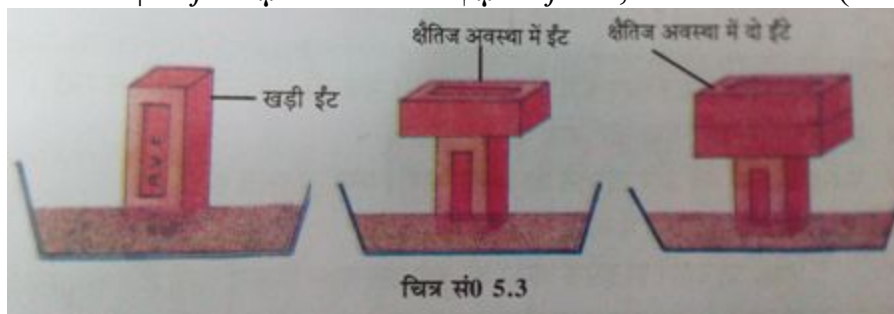
$f\ddot{A}$ > ‡ãŠæ 'ãÆ©ã½ã ,ãlãÔ©ãã ½ãò °ãÊãî Ôãñ $f\ddot{A}$ > ‡ãŠãñ Ôã½'ã ‡ãÃŠ
 |ãÊã ‡ãŠã àãñ'ã'ãŠÊã ‡ãŠ½ã Ôãñ¶ãñ ‡ãñŠ ‡ãŠãÀ¥ã „Ôã ‡ãñŠ ¼ããÀ
 ,ã©ããÃ|ã °ãÊã ‡ãŠã 'ãÆ¼ããlã ,ããããã ‡ãŠ Ôãñ|ãã Öò ,ããòÀ 'îÔãÃæ
 ,ãlãÔ©ãã ½ãò Ôã½'ã ‡ãÃŠ |ãÊã ,ããããã ‡ãŠ Ôãñ¶ãñ ‡ãñŠ ‡ãŠãÀ¥ã „Ôããè
 °ãÊã ‡ãŠã 'ãÆ¼ããlã ‡ãŠ½ã Ôãñ •ãã|ãã Öòâý
 ‡ã<¾ãã ãã¶ãÓ‡ãŠÓãÃ ãã¶ã‡ãŠÊã|ãã Öò ?
 □ ÔãÊ'ã ‡ãÃŠ |ãÊã ‡ãŠã àãñ'ã'ãŠÊã ,ããããã ‡ãŠ Ôãñ¶ãñ 'ãÀ °ãÊã ‡ãŠã
 'ãÆ¼ããlã ‡ãŠ½ã Ôãñ •ãã|ãã Öò ý

**Ôã½ãã¶ã °ãÊã ÊãØã¶ãñ 'ãÀ Ôã½'ã ‡ãÃŠ |ãÊã ‡ãŠã àãñ'ã'ãŠÊã
 ‡ãŠ½ã Ôãñ¶ãñ Ôãñ °ãÊã ‡ãŠã 'ãÆ¼ããlã °ãü□ •ãã|ãã Öò |ã©ãã
 Ôã½'ã ‡ãÃŠ |ãÊã ‡ãŠã àãñ'ã'ãŠÊã ,ããããã ‡ãŠ Ôãñ¶ãñ Ôãñ °ãÊã
 ‡ãŠã 'ãÆ¼ããlã Üã > •ãã|ãã Öòý**

,ããf ‡ Ôã½ããò ãã ‡ãŠ ÔãÊ'ã ‡ãÃŠ |ãÊã ‡ãñŠ Ôã½ãã¶ã àãñ'ã'ãŠÊã 'ãÀ
 ããlããã¼ã¶ã 'ãããÀ½ãã¥ã ‡ãñŠ °ãÊã ÊãØã¶ãñ ‡ãŠã ‡ã<¾ãã 'ãÆ¼ããlã
 Ôãñ|ãã Öò ?

ãã%ãŠ¾ãã ‡ãŠÊãã'ã 5.4

- °ãÊãî Ôãñ ¼ãÃã ‡ãŠ ããœœÊãã °ã|ãÃ¶ã Êãòý
- $f\ddot{O}$ ã½ãò ‡ãŠ $f\ddot{A}$ > Æãü;ãè ÀÆãòý
- $f\ddot{O}$ ãñŠ ... 'ãÀ ããPã'ãã¶ãîÔããÀ ‡ãŠ $f\ddot{A}$ > ããòãã|ã•ã ÀÆãòý
- $f\ddot{O}$ ãñŠ 'ãlPãã|ãã $f\ddot{O}$ ãñŠ ... 'ãÀ ‡ãŠ $f\ddot{A}$ > ,ããòÀ ÀÆãò (ããPã'ã 5.3)ý



‡ã<¾ãã Öòñ|ãã Öò ?
 Æãü;ãè $f\ddot{A}$ > 'ãÀ ‡ãŠ $f\ddot{A}$ > ‡ãñŠ Ô©ãã¶ã 'ãÀ °ãñ $f\ddot{A}$ >ò ÀÆã¶ãñ 'ãÀ ¾ãÖ
 °ãÊãî ½ãò ,ããããã ‡ãŠ ØãÖÀãfã |ããŠ ÆãüÔã •ãã|ããè Öòý
 ãã‡ãŠÓã ããÔ©ããã|ã ½ãò Æãü;ãè $f\ddot{A}$ > 'ãÀ ,ããããã ‡ãŠ °ãÊã ÊãØã ÀÖã Öò ?
 °ãñ $f\ddot{A}$ >ññ ÀÆã¶ãñ 'ãÀ ,ããããã ‡ãŠ °ãÊã ÊãØã ÀÖã Öòý
 ‡ã<¾ãã ãã¶ãÓ‡ãŠÓãÃ ãã¶ã‡ãŠÊã|ãã Öò ?

- Ôã½ãã¶ã |ãÊã 'ãÀ ÊãØã¶ãñ lããÊãñ °ãÊã ‡ãŠãñ °ãü□ã °ñ¶ãñ Ôãñ
 „Ôã‡ãŠã 'ãÆ¼ããlã ,ããããã ‡ãŠ Ôãñ|ãã Öò ý
- **Ôã½'ã ‡ãÃŠ** |ãÊã ‡ãŠã àãñ'ã'ãŠÊã Ôã½ãã¶ã Ôãñ¶ãñ 'ãÀ ,ããÀãñãã'ã|ã
 °ãÊã ‡ãŠã 'ãããÀ½ãã¥ã °ãÊã¶ãñ 'ãÀ °ãÊã ‡ãŠã 'ãÆ¼ããlã °ãÊã •ãã|ãã Öò

ý

„¹/₄ài¹À † à<|ā āā%āš³/₄āā † āšÊāā¹ā Ôāñ āāÔā® Òì, āā āā † āš Ôā¹/₂ā † āš
|āÊā ¹āÀ °āÊā † āšā ¹āÆ¹/₄āāīā °āÊā † āñš ¹āāāÀ¹/₂āā¥ā † āñš
Ôā¹/₂āā¶āī¹āā|āāè |ā©āā Ôā¹/₂ā † āš |āÊā † āñš āāñ¹ā¹āšÊā † āñš
Ì³/₄ài¹%āš¹/₂āā¶āī¹āā|āāè Òñā|āā Òōý °āÊā † āñš fÔā ¹āÆ¹/₄āāīā † āšāñ Ò¹/₂ā
°ā°ā Ôāñ Ì³/₄ā † à<|ā † āšÀ|āñ Òōý, āāf† Ôā¹/₂āçāò āā † āš °ā°ā † ā<³/₄āā Òō ?
āā † āšÔāāè |āÊā ¹āÀ °āÊā ÊāØā¶āñ (, āāÀāñāā¹ā|ā Ôāñ¶āñ) † āñš † āšÀÆā
°ā°ā „¹ā¶ā Ôāñ|āā Òō ý āā † āšÔāāè |āÊā ¹āÀ °ā°ā, |āÊā † āñš āāñ¹ā¹āšÊā
, āāòÀ fÔā ¹āÀ ÊāØāā³/₄āñ Øā³/₄āñ Êā¹/₂°āīā|ā °āÊā ¹āÀ āā¶ā¹/₄À † āšÀ|āā
Òōý

दाब = $\frac{\text{बल}}{\text{क्षेत्रफल}}$ (चूंकि बल का SI मात्रक न्यूटन (N) तथा क्षेत्रफल का SI मात्रक m² है)
दाब को P से, बल को F से तथा क्षेत्रफल को A से व्यक्त करने पर

$$P = \frac{F}{A} \quad \text{N/m}^2$$

† † āšā † āš āāñ¹ā¹āšÊā ¹āÀ ÊāØā¶āñ ÌāāÊāñ , āāā¹/₄āÊā¹/₂°āīā|āā
(Normal)°āÊā † āšāñ °ā°ā † āšÔ|āñ Òō ý

, āāÀāñāā¹ā|ā °āÊā † āñš ¹āāāÀ¹/₂āā¥ā ¹/₂āò Ìāðāā® † Ìāā āāñ¹ā¹āšÊā ¹/₂āò
† āš¹/₂āāè Òāñ¶āñ ¹āÀ °ā°ā ¹/₂āò Ìāðāā® |ā©āā °āÊā † āñš ¹āāāÀ¹/₂āā¥ā ¹/₂āò
† āš¹/₂āāè † Ìāā āāñ¹ā¹āšÊā °āü¶āñ Ôāñ, °ā°ā ¹/₂āò † āš¹/₂āāè Òāñ|āāè Òō ý

°āā¶ā†āš •āāèÌā¶ā ¹/₂āò °ā°ā † āšā ¹āÆ¹/₄āāīā :-

□ Ôāñ°ā † āšāñ ¹āò¶āāè æìÀāè Ôāñ † āšā¶āñ ¹āÀ , āāÔāā¶āāè Ôāñ † āš>|āā
Òō ý

□ ¹ā<|āāè ¹/₂āò ¶āī†āšāèÊāāè āā¹ā¶ā Ôāñ æñ¹ † āšÀ¶āā , āāÔāā¶ā Ôāñ|āā Òō
ý

□ Ô † āīšÊāāè °āÔ|āñ ³/₄āā Ôāā¹/₂āā¶ā Êāā¶āñ † āñš çāāñÊāñ ¹/₂āò |āñÀāè
† āñš Ô©āā¶ā ¹āÀ Þāāðüññ ¹ā>áñ † āñš ¹āÆ³/₄āāñØā Ôāñ „ Ôāñ Êāñ •āā¶āñ
¹/₂āòâ , āāÔāā¶āāè Òāñ|āāè Òōý

□ ¹/₂ā•ā¹Àāò † āšāñ āāÔāÀ ¹āÀ ¹āØāüjāè ¹āÔ¶ā † āšÀ °āāñçāā ðāñ¶āā
, āāÔāā¶ā ÊāØā|āā Òō ý

□ >È † āšāò ¹/₂āò ÞāāÀ † āšāè •āØāÖ æ: >ā³/₄āÀāò † āšā ¹āÆ³/₄āāñØā
āā†āš³/₄āā •āā|āā Òō āā•āÔāÔāñ ¹āāèæñ † āñš ¹āāāÔ³/₄āāò † āšā Ôā¹/₂ā † āš
āāñ¹ā °āü¶ā •āā¶āñ Ôāñ „ Ôā † āñš ¹āÀ Ôāüj † āš † āñš |āÊā ¹āÀ ÊāØā¶āñ
ÌāāÊāā °ā°ā † āš¹/₂ā Òāñ •āā|āā Òō ý

Ìāā³/₄ài¹/₂ā¥jÊāāè³/₄ā °ā°ā † ā<³/₄āā Òō ?

¹āð©Ìāāè ÞāāÀāò |āÀ¹āš Ìāā³/₄ài Ôāñ āāÜāÀāè Òō ý ¹āð©Ìāāè † āñš ÞāāÀāò
, āāñÀ Ìāā³/₄ài † āšā ³/₄āÖ , āāÌāÀ¥ā Ìāā³/₄ài¹/₂ā¥jÊā † āšÔÊāā|āā Òō ý
Ìāā³/₄ài¹/₂ā¥jÊā ÊāØā¹/₄āØā 100 Km † āšāè ...úÞāāfÀ |ā † āš ¹āòšÊāā

Öi,ãã Öö ý Ìãã³⁄⁴ãì½ã¥ìÊã ‡ãñŠ ‡ãŠãÀ¥ã ¹ãð©Ìããè ‡ãŠãè Ôã|ãÖ ¹ãÀ •ããñ
 °ãã ÊãØã|ãã Öö „Ôãñ Ìãã³⁄⁴ãì½ã¥ìÊããè³⁄⁴ã °ã°ã ‡ãŠÖ|ãñ Ööã ý fÔãñ
 Ôããããñ¹ã ½ãò Ìãã³⁄⁴ãì °ã°ã ¼ããè ‡ãŠÖ|ãñ Ööý Ìãã³⁄⁴ãì °ã°ã ‡ãŠñ ‡ã<³⁄⁴ãã
 ¹ãÆ¼ããÌã Öö ?

ãã%ãŠ³⁄⁴ãã ‡ãŠÊãã¹ã 5.5

□ ‡ãŠ À°ãÀ ÐãìÔã‡ãŠ Êãò ý ããÐã¹ã 5.4 ‡ãñŠ ,ã¶ãìÔããÀ fÔãñ ½ãñ•ã
 ‡ãŠãè ããÐã‡ãŠ¶ããè Ôã|ãÖ ¹ãÀ ÁÆãò ý



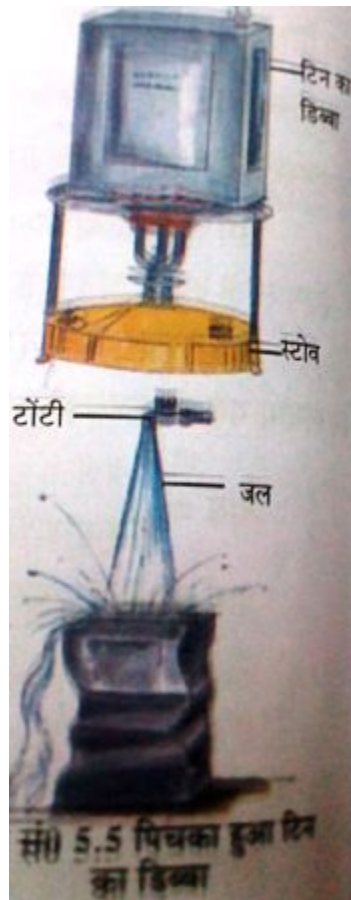
□ fÔãñ ¶ããèÐãñ ‡ãŠãè ,ããñÀ °ãã ‡ãŠÀ œãñüj °ò ý
 □ ,ã°ã fÔãñ ...¹ãÀ ‡ãŠãè ,ããñÀ ÆããèÐã¶ãñ ‡ãŠã ¹ãÆ³⁄⁴ããÔã ‡ãŠÀò ý
 ‡ã<³⁄⁴ãã ,ã¶ãì¼ãÌã Ôãñ|ãã Öö ý
 fÔãñ ...¹ãÀ ‡ãŠãè ,ããñÀ ÆããèÐã¶ãñ ½ãò ‡ãŠããÝ¶ããfÃ Ôãñ|ããè Öö ý
 ‡ã<³⁄⁴ããò ?

ÐãìÔã‡ãŠ ‡ãŠãñ °ãã¶ãñ ¹ãÀ fÔã‡ãñŠ ,ã¶ãÀ ‡ãŠãè ‡ãìŠœ Ìãã³⁄⁴ãì °ããÖÀ
 ãã¶ã‡ãŠÊã •ãã|ããè Öö ý Ìãã³⁄⁴ãì½ã¥ìÊããè³⁄⁴ã °ã°ã ‡ãñŠ ‡ãŠãÀ¥ã fÔã ¹ãÀ
 °ããÖÀ Ôãñ Ìãã³⁄⁴ãì °ã°ã ¹ãüj|ãã Öö ¹ãŠÊãÔãÀ¹ã „Ôãñ ...¹ãÀ ÆããèÐã¶ãñ
 ‡ãŠããÝ¶ã Ôãñ •ãã|ãã Öö ý

ãã%ãŠ³⁄⁴ãã ‡ãŠÊãã¹ã 5.6

□ ¹ã|ãÊãñ ãã¶ã ‡ãŠã ‡ãŠ ããj°ãã Êãòý fÔã‡ãñŠ Ðããð©ããfÃ ...úÐããfÃ
 |ã‡ãŠ ¹ãã¶ããè ¼ãÀò ý
 □ fÔãñ ‡ãìŠœ °ñÀ |ã‡ãŠ ØãÀ½ã ‡ãŠÀò ãã•ãÔãÔãñ ,ã¶ãÀ ‡ãŠãè Ìãã³⁄⁴ãì
 ¼ãã¹ã ‡ãñŠ Ôãã©ã °ããÖÀ ãã¶ã‡ãŠÊã •ãã³⁄⁴ã ý

□ ,ã°ã ãã^{oo}ãã °ãã^a ‡ãŠÀ ‡ãñŠ „Ôã ‡ãñŠ ...¹ãÀ Ýâã^ã ¹ãã¶ããè ¿ãÊãò (ããPãã 5.5)ý ‡ã<³/₄ãã Ôãñ|ãã Ôõ ?



ãã^{oo}ãã PããÀãò ,ããñÀ Ôãñ ãã¹ãPã‡ãŠ •ãã|ãã Ôõý ‡ã<³/₄ããò ?
ãã^{oo}ãñ ‡ãñŠ ,ã¶^aÀ ‡ãŠãè Ìãã³/₄ãì Øã¹/₂ãÃ ‡ãŠÀ¶ãñ Ôãñ °ããÖÀ ãã¶ã‡ãŠÊã
•ãã|ããè Ôõ ,ããòÀ „Ôã ‡ãŠã Ôãã¶ã •ãÊã ÌããÓ¹ã Êãñ Êãñ|ããè Ôõ ý ãã^{oo}ãñ
‡ãŠãñ Ýâã^ã ‡ãŠÀ¶ãñ ¹ãÀ ÌããÓ¹ã ¹ãã¶ããè ¹/₂ãò °ãÊã •ãã|ããè Ôõ ,ããòÀ
ãã^{oo}ãñ ‡ãñŠ ,ã¶^aÀ Ìãã³/₄ãì^aã°ã ‡ãŠ¹/₂ã Ôãñ •ãã|ãã Ôõý °ããÖÀ ‡ãŠãè Ìãã³/₄ãì
Ôã¹/₄ããè ãã^aÌãã,ããò Ôãñ ãã^{oo}ãñ ¹ãÀ ,ã¹ãñããã‡ãðŠ|ã ,ããããã‡ãŠ^aãã ¿ãÊã|ããè
Ôõ ãã•ãÖãÔãñ ãã^{oo}ãã ãã¹ãPã‡ãŠ •ãã|ãã Ôõý

³/₄ãÖ ¹/₄ããè ‡ãŠÀ‡ãñŠ^añÊãò :

Ìããè|ãÊã ¹ãñ³/₄ãã ³/₄ãã ¹ãã¶ããè ‡ãŠãè ¹ÊããããÔ>‡ãŠ ‡ãŠãè ÊããÊããè °ããñ|ãÊã
Êãòý fÔãñ Øã¹/₂ãÃ •ãÊã Ôãñ ,ããããã ¹/₄ãÀòý ‡ãŠ^añ ãã¹/₂ã¶ãã °ãã Øã¹/₂ãÃ
¹ãã¶ããè ‡ãŠãñ ããØãÀã‡ãŠÀ °ããñ|ãÊã ‡ãŠãñ |ãÀ¶ãã ð‡ã<‡ãŠ¶ã ÊãØãã‡ãŠÀ
°ãã^a ‡ãŠÀ °òý ,ã°ã fÔã °ããñ|ãÊã ¹ãÀ Ýâã^ã ¹ãã¶ããè ¿ãÊãòý^añÊãò ‡ã<³/₄ãã
Ôãñ|ãã Ôõ ? ‡ã<³/₄ãã °ããñ|ãÊã ãã¹ãPã‡ãŠ •ãã|ããè Ôõ ? ð‡ã<‡ãŠ¶ã ÊããñÊã
^añ¶ãñ ¹ãÀ ‡ã<³/₄ãã Ôãñ|ãã Ôõ ?

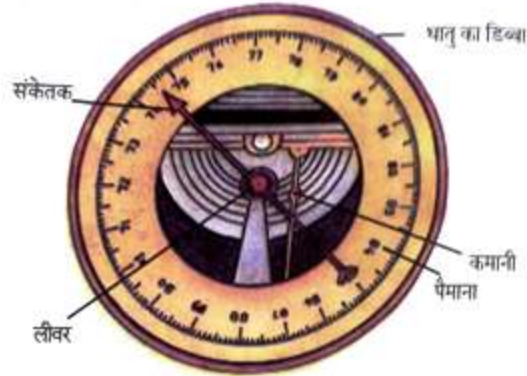
Ìãã³/₄ãì^aã°ã ‡ãŠã ¹/₂ãã¹ã¶ã :-

Pāñ|āāīā¶āāè

'āāÀñ ‡ āŠā īāāÓ'ā Ōāā¶ā ‡ āŠāÀ ‡ āŠ Ōō ,ā|ā: fÔā āā % āŠ³/₄āā
‡ āŠÊāā'ā ‡ āŠāñ āāīāāā¶āŠ ‡ āŠāè ªñÇā ÀñÇā ¹/₂āō ‡ āŠÀò

āā¶ā³Āīā ªªª ¹/₂āā'āāè (Aneroid Barometer) :-

īāā³/₄āīªª āā¶ā³Āīā ªªª¹/₂āā'āāè Ōāñ ¹/₄āāè —āā|ā ‡ āŠÀ|āñ Ōōý fÔā¹/₂āō
† ‡ āŠ ŌāāñÊāā ‡ āŠāÀ £āā|āī ‡ āŠā āā|ªª Ōāñ|āā Ōō ; āāªÔā ‡ āñŠ ...'āÀ
‡ āŠāè Ōā|āŌ (◻ ‡ ā< ‡ āŠ¶ā)'ā|āÊāāè, ÊāŌÀªÀ ‡ īāā īāā³/₄āī¹/₂ā¶|Êāāè³/₄ªª ªªª
‡ āñŠ 'āāāÀīā|āĀ¶ā ‡ āñŠ 'āÆāā|ā Ōāīā¹/₂āŌāÆāŌāè Ōāñ|āāè Ōō (āāPāª
5.7)ý āā|ªª ‡ āñŠ ,āªÀ ‡ āŠāè Ōīāā āā¶ā ‡ āŠāÊā ªāè •āā|āāè Ōōý
īāā³/₄āī¹/₂ā¶|Êāāè³/₄ªª ªªª ªū◻āñ 'āÀ ...'āÀāè Ōā|āŌ ,āªÀ ªªª •āā|āāè Ōō
,āāōÀ ªªª ‡ āŠ¹/₂ā Ōāñ¶āñ 'āÀ Ōā|āŌ ...'āÀ „Ÿ •āā|āāè Ōōý Ōā|āŌ ‡ āŠāè
fÔā Ōāāā|ā ‡ āñŠ ‡ āŠāÀ¶ā ,āªÀ ÊāŌāāè ‡ āŠ¹/₂āā¶āāè ªªª •āā|āāè Ōō ³/₄āā
... 'āÀ „Ÿ •āā|āāè Ōō, fÔāŌāñ ÊāŌāñ ÊāāèīāÀ Ōāñ ‡ ‡ āŠ Ōāā ‡ āñŠ|ā ‡ āŠ
(Pointer)•āīü|ā Ōāñ|āā Ōō •āāñ 'āō¹/₂āā¶āñ 'āÀ ªªª ‡ āŠā 'āāŸ³/₄āāū ‡ āŠ
(Reading)ªñ|āā Ōōý



चित्र सं० 5.7 अ) निर्द्व वायु मापी

•āÊā 'ā½'ā, Ôāāfāā ‡ āŜÊā 'ā½'ā, 'āiŜ'°āāÊā 'ā½'ā , āāāā ‡ āŜāē ‡ āŜā¾āĀ
āāīāāāāā īāā¾āī 'ā°ā 'āĀ , āāāāāāĀ|ā Ōō ý

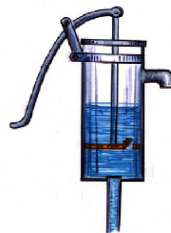
•āÊā 'ā½'ā :-

•āÊā 'ā½'ā ‡ āŜāē ÔāāĀPāāā āāPāāāāīÔāāĀ Ōāñ|āāē Ōōý
'ā½'ā ‡ āñŜ ŌōāāĵÊā ‡ āŜāñ ...'āĀ „Ÿāāāñ 'āĀ 'ā½'ā ‡ āñŜ , āāĀ ‡ ā¾āā
Ōāñ|āā Ōō ?

āāPāāāāīÔāāĀ āā'āÔ>ā āāēPāñ •āā|āā Ōōý āā'āÔ>ā ‡ āŜā īāāÊā
īā, ĄāīÊā •āā|āā Ōō , āāōĀ īāā¾āī 'āāÔĀ āāā ‡ āŜÊā •āā|āāē Ōō |āāā
īāā¾āī 'ā°ā ‡ āñŜ ‡ āŜāĀā 'ā½'ā ‡ āŜāē āāāāē ‡ āŜā īāāÊā īā, 'āā Ōāñ
•āā|āā Ōōý (āāPāā 5.8 ‡ āŜ)ý



'ā½'ā ‡ āñŜ ŌōāāĵÊā ‡ āŜāñ āāēPāñ ‡ āŜāāāñ 'āĀ ‡ ā¾āā Ōāñ|āā Ōō ?
āā'āÔ>ā ...'āĀ „Ÿāāā Ōō ý āā'āÔ>ā ‡ āñŜ āāēPāñ īāā¾āī'ā°ā ‡ āŜ½ā
Ōāñāāñ ‡ āñŜ ‡ āŜāĀā īāāÊā īā, 'āā Ōāñ •āā|āā Ōō , āāōĀ īāāÊā
īā, ĄāīÊā •āā|āā Ōō 'āŜÊāÔāĀ'ā •āÊā 'āñÊāāā ‡ āñŜ , āāĀ Pāūā •āā|āā Ōō
(āāPāā 5.8 Ąā) ý 'āiā: ŌōāāĵÊā ‡ āŜāñ ...'āĀ Êāñ •āāāñ 'āĀ ‡ ā¾āā
Ōāñ|āā Ōō ?



āāPāā Ōāā 5.8 (Ąā)

āā'āÔ>ā āāēPāñ ‡ āŜāē , āāñĀ •āā|āā Ōōý •āÊā ‡ āŜā 'ā°ā 'āūāāñ ‡ āñŜ
‡ āŜāĀā īāāÊā īā, ĄāīÊā •āā|āā Ōō (īāāÊā īā, 'āā ŌĀĀ Ōō) , āāōĀ 'ā½'ā
½āō •āÊā āā'āÔ>ā ‡ āñŜ ...'āĀ ¼āĀ •āā|āā Ōō (āāPāā 5.8 Ōā)ý ŌōāāĵÊā
‡ āŜāñ āāēPāñ Êāñ •āāāñ 'āĀ ‡ ā¾āā Ōāñ|āā Ōō ? āā'āÔ>ā ...'āĀ „Ÿāā
Ōōý •āÊā 'ā°ā ‡ āñŜ ‡ āŜāĀā īāāÊā īā, 'āā Ōāñ •āā|āā Ōō 'āŜÊāÔāĀ'ā
āāPāāāāīÔāāĀ •āÊā āāē Ōāñ 'āāÔĀ āāā ‡ āŜÊāāñ Êāāāā Ōōý fÔā

Ôã½ã¾ã ÌãÊÌã Ìã₂ ĄãìÊã •ãã|ãã Öö ,ããõÀ 'ã½'ã ‡ãñŠ ,ãªÀ •ãÊã ¶ããèPãñ
 Ôãñ ,ãã‡ãŠÀ ¼ãÀ¶ãñ ÊãØã|ãã Ööý fÔã 'ãÆ‡ãŠãÀ 'ã½'ã ‡ãñŠ ÖöããìÊã
 ‡ãñŠ ...'ãÀ ¶ããèPãñ ‡ãŠÀ¶ãñ Ôãñ ÊãØãã|ããÀ •ãÊã ãã¶ã‡ãŠÊã¶ãñ ÊãØã|ãã
 Öö (ããPãã 5.8 Üã)ý

ããPãã Ôãã0 5.8 (Ôã ‡Ìãã Üã)



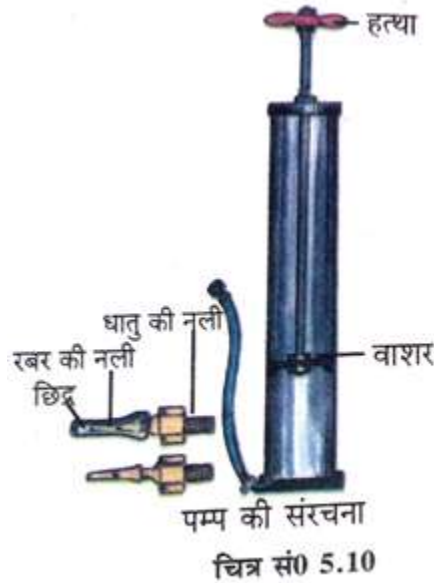
(Øã)



(Üã)

'ãìŠ>ããÊã 'ã½'ã :-

'ãìŠ>ããÊã 'ã½'ã ãã‡ãŠÔã 'ãÆ‡ãŠãÀ ‡ãŠã¾ãÃ ‡ãŠÀ|ãã Öö ?
 'ãìŠ>ããÊã 'ã½'ã 'ãÀã 'ãìŠ>ããÊã ½ãò ÖÌãã ¼ãÀ|ãñ Ôã½ã¾ã °Êãõ;À ½ãò
 ÊãØããè 'ã|ãÊããè ¶ãÊããè 'ãÀ 'ã½'ã ‡ãŠã ãã¶ãPãÊãã ããÔãÀã ‡ãŠÔã ‡ãŠÀ
 ÊãØãã ãñ|ãñ Öö (ããPãã 5.9)ý •ãã ãã'ãÔ>¶ã ‡ãŠãñ °ããÖÀ ‡ãŠãè ,ããñÀ
 ĄããéPã|ãñ Öö |ãñ Pã½ãü|ñ ‡ãŠã ÌãÍãÀ ããÔã ‡ãìŠü; •ãã|ãã Öö ,ããõÀ
 °ããÖÀ ‡ãŠãè Ìã¾ãì ÌãÍãÀ ‡ãŠãñ °ãã ‡ãŠÀ °ãñÊã¶ã ‡ãñŠ ,ãªÀ ¼ãÀ
 •ãã|ããè Öö ý fÔã Ôã½ã¾ã ØããñÊããè Á'ããè ÌãÊÌã ¶ãÊããè ‡ãñŠ ...'ãÀãè
 ½ãüìÖ ‡ãŠãñ °ãª ÀĄã|ãã Öö ý



Ôããfãã†ãŠÊã 'ã½'ã ãã†ãŠÔã 'ãÆ†ãŠãÀ †ãŠã¾ãÃ †ãŠÀ|ãã Öö ?

•ã°ã 'ã½'ã †ãñŠ Ö|©ãñ †ãŠãñ ...'ãÀ †ãŠãè ,ãññÀ ÆããèPãã •ãã|ãã Öö |ã°ã ãã'ãÔ>¶ã †ãñŠ ¶ããèPãñ ÆããÊããè Ö©ãã¶ã °ãü¶ãñ †ãñŠ 'ãŠÊãÔlãÀ'ã lãã¾ãì 'ã°ã †ãŠ½ã Öãñ •ãã|ãã Öö ý ãã'ãÔ>¶ã †ãñŠ ...'ãÀ Öãñ Ôlãã °ããlã jãÊã†ãŠÀ lããlãÀ †ãñŠ ¶ããèPãñ °ãñÊã¶ã ½ãò ¼ãÀ •ãã|ããè Öö ý •ã°ã Ö|©ãñ †ãŠãñ ¶ããèPãñ °ãã¾ãã •ãã|ãã Öö |ã°ã ãã'ãÔ>¶ã †ãñŠ ¶ããèPãñ †ãŠãè lãã¾ãì 'ãÀ 'ã°ã °ãü¶ãã Öö, ãã•ãÔã†ãñŠ †ãŠãÀ¥ã lããlãÀ †ãñŠ ãã†ãŠ¶ããÀñ 'ãòŠÊã †ãŠÀ °ãñÊã¶ã Öãñ ããPã'ã†ãŠ •ãã|ãã Öö ,ããòÀ °ããè ÖìfÃ lãã¾ãì À°ãÀ †ãŠãè ¶ãÊããè Öãñ Öãñ †ãŠÀ >ãîã ½ãò PãÊããè •ãã|ããè Öö ý 'ã½'ã Öãñ °ããè ÖìfÃ lãã¾ãì lããÊlã >ãîã †ãŠãè ÔãÔã¾ã|ãã Öãñ ãã¶ã†ãŠÊã †ãŠÀ À°ãÀ ¶ãÊããè †ãñŠ 'ãÀã Ôããfãã †ãŠÊã >ãîã ½ãò •ãã|ããè Öö ý Ôããfãã†ãŠÊã >ãîã ½ãò ¼ãÀãè lãã¾ãì †ãñŠ fÔã lããÊlã >ãîã 'ãÀ °ããÔÀ Öãñ 'ã°ã jãÊã¶ãñ †ãñŠ †ãŠãÀ¥ã >ãîã ½ãò ¼ãÀãè lãã¾ãì °ããÔÀ ¶ãÔãè ãã¶ã †ãŠÊã 'ãã|ããè Öö ý ãã'ãÔ>¶ã †ãŠãñ °ããÀ-°ããÀ ...'ãÀ-¶ããèPãñ †ãŠÀ¶ãñ Öãñ Ôããfãã†ãŠÊã >ãîã ½ãò Ôlãã ¼ãÀ •ãã|ããè Öö ý

„'Êããlã¶ã °ãÊã (Upthrust):-

□ ãã †ãŠÔããè lãÔ|ãì †ãŠãñ 'ãã¶ããè ¾ãã ³lã ½ãò jì°ã¶ãñ 'ãÀ ³lã †ãŠã ãã †ãŠlã¶ãã ,ãã¾ãlã¶ãã (Volume)ããlãÔ©ãããã'ã|ã Öãñ|ãã Öö ? DeeDees keâjkeâs osKesb -

ãã%ãŠ¾ãã †ãŠÊãã'ã 5.9

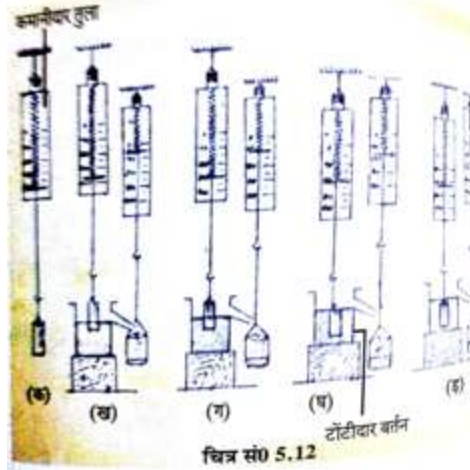
†ãŠãúPã †ãŠã †ãŠã ,ãã¾ãlããã †ãŠãÀ Øãì>†ãŠã Êãòý fÔã †ãŠã ,ãã¾ãlã¶ãã ãã†ãŠlã¶ãã ÖãñØãã ?

,ãã¾ãlã¶ãã = Êã½ããfÃ × PããöüjãfÃ × ...úPããfÃ , Öãñ —ãã|ã †ãŠÀò

‡ ā^{3/4}āā ,āā'ā¶āñ ‡ āiŠ † ú Ôāñ 'āā¶āāē ĄāāēĤā|āñ Ôā^{1/2}ā^{3/4}ā 'āā¶āāē Ôāñ
^{1/4}āĀñ °ā|āĀ¶ā ‡ āŠāñ 'āā¶āāē ‡ āñŠ ,ā¶ā Ąāā ĩāā^{3/4}āi ^{1/2}āō ...¹āĀ ‡ āŠāē

□ ÊāāñŌñ †āñŠ Ōi†āŠ ÊāŌāñ ††āŠ °āñÊā¶ā †āŠāñ āāŌ¹āÆāŌā |āiÊāā Ōāñ Êā>†āŠā †āŠÀ Ìāā³⁄₄āi ½āō „Ōā†āŠā ¼āāÀ ¶āāñ> †āŠÀò (āāPā¹ā 5.12)ý
 □ †āŠāúPā †āŠā ††āŠ >āñ>āè °āÀ āāPā¹ā¶āiŌāāÀ °ā|āÃ¶ā Êāò ý
 □ fŌāñ >āñ>āè †āñŠ Ō|āÀ |ā†āŠ •āÊā Ōāñ ¼āÀò ý
 □ >āñ>āè †āñŠ ½āúìŌ ¹āÀ ††āŠ āāŌ¹āÆāŌā °āōÊāòŌā Ōāñ Êā> †āŠāè ¹āāúÊāāè©āāè¶ā †āŠāè ©āōÊāāè fŌā ¹āÆ †āŠāÀ Ōā¹⁄₂āā³⁄₄āāñāā•ā|ā †āŠÀò āā†āŠ ¹āā¶āāè Ōāñ ¼āĀñ °ā|āÃ¶ā Ōāñ āā¶ā†āŠÊāā ¹āā¶āāè fŌā ©āōÊāāè ½āō ††āŠ¹ā Ōāñ •āā³⁄₄ā ý
 □ ,ā°ā āāŌ¹āÆāŌā °āōÊāòŌā Ōāñ Êā> †āñŠ ÊāāñŌñ †āñŠ °āñÊā¶ā †āŠāñ fāāèĀñ-fāāèĀñ ¹āā¶āāè †āñŠ ,ā¶Ā ì¹āā†ā ý †āĀ³⁄₄ā Ōāñ|āā Ōō ?
 □ ÊāāñŌñ †āŠā °āñÊā¶ā ¹āā¶āāè ½āō ì¹āā|āñ •āā¶āñ ¹āÀ ¹āā¶āāè āā¶ā†āŠÊā †āŠÀ ©āōÊāāè ½āō ¼āÀ|āā •āā|āā Ōō ý
 □ °āñÊā¶ā †āŠāñ fāāèĀñ-fāāèĀñ ¶āāèPāñ †āŠÀ|āñ Ōì † ¹āā¶āāè ½āō ¹āi¶āĀ|ā: ì¹āā °òý
 □ fŌā ,āìāŌ©āā ½āō f¶ā °āñ¶āāò |āiÊāā,āāò †āñŠ ¹āāÝā³⁄₄āāú†āŠ ¶āāñ> †āŠÀ Êāòý
 □ °āñÊā¶ā †āñŠ Ìāā³⁄₄āi ½āō Êā>†āŠāè ,āìāŌ©āā †āñŠ ¹āāÝā³⁄₄āāú†āŠ ½āō Ōāñ °āñÊā¶ā †āñŠ •āÊā ½āō ¹āi¶āĀ|ā: ì¹āāè ,āìāŌ©āā †āŠā ¹āāÝā³⁄₄āāú†āŠ Ūā¹ā °òý
 □ ¹āāÝā³⁄₄āāú†āŠ †āñŠ fŌā ,ā¶ĀāÀ †āŠā †āĀ³⁄₄āā †āŠāÀ¶ā Ōō ?
 □ °āñÊā¶ā †āñŠ ¼āāÀ ½āō ¾āŌ †āŠ¹⁄₂āāè „¹Êāāìā¶ā °āÊā †āñŠ †āŠāÀ¶ā Ōō ý
 □ ¼āāÀ †āŠāè fŌā †āŠ¹⁄₂āāè ,āāōÀ ©āōÊāāè ½āō ††āŠ¹ā ¹āā¶āāè †āñŠ ¼āāÀ ½āō †āĀ³⁄₄āā Ōā¹⁄₂°ā¶ā Ōō ? °āñ¶āāò ÊāŌā¼āŌā Ōā¹⁄₂āā¶ā Ōòý †āĀ³⁄₄āā āā¶āŌŌ†āŠŌāĀ āā¶ā†āŠÊā|āā Ōō ?

°āñÊā¶ā ‡āñŠ ¼āāÀ ½āò ‡āŠ½āāè „Ôā‡āñŠ 'āÀā Ö>ā¾āñ Øā¾āñ 'āā¶āāè
‡āñŠ ¼āāÀ ‡āñŠ °āÀ°āÀ Öāñ|āāè Ööý 'āā¶āāè ‡āñŠ Ô©āā¶ā 'āÀ ,ā¶¾ā
¾lā Êāñ¶āñ 'āÀ ¼āāè Ôā½āā¶ā 'āāÀ¥āā½ā āā½āÊā|āñ Öö ý



•ā°ā ‡āŠāñfĀ lāÔ|āi āā‡āŠÔāāè ¾lā ½āò 'āi¥āĀ|ā: ¾āā ,āāāāālā‡āŠ
Ā'ā Ôāñ ;i°āāñfĀ •āā|āāè Öö |āāñ „Ôā‡āñŠ ¼āāÀ ½āò ‡āŠ½āāè
,āā|āāè Ööý ¼āāÀ ½āò ¾āÖ ‡āŠ½āāè „Ôā lāÔ|āi 'āÀā Ö>ā† Øā† ¾lā
‡āñŠ ¼āāÀ ‡āñŠ °āÀ°āÀ Öāñ|āāè Öö ý ÔālāĀ 'āÆ©ā½ā ¾āi¶āā¶ā
āñlā ‡āñŠ lāō—āāāā¶ā ‡āŠ ,āā ‡āŠāā½ā;āè•ā ¶āñ fÔāñ —āā|ā
āā‡āŠ¾āā ©āā ý f¶Öāè ‡āñŠ ¶āā½ā 'āÀ fÔāñ ,āā ‡āŠāā½ā;āè•ā
‡āŠā āāÔā®ā¶ā ‡āŠÖ|āñ Öö ý

Ôā½āā¶ā ¼āāÀ ‡āŠāè lāÔ|āi ‡āŠāè ,āā ‡āðŠāā|ā °āÊā¶āñ 'āÀ „lĒāālā¶ā
°āÊā ‡āñŠ ½āā¶ā 'āÀ ‡ā<¾āā 'āÆ¼āālā 'āü|āā Öö ?

āā%āŠ¾āā ‡āŠÊāā'ā 5.12

- fāā|āi ‡āŠāè ‡āŠ ‡āŠ>āñĀāè Êāò ý ‡āŠ>āñĀāè ‡āñŠ ¼āāÀ ‡āñŠ
°āÀ°āÀ „Ôāāè fāā|āi ‡āŠā >i‡āŠüjā Êāò ý
- ‡āŠ>āñĀāè |ā©āā fāā|āi ‡āñŠ >i‡āŠüjñ ‡āŠāñ 'āā¶āāè Ôāñ ¼āĀñ °āÀ|ā¶ā
½āò °āĀāè-°āĀāè Ôāñ jāÊāò ý ‡ā<¾āā Öāñ|āā Öö ?
- fāā|āi ‡āŠā >i‡āŠüjā jī°ā •āāāā Öö ‡āŠ>āñĀāè •āÊā 'āÀ |āōÀ|āāè ĀÖ|āāè
Öö ý ‡ā<¾āāò ?
- fāā|āi ‡āŠā >i‡āŠüjā āā•ā|ā¶āā •āÊā āālāÔ©āāāā'ā|ā ‡āŠĀ|āā Öö , „Ôā
'āÀ ÊāØāā „lĒāālā¶ā °āÊā „Ôā •āÊā ‡āñŠ ¼āāÀ ‡āñŠ °āĀ°āÀ Öāñ|āā Ööý
„lĒāālā¶ā °āÊā fāā|āi ‡āñŠ >i‡āŠüjñ ‡āñŠ ¼āāÀ Ôāñ ‡āŠ½ā Öāñ¶āñ ‡āñŠ
‡āŠā¥ā lāÖ jī°ā •āāāā Ööý
- ‡āŠ>āñĀāè ‡āŠāè āālāāālāÓ> ,āā‡āðŠāā|ā ‡āñŠ ‡āŠā¥ā „Ôā‡āñŠ 'āÀā
Ö>ā¾āñ Øā¾āñ •āÊā ‡āŠā ¼āāÀ ¾āā „lĒāālā¶ā °āÊā „Ôā‡āñŠ ¼āāÀ ‡āñŠ
°āĀ°āÀ Öāñ|āā Öö ,ā|ā: ‡āŠ>āñĀāè 'āā¶āāè ½āò |āōÀ|āāè ĀÖ|āāè Ööý

ÎăÔ|àì ¹ăÀ ÊăÔă¶ăñ ÎăăÊăă „¹ÊăăÎă¶ă ²ăÊă „Ôă‡ăăŠăè ,ăă‡ăăđŠăă|ă
‡Îăă ,ăă‡ăăŠăăÀ ¹ăÀ äă¶ăă¼ăĂă‡ăăŠăă|ăă Ööý

³lã ½ãò lãÔ|ãì†â |ãõÀ|ããë ,ããõÀ jîã|ããë ‡ã¼ããò Öö(ããPãã 5.13) ?

-
- चित्र सं० 5.13

fÔãñ ,ãã¼ããÔããè ¼ããÀ ¼ããè ‡ãŠÖ|ãñ Öö ý

- lāŌ|āi ³lā ‡āšāē Ōā|āŌ ¹āÀ |āōÀ|āāē ÀŌñŌāāē |ā©āā fŌā‡āšā ‡āišœ ,āālā
¹āā¶āāē ½āō ¡r°āā ÀŌñŌāā ý lāñŌā ¼āāŌā Ōā|āŌ ‡āñš ...¹āÀ ÀŌñŌāā ý
fŌāŌāñ ‡ā<¾āā āā¶āŌ‡āšŌāĀ āā¶ā‡āšĒā|āā Ōō ý

$$\mathbb{P}u\hat{u}\hat{a}\hat{a} \nmid \hat{a}\hat{S} \quad \hat{a}\hat{O}\hat{a}\hat{i} \quad \hat{a}\hat{A} \quad \nmid \quad \hat{a}\hat{S}\frac{3}{4}\hat{a}\hat{A}\hat{a} \quad ,\hat{E}\hat{a}\hat{a}\hat{a}\hat{a} \quad \hat{a}\hat{E}\hat{a} = \hat{a}\hat{O}\hat{a}\hat{i} \quad \hat{a}\hat{A}\hat{a} \\ \hat{a}\hat{a}\hat{a}\hat{O}\hat{a}\hat{a}\hat{a}\hat{a}\hat{a}\hat{a} \quad \hat{a}\hat{a} \quad \hat{a}\hat{a} \quad \nmid \quad \hat{a}\hat{S}\hat{a} \quad \hat{a}\hat{a}\hat{A}$$

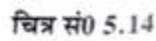
fÔāāāÊā† •ā°ā İāÔ|āi ‡āŠā ¼āāÀ İāÔ|āi 'āĀā Ö>ā† Øā† ³İā ‡āñŠ ¼āāÀ
‡āñŠ °āĀāāÀ Öāñ|āā Öō |āāñ İāÔ|āi ³İā ‡āŠāē Ôā|āÖ 'āĀ |āōÀ|āāē Öō
fÔāñ ¹Êāİā¶ā ‡āŠā āāÔā®ā¶ā ‡āŠÖ|āñ Öōý

levelJe :

LevelJe = efkeâieÇe0/m³ (LevelJe ‡ âŠăñ dñ, oÇJÙeceeve ‡ âŠăñ m Ôăñ
 ¦â©ăñ DeeÙeeve ¦ăŠăñ v Ôăñ Ĩ¼ă¦ă¦ă ¦ăŠĂ¶ăñ ¦ăÀ)

efkeäÇâÙee keâueehē 5.11 keâer meneÙelee mes Deheves Deeme-heeme
efmLele "esme JemlegDeesb keâe IevelJe helee keâjsb ~

³İâ Ô|ãÀ °äü⊘|ãñ Ôãñ ¹àòªæè ¹ãÀ ªãª °äü⊘ •ãã|ãã Ööý



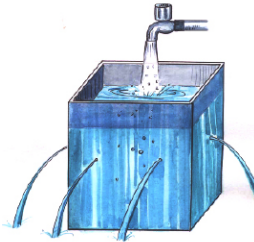
- ☐ ›añ›àè ‡añŠ ½ăúiÖ 'ăÀ Øăi°ăăÀă °ăăúfăăñ ý
☐ °ă|ăĂŲă ‡ăŠăñ 'ăăŲăăè Ôăñ ¼ăĂò ý
☐ Øăi°ăăĂñ ‡ăŠăè ,ăă‡ăăđŠăă|ă 'ăÀ ‡ă<³/₄ăă 'ăĂ¼ăă|ă 'ăü|ăă Öö ?
☐ Øăi°ăăĂă 'ăîŠÊă •ăă|ăă Öö ý
‡ă<³/₄ăă äăŲăăÖ‡ăŠÓăĂ äăŲăăŠÊă|ăă Öö ý

³Ìà °ã|ãÃ¶ã ‡ ãŠãè °æ|ããÀãò 'ãÀ àãõãã|ã•ã ãã'Íãã ½ãò ¼ããè °ã°ã ;ãÊã|ãã Öõ ý

‡ ã<³/ãã ³Ìà Ôã¼ããè ãã'Íãã,ããò ½ãò °ã°ã ;ãÊã|ãã Öõ ý DeeDees keâjkeâs osKesb -

ãã%ãŠ³/ãã ‡ãŠÊãã'ã 5.15

□ ‡‡ãŠ ãã¶ã ‡ãŠã ãã|°ãã Êãò (ããPãã 5.15 Ćã)ý



ããPãã Ôãã0 5.15 (Ćã) ³Ìà Ôã¼ããè ãã'Íãã,ããò ½ãò °ã°ã ;ãÊã|ãã Öõ ý

□ $f\hat{O}\hat{a}^{1/2}\hat{a}\hat{o}\hat{O}\hat{a}^{1/2}\hat{a}\hat{a}\hat{¶}\hat{a} \dots \acute{u}P\hat{a}\hat{a}f\hat{A} \hat{a}\hat{A} P\hat{a}\hat{A}\hat{a}\hat{o}, \hat{a}\hat{a}\hat{n}\hat{A} \hat{a}\hat{a}\hat{o}^3 \hat{a}\hat{¶}\hat{a}\hat{a}^3/4\hat{a}\hat{o} \acute{y}$

□ $f\hat{O}\hat{a}\hat{n} \hat{a}\hat{a}\hat{¶}\hat{a}\hat{a}\hat{e} \hat{O}\hat{a}\hat{n} \hat{a}\hat{A}\hat{n}\hat{a} \acute{y} \hat{a}\hat{a}\hat{a}\hat{a}\hat{a} \hat{O}\hat{a}\hat{n}\hat{a}\hat{a} \hat{O}\hat{o} ?$

•ãÊã Ôã¼ããè ãã'Íãã,ããò ½ãò Ôã¼ãã¶ã Á'ã Ôãñ ãã¶ã ‡ãŠÊã|ãã Öõ ,ããõÀ

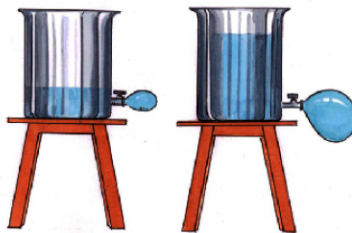
•ãÊã ‡ãŠãè £ããÀã†ã Ôã¼ãã¶ã °Íããè 'ãÀ ããØãÀ|ããè Öõý

³Ìà Ôã¼ããè ãã'Íãã,ããò ½ãò Ôã¼ãã¶ã °ã°ã ;ãÊã|ãã Öõ ý

³Ìà °ã°ã ØãÖÀãfÃ ‡ãñŠ Ôããĉã °ã°Êã|ãã Öõ

ãã%ãŠ³/ãã ‡ãŠÊãã'ã 5.16

□ >ãñ>æ ÊãØãñ ãã¶ã ‡ãñŠ °ãñ ãã|°ãñ Êãò ,ããõÀ >ãñãã>³/ããò ‡ãñŠ ½ãìúÖ 'ãÀ Øãì°ããÀã °ããú£ã Êãòý °ãñ¶ããò ãã|°ããò ½ãò %ãŠ½ãÍã: h_1 |ãĉãã $h_2 \dots$ úPããfÃ |ã‡ãŠ ³Ìà ¼ãÀ Êãò ý •ãÖãú $h_2 > h_1$



ããPãã 5.16 `Ćã' ½ãò ÊãØãã Øãì°ããÀã ããPãã 5.16 ` ‡ãŠ' ½ãò ÊãØãñ Øãì°ããÀñ ‡ãŠãè |ãÊã¶ãã ½ãò ,ããã£ã‡ãŠ 'ãÍŠÊã|ãã Öõ ý
,ã|ã: ³Ìà ‡ãŠã °ã°ã ØãÖÀãfÃ °ãü¶ãñ ‡ãñŠ Ôããĉã-Ôããĉã °ãü¶ãã Öõ ý

ããìãÍãñÓã

³Ìà ‡ãŠã °ã°ã (P), ³Ìà Ô|ã¹/²¼ã ‡ãŠãè ...úPããfÃ (h), ³Ìà ‡ãñŠ Üã¶ã|ã (d)|ãĉãã ØãìÁ|ã •ãã¶ã|ã |ãÀ¥ã (g)'ãÀ ãã¶ã¼ãÃÀ ‡ãŠÀ|ãã Öõ :-

Øããã¥ã|ããè³/ã Á'ã ½ãò, $P = hdg$

,ã¼³⁄⁴ããÔã 'ãÆÍ¶ã

1. ã¶ã½¶ãããÊãããÆã|ã 'ãÆÍ¶ããò ½ãò ÔãÖãè ãã|ã ‡ ãŜÊ'ã œãú> ‡ ãŜÀ ,ã¼³⁄⁴ããÔã 'ã|ããÔ|ã‡ãŜã ½ãò ããÊãããÆã†-

(‡ ãŜ) Ôã½ã|ã³ãè |ãÊã 'ãÀ °ã°ã ½ãã¹ããè ‡ ãñŜ 'ããÀñ ‡ ãŜãè ...úPããfÃ Öãñ|ããè Öö -

(i) 60 cm (ii) 76 cm (iii) 70 cm (iv) 100 cm

(Æã) °ã°ã ‡ãŜã ½ãã¹ã‡ãŜ Öö -

(i) ¶³⁄⁴ã|ã>¶ã-½ããè>À (ii) ãã ‡ ãŜÊããñ ØãÆã½ã (iii) •ã|Êã (iv) ¶³⁄⁴ã|ã>¶ã/½ããè>À²

(Øã) ãã ‡ ãŜÔããè |ãÔ|ã| ‡ ãŜãñ •ãÊã ½ãò 'ã|ãã|ã: |ã°ã¶ãñ 'ãÀ „Ôã 'ãÀ ÊãØã¶ãñ |ããÊãã „|Êãã|ã¶ã °ãÊã = |ãÔ|ã| ‡ãŜã ¼ããÀ, ,ã|ã:

(i) |ãÔ|ã| •ãÊã ½ãò |ã°ã •ã³⁄⁴ãñØããè (ii) |ãÔ|ã| Ôã|ãÖ 'ãÀ |ãöÀñØããè

(iii) |ãÔ|ã| •ãÊã ½ãò ‡ã|Ŝœ |ã°ãè Ö|³⁄⁴ããè |ãöÀñØããè (iv) |ãÔ|ã| Ôã|ãÖ ‡ãñŜ ¶ããèPãñ 'ã|ããè |ã°ãè Ö|³⁄⁴ããè |ãöÀñØããè ý

2. ¶ããèPãñ ããÊãÆãñ |ãã ‡ ã<³⁄⁴ããò ½ãò ããÀ ‡ ã<|ã Ô©ãã¶ããò ‡ ãŜãè 'ã|ãã|ãÃ ,ã¹ã¶ããè ,ã¼³⁄⁴ããÔã 'ã|ããÔ|ã‡ãŜã ½ãò ‡ãŜãéãã•ã† :-

(‡ ãŜ) ,ããöÀ ‡ ãñŜ ,ã¶ã|ãã|ã ‡ ãŜãñ °ã°ã ‡ãŜÖ|ãñ Öö ý

(Æã) Ôã½ã|ã³ |ã> Ôãñ ...úPããfÃ °ãüœ¶ãñ 'ãÀ |ãã³⁄⁴ã|ã½ã¶|Êããè³⁄⁴ã °ã°ã Öãñ •ãã|ãã Öö ý

(Øã) |ãöÀ¶ãñ ‡ãñŜ ããÊã³⁄⁴ãñ |ãÔ|ã| ‡ãŜã ¼ããÀ, |ãÔ|ã| 'ãÀã Ö>ã† Øã³⁄⁴ãñ ³|ã ‡ãñŜ ¼ããÀ ‡ãñŜ Öãñ|ãã Öö ý

(Üã) ³|ã, °ã|ãÃ¶ã ‡ãŜãè 'ãö°ãè 'ãÀ |ãÊã|ãã Öö ý

3. ãã¶ã½¶ãããÊãããÆã|ã ‡ ãŜ©ã¶ããò ½ãò ÔãÖãè ‡ ãŜ©ã¶ã ‡ ãñŜ Ôã½½ã|ãÆã T ,ããöÀ ØãÊã|ã ‡ãŜ©ã¶ã ‡ãñŜ Ôã½½ã|ãÆã F ããÊãããÆã† -

(‡ ãŜ) 'ã°ã©ãÃ Ôã¼ããè ,ã|ãÔ©ãã,ããò ½ãò àãöãã|ã•ã ãã¹ãã ½ãò °ã°ã |ãÊã|ãñ Öö ý

(Æã) Pãã‡ã|Ŝ ‡ãŜãñ Àñã|ã ‡ãŜÀ‡ãñŜ fÔã‡ãŜãè £ããÀ ‡ãñŜ ããñ¹ã¹ãŜÊã ‡ãŜãñ ‡ãŜ½ã ‡ãŜÀ|ãñ Öö ý ,ã|ã: ³⁄⁴ãÖ ,ããã£ã‡ãŜ °ã°ã |ãÊã|ããè Öö ý

(Øã) ãã ‡ ãŜÔããè |ãÊã 'ãÀ °ã°ã „Ôã 'ãÀ ÊãØãñ Êã½°ã|ã|ã °ãÊã ‡ ãñŜ ,ã¶ã|ã% ãŜ½ãã¶ã|ã¹ãã|ããè |ã©ãã ããñ¹ã¹ãŜÊã ‡ãñŜ |³⁄⁴ã|ã|% ãŜ½ãã¶ã|ã¹ãã|ããè Öãñ|ãã Öö ý

(Üã) ãã¶ã³Ã|ã °ã°ã½ãã¹ããè ‡ãŜãñ †‡ãŜ Ô©ãã¶ã Ôãñ °|ÔãÀñ Ô©ãã¶ã |ã‡ãŜ Êãñ •ãã¶ãã ,ãÔã|ãã|ã£ãã•ã¶ã‡ãŜ Öãñ|ãã Öö ý

(Ý) °ã|ãÃ¶ã ‡ãŜãè 'ãö°ãè 'ãÀ °ã°ã „Ôã½ãò ¼ãÀñ ³|ã ‡ãŜãè ...úPããfÃ 'ãÀ ãã¶ã¼ããÀ ‡ãŜÀ|ãã Öö ý

(Pa) Ôã½ãî³ |ãÊã ¹ãÀ Ôãã½ãã¶¾ã äãÔ©ããã|ã ½ãò Ìãã¾ãî½ã¥jÊããè¾ã ºã°ã
10 ½ããè>À ¹ããÄñ ‡ãñŠ Ô|ã½¼ã ‡ãñŠ ºãÄã°ãÀ Öãñ|ãã Öö ý

6. ÊããñÖñ ‡ãŠã »ì‡ãŠüjã ¹ãã¶ããè ½ãò jîã •ãã|ãã Öö , •ã°ããã‡ãŠ fÔãÖãñ
ºã¶ãñ •ãÖã•ã |ãðÀ|ãñ ÀÖ|ãñ Ööý ‡ã<¾ããò ?

7. †Ê¾ãî½ããèãã¶¾ã½ã |ã©ãã ÊããñÖñ ‡ãñŠ ºãñ »ì‡ãŠüjãò ‡ãŠã ¼ããÀ
%ããŠ½ãÍã: 22 ØãÆã½ã |ã©ãã 80ØãÆã½ã Öö ý ºãñ¶ããò »ì‡ãŠüjãò ‡ãŠã
,ãã¾ã|ã¶ã Ôã½ãã¶ã Öö ý †Ê¾ãî½ããèãã¶¾ã½ã ‡ãñŠ »ì‡ãŠüjñ ‡ãŠãñ
¹ãã¶ããè ½ãò jîãã¶ãñ Öãñ „Ôã ‡ãñŠ ¼ããÀ ½ãò 10 ØãÆã½ã ‡ãŠãè
‡ãŠ½ããè ¹ãÆ|ããè|ã Öãñ|ããè Öö ý ÊããñÖñ ‡ãñŠ »ì‡ãŠüjñ ‡ãŠãñ £ããØãñ
Öãñ Êã>‡ãŠã ‡ãŠÀ ¹ãã¶ããè ½ãò jîãã¶ãñ ¹ãÀ „Ôã ¹ãÀ „¹ÊããÍã¶ã ºãÊã
ãã‡ãŠ|ã¶ã ÖãñØãã ?

8. äã¶ã³ÄÌã ºã°ã½ãã¹ããè ‡ãŠã ¶ãã½ãããã‡ãŠ|ã äãPãã ºã¶ããf†ý

9. Ôããfãã‡ãŠÊã ¹ã½¹ã ‡ãŠãè ‡ãŠã¾ãÄã äãÌãããfã ‡ãŠã ÔãããPãã Ìã¥ãÄ¶ã
‡ãŠãèãã•ã†ý

10. •ãÊã ¹ã½¹ã ‡ãŠãè ‡ãŠã¾ãÄã äãÌãããfã ‡ãŠã ÔãããPãã Ìã¥ãÄ¶ã
‡ãŠãèãã•ã†ý

8. äã¶ã³ÄÌã ºã°ã½ãã¹ããè ‡ãŠã ¶ãã½ãããã‡ãŠ|ã äãPãã ºã¶ããf†ý

9. Ôããfãã‡ãŠÊã ¹ã½¹ã ‡ãŠãè ‡ãŠã¾ãÄã äãÌãããfã ‡ãŠã ÔãããPãã Ìã¥ãÄ¶ã
‡ãŠãèãã•ã†ý

10. •ãÊã ¹ã½¹ã ‡ãŠãè ‡ãŠã¾ãÄã äãÌãããfã ‡ãŠã ÔãããPãã Ìã¥ãÄ¶ã
‡ãŠãèãã•ã†ý

4. Ôããfãã‡ãŠÊã ¹ã½¹ã Ìã ¹ãîŠºããÊã ¹ã½¹ã ½ãò ¹ãÆ½ãîCEã ,ã¶|ãÀ ‡ã<¾ãã
Öö ?

5. •ãÊã ¹ã½¹ã ½ãò äã‡ãŠ|ã¶ã ÌããÊÌã Öãñ|ãñ Öö ý ‡ã<¾ããò ?

6. ÊããñÖñ ‡ãŠã »ì‡ãŠüjã ¹ãã¶ããè ½ãò jîã •ãã|ãã Öö , •ã°ããã‡ãŠ fÔãÖãñ
ºã¶ãñ •ãÖã•ã |ãðÀ|ãñ ÀÖ|ãñ Ööý ‡ã<¾ããò ?

7. †Ê¾ãî½ããèãã¶¾ã½ã |ã©ãã ÊããñÖñ ‡ãñŠ ºãñ »ì‡ãŠüjãò ‡ãŠã ¼ããÀ
%ããŠ½ãÍã: 22 ØãÆã½ã |ã©ãã 80ØãÆã½ã Öö ý ºãñ¶ããò »ì‡ãŠüjãò ‡ãŠã
,ãã¾ã|ã¶ã Ôã½ãã¶ã Öö ý †Ê¾ãî½ããèãã¶¾ã½ã ‡ãñŠ »ì‡ãŠüjñ ‡ãŠãñ
¹ãã¶ããè ½ãò jîãã¶ãñ Öãñ „Ôã ‡ãñŠ ¼ããÀ ½ãò 10 ØãÆã½ã ‡ãŠãè
‡ãŠ½ããè ¹ãÆ|ããè|ã Öãñ|ããè Öö ý ÊããñÖñ ‡ãñŠ »ì‡ãŠüjñ ‡ãŠãñ £ããØãñ
Öãñ Êã>‡ãŠã ‡ãŠÀ ¹ãã¶ããè ½ãò jîãã¶ãñ ¹ãÀ „mekeãs Yeej cesb
efkeâlepeer keâceer heÇleerle nesieer ?

8. äã¶ã³ÄÌã ºã°ã½ãã¹ããè ‡ãŠã ¶ãã½ãããã‡ãŠ|ã äãPãã ºã¶ããf†ý

9. Ôããfãã‡ãŠÊã ¹ã½¹ã ‡ãŠãè ‡ãŠã¾ãÄã äãÌãããfã ‡ãŠã ÔãããPãã Ìã¥ãÄ¶ã
‡ãŠãèãã•ã†ý

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¹ãÆ‡ãŠãÍã ,ããõÀ ¹ãÆ‡ãŠãäãÍã‡ãŠ ³/₄ãâ¨ã



ÊãòÔã 'ãÀã ,ã¹ãìã|ãÃ¶ã ý

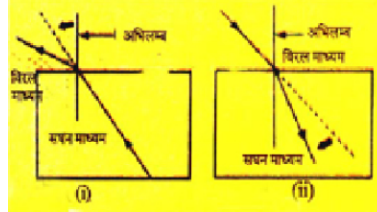
ÊãoÔãão ‡ãñŠ Ôã³¼ããñ•ã¶ã Ôãñ 'ãÆ‡ãŠãããÍã‡ãŠ ¾ã¶ããò ‡ãŠãã¶ã½ããÃ¥ã -(Ôãîà½ãªÍããê)ý

,ã¹ãĭã|ãÃ¶ã (Refraction)‡ã¼ãã Öõ ?

āā¹āēāē † āšāā ½āō , āā¹ā¹ āū Pāi † āñš Ōō āā † āš¹ āē † āšāīā Ōāēā
 Àñēāā ½āō Ōā½āā † āšÀ|āā Ōōý fŌā , āāfāāÀ¹āÀ , āā¹āāñ¹ āē † āšāīā
 Ōāāñ|ā † āñš Ōāā½āāñ āāŌā|ā āā † āšŌāāē , ā¹āāÀ¹āāē īāŌ|āi † āšāē
 ēā³⁄4āā , „¹āēā³⁄4āā¹ ōāāāñ † āšā † āšāÀēā Ōā½āāē āāēā³⁄4āā Ōōý
 Ōāi³⁄4āÀŌāēŌēā |āāā Pā³ŌāēŌēā † āš¹ā , āāōÀ āā † āšŌā āāŌāāā|ā
 ½āō Ōāñ|āā Ōō , fŌāñ ¼āāē •āāā āāēā³⁄4āā Ōōý , āā¹ā¹ ¾āŌ ¼āāē •āāā
 Pāi † āñš Ōō āā † āš āā † āšŌāāē¹āēā † āñš Pā½ā † āšāēēāñ fāāāāēā Ōāñ
 › † āšÀā † āšÀ¹āē † āšāīā † āšāē āā † āšāēāō ēāāō , āā|āē Ōō āā•āŌāñ
 āāāīā|āāā † āšŌāñ Ōōý āāāīā|āāā † āñš āāā³⁄4ā½āāō † āšā Ōāi³⁄4āāāā
 ¼āāē , āā¹ā¹ † āšÀ Pāi † āñš Ōōý Ōā½āāēā¹āēā , „āāēā¹āēā |āāā
 , āīā|āēā¹āēā¹āēā āā † āšŌāāē īāŌ|āi † āñš ōāāñ āēāāāā¹⁄2āāō † āšā
 āāīāŌ|āō|ā , āf³⁄4ā³⁄4āā ¼āāē āē † āšāīā † āñš Ōāēāē Àñēāāē³⁄4ā āā
 † āñš , āāāīāŌā½āā † āñš āāŌāāāā † āšñ , āāfāāÀ¹āÀ † āšÀ Pāi † āñš Ōōý
 āā¹āēāē † āšāāā ½āō , āā¹ā¹ āāÀ¹āāē , ā¹āāÀ¹āāē † īāā , āē¹ā¹ āāÀ¹āāē
 āāāāāō † āšā , āf³⁄4ā³⁄4āā ¼āāē † āšÀ Pāi † āñš Ōōý

$f\hat{O}\tilde{a}$, $\tilde{a}f^{3/4}\tilde{a}\tilde{a}^{3/4}\tilde{a}$ $\frac{1}{2}\tilde{a}\tilde{o}$ $\tilde{O}\frac{1}{2}\tilde{a}$ $\frac{3}{4}\tilde{a}\tilde{O}$ • $\tilde{a}\tilde{a}\tilde{a}$ $\hat{O}\tilde{a}\ddot{+}\tilde{a}\tilde{o}\tilde{S}\tilde{O}\tilde{a}\tilde{n}$ $\tilde{a}\tilde{a}\ddot{+}\tilde{a}\tilde{S}$ $\tilde{a}\tilde{a}\tilde{E}\ddot{+}\tilde{a}\tilde{S}\tilde{a}\tilde{l}\tilde{a}$ $\ddot{+}\tilde{a}\tilde{S}\tilde{a}\tilde{e}$
 $\tilde{a}\tilde{a}$ $\ddot{+}\tilde{a}\tilde{S}\tilde{A}\tilde{Y}\tilde{a}$ • $\tilde{a}^{\circ}\tilde{a}$ $\ddot{+}\tilde{+}\tilde{a}\tilde{S}$ $\tilde{a}\tilde{a}\tilde{A}^{\text{a}}\tilde{l}\tilde{a}\tilde{a}\tilde{e}$ $\frac{1}{2}\tilde{a}\tilde{a}\tilde{f}^{3/4}\tilde{a}\frac{1}{2}\tilde{a}$ $\hat{O}\tilde{a}\tilde{n}$ $^{\text{a}}\hat{O}\tilde{a}\tilde{A}\tilde{n}$ $\tilde{a}\tilde{a}\tilde{A}^{\text{a}}\tilde{l}\tilde{a}\tilde{a}\tilde{e}$
 $\frac{1}{2}\tilde{a}\tilde{a}\tilde{f}^{3/4}\tilde{a}\frac{1}{2}\tilde{a}$ $\frac{1}{2}\tilde{a}\tilde{o}$ $\tilde{a}\tilde{a}\tilde{E}\tilde{l}\tilde{a}\tilde{n}\tilde{l}\tilde{a}$ $\ddot{+}\tilde{a}\tilde{S}\tilde{A}\tilde{a}\tilde{a}\tilde{e}$ $\tilde{O}\tilde{o}$ $|\tilde{a}\tilde{a}\tilde{n}$ $\ddot{+}\tilde{a}\langle^{3/4}\tilde{a}\tilde{a}$ $\tilde{O}\tilde{a}\tilde{n}|\tilde{a}\tilde{a}$ $\tilde{O}\tilde{o}$? $f\hat{O}\tilde{a}$
 $\tilde{U}\tilde{a}\rangle\tilde{a}\tilde{a}$ $\ddot{+}\tilde{a}\tilde{S}\tilde{a}\tilde{n}$ $\tilde{a}\tilde{a}\tilde{l}\tilde{a}$ — $\tilde{a}\tilde{a}\tilde{a}$ $\tilde{a}\tilde{a}\tilde{a}$ $\ddot{+}\tilde{a}\tilde{S}\tilde{a}\tilde{e}$ $\frac{1}{4}\tilde{a}\tilde{a}\tilde{O}\tilde{a}\tilde{a}$ $\frac{1}{2}\tilde{a}\tilde{o}$ $\ddot{+}\tilde{a}\langle^{3/4}\tilde{a}\tilde{a}$ $\ddot{+}\tilde{a}\tilde{S}\tilde{O}\tilde{a}\tilde{n}$ $\tilde{O}\tilde{o}$? $f\hat{O}\tilde{a}$

Üa>¶āā ‡āñŠ „¹ā³/₄āāñŌā Ōāñ āā‡āŠŌā ¹āÆ‡āŠāÀ ‡āñŠ ¹āÆ‡āŠāāāā‡āŠ
 „¹ā‡āŠÀāāō ‡āŠā āā¶ā¹/₂āāÅā ŌāÆ¹/₄āā Ōō ? „āāf‡³/₄āŌ •āā¶ā¶āñ ‡āŠā
¹āÆ³/₄āāŌā ‡āŠÀō āā‡āŠ ¹āÆ‡āŠāā‡āŠ ‡āŠāē āā‡āŠÀā •ā°ā ‡āŠ ¹āāÀ¹āāē
¹/₂āāf³/₄ā¹/₂ Ōāñ ¹ŌāĀñ ¹āāÀ¹āāē ¹/₂āāf³/₄ā¹/₂ ¹/₂āō ¹āÆāāāā‡āŠ ‡āŠÀāāē Ōō
 āāñ ‡ā³/₄āā Ōāñāā Ōō (āāPāā 6.1)?



āāPāā Ōāā 6.1

āā%āŠ³/₄āā ‡āŠÊāā¹ā 6.1

„āā¹ā ‡āŠ >āùPāĀ Êāō āā „Ōā ‡āñŠ ‡āŠāùPā ‡āŠāñ ‡āŠ ‡āŠāÊāñ
 ‡āŠāŌā•ā mes, āā•āŌā ‡āñŠ °āāēPā ¹/₂āō ‡āŠ „ā³/₄ā¶ā °āāĀāē ‡āŠ āāœ³
 °ā¶ā Ōāñ āā‡āŠ °ōý >āùPāĀ •āÊāā¶āñ ¹āÀ ¹āÆ‡āŠāā‡āŠ ‡āŠā ‡āŠ ¹āāÊāā
¹āā•ā ¹āÆā¹ā ŌāñŌāāý „āā¹ā >eŪeĀ ds Ōāā¶ā ¹āÀ „āā•ā ‡āŠÊā
 āā¹/₂āÊā¶āñ āāÊāāē ÊāñŌāĀ ¹āāā¶āŌāÊā Êāāf> ‡āŠā „¹ā³/₄āāñŌā ‡āŠÀ
 Ōā‡āŠāñ Ōōý „āāfāñĀñ ‡āŠ¹/₂āĀñ ¹/₂āō „āŌāĀ°āāāē Ōāñ fāī,āā „¹ā¶ā
 ‡āŠāēāā•ā ‡āāā fŌā fāī³/₄āō ¹/₂āō ¹āā¶āē Ōāñ ¹/₄āĀ āāŌāÊāāŌā
 ĀāāÆā³/₄āñ „āāōÀ fŌā āāŌāÊāāŌā ¹/₂āō ‡āīŌē ¹āā „āāÊā³/₄āñý fāī,āā
 āā³/₄āī ¹/₂āō āāā ¹āāñŠ ‡āŠā ¹āā¶āē ¹/₂āō ¹āÆ‡āŠāā āā‡āŠÀā ‡āñŠ
¹āā ‡āŠāñ ¹āā¶āñ ¹/₂āō ŌāŌā³/₄āā ‡āŠÀōŌāñý >āùPāĀ Ōāñ āāÊā
 Ōā³/₄āā ¹āÆ‡āŠāā ¹āā•ā •ā°ā „āŌāĀ°āāāē ‡āñŠ fāī³/₄āō Ōāñ Ōāñ ‡āŠÀ
¹āā¶āē ¹/₂āō ¹āÆāāā‡āŠ ‡āŠÀāā Ōō āāñ ¹āÆ‡āŠāā‡āŠ ‡āŠāē āā‡āŠÀā ‡āŠā
¹/₂āāŌāĀ °āÊā •āāā Ōōý fŌā ¹āÆ³/₄āāñŌā Ōāñ ‡ā³/₄āā āā¶āŌ ‡āŠŌāĀ
 āā¶ā‡āŠÊāāā Ōō ?

¹āÆ‡āŠāā ‡āŠāē āā‡āŠÀā •ā°ā ‡āŠ ¹āāÀ¹āāē ¹/₂āāf³/₄ā¹/₂ā
 Ōāñ ¹ŌāĀñ ¹āāÀ¹āāē ¹/₂āāf³/₄ā¹/₂ā ¹/₂āō ¹āÆāāā‡āŠ ‡āŠÀāāē Ōō
 āāñ āāŌō „āā¶āñ ¹/₂āāŌāĀ Ōāñ āāāPāāāÊāā Ōāñ •āāāē Ōōý
 fŌā Üa>¶āā ‡āŠāñ ¹āÆ‡āŠāā‡āŠ ‡āŠā „āāāāā¶ā ‡āŠŌāñ Ōōý
 ‡āŠ ¹/₂āāf³/₄ā¹/₂ā Ōāñ ¹ŌāĀñ ¹/₂āāf³/₄ā¹/₂ā ¹/₂āō ¹āÆāāā‡āŠ ‡āŠÀ¶āñ ¹āÀ
¹āÆ‡āŠāā ‡āŠāē āā‡āŠÀā ‡āŠā „āā¶āñ ¹/₂āāŌāĀ Ōāñ āāāPāāāÊāā
 Ōāñāā ¹āā¶āāō ¹/₂āāf³/₄ā¹/₂āō ¹/₂āō ¹āÆ‡āŠāā‡āŠ ‡āŠāē PāāÊā ‡āñŠ „āāāāā
¹āÀ āā¶ā¹/₄āĀ ‡āŠÀāā Ōōý ¹āā¶āāō ¹/₂āāf³/₄ā¹/₂āō ¹/₂āō ¹āÆ‡āŠāā‡āŠ ‡āŠāē
 PāāÊā ‡āŠā „āāāāā ¹ŌāĀñ ¹/₂āāf³/₄ā¹/₂ā ‡āŠā ¹āŌÊāñ ¹/₂āāf³/₄ā¹/₂ā ‡āñŠ
 Ōāāāā „āāāāā¶āāā‡āŠ (Refractive index)‡āŠŌÊāāāāŌōý

- $\ddot{a}\ddot{S}\ddot{a}\ddot{u}\ddot{P}\ddot{a} \ \ddot{a}\ddot{S}\ddot{a} \ \ddot{a}\ddot{S} \ \ddot{O}\ddot{a}\ddot{i} \ \ddot{a}\ddot{S}\ddot{a}, \ \ddot{E}\ddot{a}\ddot{f}\ddot{a}\ddot{O}\ddot{a} \ \ddot{a}\ddot{a}\ddot{n}\ddot{j}\ddot{A}, \ \ddot{O}\ddot{a}\ddot{i}\ddot{a}\ddot{n}\ddot{S}^a \ \ddot{a}\ddot{S}\ddot{a}\ddot{O}\ddot{a}\cdot\ddot{a} \ \ddot{a}\ddot{c}\ddot{a}\ddot{a} \ \ddot{a}\ddot{i}\ddot{S}\ddot{c}e \ \ddot{E}\ddot{a}\ddot{f}\ddot{a}\ddot{O}\ddot{a}\ddot{a}\ddot{n}\ddot{j}\ddot{A} \ \ddot{a}\ddot{a}\ddot{i}\ddot{a}\ddot{P}\ddot{a} \ \ddot{a}\ddot{c}\ddot{a}\ddot{a}, \ \ddot{a}\ddot{a}\ddot{E}\ddot{a}\ddot{a}\ddot{a}\ddot{i}\ddot{a}\ddot{P}\ddot{a} \ \ddot{E}\ddot{a}\ddot{o} \ \acute{y}$
- $\ddot{a}\ddot{a}\ddot{i}\ddot{a}\ddot{P}\ddot{a}\ddot{o} \ \ddot{a}\ddot{S}\ddot{a}\ddot{e} \ \ddot{O}\ddot{a}\ddot{O}\ddot{a}^3\ddot{a}\ddot{i}\ddot{a}\ddot{a} \ \ddot{O}\ddot{a}\ddot{n} \ \ddot{a}\ddot{S}\ddot{a}\ddot{O}\ddot{a}\cdot\ddot{a} \ \ddot{a}\ddot{S}\ddot{a}\ddot{n} \ \ddot{E}\ddot{a}\ddot{f}\ddot{a}\ddot{O}\ddot{a} \ \ddot{a}\ddot{a}\ddot{n}\ddot{j}\ddot{A} \ \ddot{a}\ddot{A} \ \ddot{E}\ddot{a}\ddot{O}\ddot{a}\ddot{a}\ddot{i}\ddot{u}\ddot{y}$
- $\ddot{a}\ddot{S}\ddot{a}\ddot{O}\ddot{a}\cdot\ddot{a} \ \ddot{a}\ddot{a}\ddot{n}\ddot{S} \ \frac{1}{2}\ddot{a}\ddot{f}\frac{3}{4}\ddot{a} \ \frac{1}{2}\ddot{a}\ddot{o} \ \ddot{a}\ddot{S}\ddot{a}\ddot{u}\ddot{P}\ddot{a} \ \ddot{a}\ddot{S}\ddot{a} \ \ddot{O}\ddot{a}\ddot{i} \ \ddot{a}\ddot{S}\ddot{a} \ \ddot{A}\ddot{C}\ddot{e}\ddot{a} \ \ddot{a}\ddot{S}\ddot{A} \ \ddot{f}\ddot{O}\ddot{a}\ddot{a}\ddot{S}\ddot{a}\ddot{e} \ \ddot{O}\ddot{a}\ddot{a}\ddot{e}\frac{1}{2}\ddot{a}\ddot{a} \ \ddot{O}\ddot{a}\ddot{a}\ddot{a}\ddot{n}\ddot{S} \ \ddot{P}\ddot{a}\ddot{a}\ddot{A}\ddot{a}\ddot{o}, \ \ddot{a}\ddot{a}\ddot{n}\ddot{A} \ \text{ABCD} \ \ddot{A}\ddot{n}\ddot{C}\ddot{e}\ddot{a}\ddot{a} \ \ddot{C}\ddot{e}\ddot{a}\ddot{a}\ddot{e}\ddot{P}\ddot{a} \ \ddot{a}\ddot{S}\ddot{A} \ \ddot{a}\ddot{P}\ddot{a}\ddot{a}\frac{3}{4}\ddot{a}\ddot{n}\ddot{a} \ \acute{y}$
- $\ddot{O}\ddot{a}\ddot{i} \ \ddot{a}\ddot{a}\ddot{n}\ddot{S} \ \ddot{a}\ddot{a}\ddot{n}\ddot{S} \ \text{AB} \ \ddot{a}\ddot{S}\ddot{E}\ddot{a}\ddot{a}\ddot{S} \ \ddot{a}\ddot{S}\ddot{a}\ddot{e}, \ \ddot{a}\ddot{a}\ddot{n}\ddot{A} \ \ddot{a}\ddot{a}\ddot{n} \ \ddot{a}\ddot{a}\ddot{i}\ddot{a}\ddot{P}\ddot{a} \ \text{P,Q} \ \ddot{a}\ddot{S} \ \ddot{O}\ddot{a}\ddot{a}\ddot{e}\ddot{f}\ddot{a}\ddot{a}\ddot{e} \ \ddot{A}\ddot{n}\ddot{C}\ddot{e}\ddot{a}\ddot{a} \ \ddot{a}\ddot{A} \ \ddot{a}\ddot{a}\ddot{P}\ddot{a}\ddot{a} \ \ddot{O}\ddot{a}\ddot{a}0 \ 6.2 \ (a) \ \ddot{a}\ddot{a}\ddot{n}\ddot{S}, \ \ddot{a}\ddot{P}\ddot{a}\ddot{i}\ddot{O}\ddot{a}\ddot{a}\ddot{A} \ \ddot{E}\ddot{a}\ddot{O}\ddot{a}\ddot{a}\ddot{i}\ddot{u}\ddot{y}$
- $\ddot{a}\ddot{o}\ddot{a} \ \ddot{O}\ddot{a}\ddot{i} \ \ddot{a}\ddot{a}\ddot{n}\ddot{S} \ \ddot{a}\ddot{a}\ddot{n}\ddot{S} \ \ddot{a}\ddot{i}\ddot{O}\ddot{a}\ddot{A}\ddot{n} \ \ddot{a}\ddot{S}\ddot{E}\ddot{a}\ddot{a}\ddot{S} \ \text{CD} \ \ddot{a}\ddot{S}\ddot{a}\ddot{e}, \ \ddot{a}\ddot{a}\ddot{n}\ddot{A} \ \ddot{O}\ddot{a}\ddot{n} \ \ddot{a}\ddot{a}\ddot{i}\ddot{a}\ddot{P}\ddot{a} \ \text{P, Q} \ \ddot{a}\ddot{a}\ddot{n}\ddot{S} \ \ddot{a}\ddot{A}\ddot{E}\ddot{a}\ddot{a}\ddot{i}\ddot{a}\ddot{a}\ddot{a}\ddot{o}\ddot{a}\frac{1}{2}\ddot{a}\ddot{a}\ddot{o} \ \ddot{a}\ddot{S}\ddot{a}\ddot{n} \ \ddot{a}\ddot{n}\ddot{C}\ddot{e}\ddot{a}\ddot{o} \ \acute{y} \ \ddot{a}\ddot{c}\ddot{a}\ddot{a} \ \ddot{f}\ddot{P}\ddot{a}\ddot{a}\ddot{a}\ddot{n}\ddot{S} \ \ddot{O}\ddot{a}\ddot{a}\ddot{e}\ddot{f}\ddot{a} \ \frac{1}{2}\ddot{a}\ddot{o} \ \ddot{a}\ddot{a}\ddot{n} \ \ddot{a}\ddot{a}\ddot{i}\ddot{a}\ddot{P}\ddot{a} \ \text{R,S} \ \ddot{E}\ddot{a}\ddot{O}\ddot{a}\ddot{a}\ddot{i}\ddot{a} \ \acute{y}$
- $\text{P,Q,R,S} \ \ddot{a}\ddot{a}\ddot{i}\ddot{a}\ddot{P}\ddot{a}\ddot{o} \ \ddot{a}\ddot{S}\ddot{a}\ddot{n} \ \ddot{O}\ddot{a} \ \ddot{a}\ddot{S}\ddot{A} \ \ddot{f}\ddot{P}\ddot{a}\ddot{a}\ddot{a}\ddot{n}\ddot{S} \ \ddot{O}\ddot{c}\ddot{a}\ddot{a}\ddot{P}\ddot{a} \ \ddot{a}\ddot{A} \ \ddot{a}\ddot{o}\ddot{a}\ddot{a}\ddot{O}\ddot{a}\ddot{E}\ddot{a} \ \ddot{O}\ddot{a}\ddot{n} \ \ddot{a}\ddot{a}\ddot{o}\ddot{P}\ddot{a}\ddot{i} \ \ddot{a}\ddot{P}\ddot{a}\ddot{a}\ddot{i}\ddot{u}\ddot{y} \ \ddot{a}\ddot{c}\ddot{a}\ddot{a} \ \ddot{a}\ddot{S}\ddot{a}\ddot{a}\ddot{P}\ddot{a} \ \ddot{a}\ddot{a}\ddot{n}\ddot{S} \ \ddot{O}\ddot{a}\ddot{i} \ \ddot{a}\ddot{a}\ddot{n}\ddot{S} \ \ddot{a}\ddot{S}\ddot{a}\ddot{n} \ \frac{1}{4}\ddot{a}\ddot{a}\ddot{e} \ \ddot{O}\ddot{a}\ddot{i}\ddot{u}\ddot{y}$

Ôãã'ãñã ÷ ãŠãúPã ÷ ãŠã ,ã'ãlã|ãÃ¶ãã ÷ ãŠ Ööý fÔã ãã%ãŠ³/₄ãã ÷ ãŠÊãã'ã
Ôãñ ãã¶ã¹/₂¶ãããÊãããCã|ã ãã¶ãÔ÷ãŠÔãÃ ãã¶ã÷ãŠÊã|ãã Öö :-

□ 'ãÆ ÷ ãŠãlã ÷ ãŠãè ãã ÷ ãŠÀã ,ã°ã ããlãÀÊã ¹/₂ããf³/₄ã¹/₂ã Ôãñ ÔãÜã¶ã
¹/₂ããf³/₄ã¹/₂ã ¹/₂ãò 'ãÆlãñlã ÷ ãŠÀ|ããè Öö, |ããñ lãÖ ,ããã¹/₄ãÊã¹/₂ã ÷ ãŠãè
,ããñÀ çãl ÷ ãŠ|ããè Öö |ã©ãã ÔãÜã¶ã Ôãñ ããlãÀÊã ¹/₂ããf³/₄ã¹/₂ã ¹/₂ãò
'ãÆlãñlã ÷ ãŠÀ¶ãñ 'ãÀ 'ãÆ ÷ ãŠãlã ÷ ãŠãè ãã ÷ ãŠÀã ,ããã¹/₄ãÊã¹/₂ã Ôãñ 'ãÀ
Ö÷ããè Ööý

□ ³/₄ããã 'ãÆ ÷ ãŠãlã ÷ ãŠãè ãã ÷ ãŠÀã ÷ ãŠãúPã ÷ ãñŠ Øãl ÷ ãñŠ 'ãÀ
,ããã¹/₄ãÊã¹/₂ã ,ãã'ããã|ã|ã Ôãñ, |ããñ 'ãÔãÃñ ¹/₂ããf³/₄ã¹/₂ã ¹/₂ãò 'ãÆlãñlã
÷ ãŠÀ¶ãñ 'ãÀ ãã ÷ ãŠÀã ,ã'ã¶ãñ ¹/₂ããØãÃ Ôãñ ããlãPãããÊã|ã ¶ãÖãè Ôãñ|ããè
|ã©ãã ãã¶ãØãÃ|ã ãã ÷ ãŠÀã ,ãã'ããã|ã|ã 'ãÆ ÷ ãŠãlã ÷ ãŠãè ãã ÷ ãŠÀã ÷ ãñŠ
Ôã¹/₂ãã¶ãÀ Öãñ|ããè Ööý

°ãã¶ã÷ãŠ •ããèlã¶ã ¹/₂ãò ,ã'ãlã|ãÃ¶ã ÷ ãñŠ „ãÖÀã :-

1. |ããÀãò ÷ ãŠã ãã>¹/₂ããã>¹/₂ãã¶ãã :-

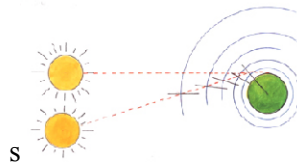
Àã|ã ¹/₂ãò |ããÀãò ÷ ãŠãè Pã¹/₂ã ÷ ãŠ Üã>|ããè-°ãü÷ããè ÖifÃ ããCããfÃ ãñ|ããè
Öö ý fÔãñ |ããÀãò ÷ ãŠã ãã>¹/₂ããã>¹/₂ãã¶ãã ÷ ãŠÖ|ãñ Ööý 'ãð©lããè ÷ ãñŠ
lãã³/₄ãl¹/₂ããjÊã ¹/₂ãò ãã¹/₄ã¶ãã-ãã¹/₄ã¶ãã ,ã'ãlã|ãÃ¶ãã ÷ ãŠ lããÊããè lãã³/₄ãl
÷ ãŠãè 'ãÀ|ãò Öãñ|ããè Öö ý lãã³/₄ãl¹/₂ããjÊã ÷ ãŠãè ãã¹/₄ã¶ãã-ãã¹/₄ã¶ãã 'ãÀ|ããò
'ãÀ |ããÀãò Ôãñ ,ãã¶ãñ lããÊãñ 'ãÆ ÷ ãŠãlã ÷ ãŠã ,ã'ãlã|ãÃ¶ã Ôãñ|ãã Öö
ãã•ãÔãÔãñ |ããÀãò Ôãñ Ö¹/₂ããÀãè ,ããüCãã |ã ÷ ãŠ ,ãã¶ãñ lããÊãã 'ãÆ ÷ ãŠãlã
÷ ãŠ¹/₄ããè 'ãÖülpã|ãã Öö ÷ ãŠ¹/₄ããè ¶ãÖãè 'ãÖülpã|ãã Öö ý fÔããè ããÊã ÷
Ö¹/₂ãò |ããÀñ ãã>¹/₂ããã>¹/₂ãã¶ãñ Öl† 'ãÆ|ããè|ã Öãñ|ãñ Öö (ããPãã 6.3)ý



ããPãã Ôãã0 6.3

**2. Ôãl³/₄ããó³/₄ã Ôãñ 'ãÖÊãñ ÷ lãã Ôãl³/₄ããÃÔ|ã ÷ ãñŠ °ãã Ôãl³/₄ãÃ
÷ ãã<³/₄ããò ããCããfÃ ãñ|ãã ÀÖ|ãã Öö ?**

'ãð©lããè |ãÊã Ôãñ ...'ãÀ •ãã¶ãñ 'ãÀ lãã³/₄ãl ããlãÀÊã Öãñ|ããè •ãã|ããè Ööý
ãã•ãÔãÔãñ lãã³/₄ãl ¹/₂ããjÊã ¹/₂ãò lãã³/₄ãl ÷ ãŠãè ããlããã¹/₄ã¶ãã 'ãÀ|ãò °ã¶ã
•ãã|ããè Ööã ãã•ã¶ã ÷ ãŠã ,ã'ãlã|ãÃ¶ãã ÷ ãŠ ...'ãÀ •ãã¶ãñ 'ãÀ ÷ ãŠ¹/₂ã Ôãñ|ãã
•ãã|ãã Ööý Ôãl³/₄ããó³/₄ã ÷ ãñŠ Ôã¹/₂ã³/₄ã •ã°ã Ôãl³/₄ãÃ ãããããã|ã•ã
(Horizon) ÷ ãñŠ ¶ããèPãñ Öãñ|ãã Öö |ããñ „ÔãÔãñ ,ãã¶ãñ lããÊããè 'ãÆ ÷ ãŠãlã
÷ ãŠãè ãã ÷ ãŠÀããò ããPãã 6.4 ÷ ãñŠ ,ã¶ãlÔããÀ lãã³/₄ãl ÷ ãŠãè ããlããã¹/₄ã¶ãã
'ãÀ|ããò Ôãñ ,ã'ãlããã|ãÃ|ã Öãñ|ããè ÖifÃ Ö¹/₂ããÀãè ,ããüCãã |ã ÷ ãŠ

$$S_1$$


6.4

3. **1'āā¶āāē ½āō 1'āōāā¶ÔāÊā ‡āŠā >ññüōā āā^aŒāāfĀ ^añ¶āā :-** ,āā¹ā¶āñ
^añŒāā ŌāñŌāā āā‡āŠ •āÊā ½āō ÀŒāāē 1'āōāāÔāÊā ‡āŠā •āÊā ‡āñŠ ,āā^aÀ
‡āŠā ¼āāŌā >ññüōā āā^aŒāā³/āāē ^añ|āā Ōōý ‡ā<³/āāō ? 1'āā¶āāē ‡āñŠ ¼āāē|āÀ
lāāÊāñ 1'āōāāÔāÊā ‡āñŠ ¼āāŌā Ōāñ ,āā¶āñ lāāÊāāē 1'āÆ ‡āŠālā ‡āŠāē
āā‡āŠÀŸāō •ā^a lāā³/āi ½āō 1'āÆlāñlā ‡āŠÀ|āāē Ōō ,|āāñ ,āāā¹/āÊā¹/₂ā Ōāñ
^alÀ Ō>|āāē Ōō āā•āŌā ‡āñŠ ‡āŠāŸā 1'āā¶āāē ‡āñŠ ¼āāē|āÀ lāāÊāñ
1'āōāāÔāÊā ‡āŠā ¼āāŌā āāPā^{..}ā 6.5 ‡āñŠ ,ā¶āiŌāāÀ >ññüōā āā^aŒāā³/āāē
^añ|āā Ōōý



Özellik 6.5

4. 'āā||āāē ½āō āāÔā ‡ ā< ‡ āŠā ‡ āŠā lāāÔ|āāālā ‡ āŠ
 āāÔ©āāā|ā Ôāñ „Ÿā āā³Ēā||āā :- „āā'ā||āñ ÔlāPœ
 'āā||āāē ‡āñŠ °ā|āĀ||ā ‡āñŠ 'āñ° 'āÀ ÀĒāñ āāÔā‡ā<‡āñŠ
 ¾āā •āĒā ½āō |āōÀ|āāē ½āœāāĒā³¾āāō ‡ āŠāñ °ñĒāā
 ÔāñØāāý ‡ ā<¾āā āāÔā ‡ ā< ‡ āŠā ¾āā ½āœāāĒā³¾āāū
 lāāÔ|ālā ½āō „|ā||āāē Ôāē ØāÔĀāfĀ 'āÀ āāÔ©ā|ā Ôāñ|āñ
 Ôö •āÔāū lāÔ 'āĒ|āāē|ā Ôāñ|āñ Ôö ? 'āā||āāē ½āō
 āāÔ©ā|ā āāÔā ‡ ā< ‡ āñŠ ¾āā ½āœāāĒā³¾āāō Ôāñ „āā||āñ

ÌããÊãã 'ãÆ ‡ ãŠãÍã ÒãÜã¶ã ½ãã£³ã½ã (¹ã¶ããè) Òãñ
 ããÌãÀÊã ½ãã£³ã½ã Ìãã³ãì ½ãò 'ãÆÌãñÍã ‡ ãŠÀãã Öö,
 ãã•ãÔã ‡ ãñŠ ‡ ãŠãÀ¥ã ããPãã Òãã£³ãã 6.6 ‡ ãñŠ
 ,ã¶ãìÔããÀ ããÔã ‡ ã< ‡ ãŠã ,ã¹ã¶ããè ÌããÔãããÌã ‡ ãŠ
 ããÔ©ãããã Òãñ ...¹ãÀ „Ýã Òì,ãã ãã³£ã³ããè ãñãã Ööý



ÈòÔã :-

,ãã¹ã¶ãñ ,ã¶ãñ‡ãŠ ÊããñÒããò ‡ ãŠãñ †ñ¶ã‡ãŠ 'ãÆ³ããñÒã
 ‡ ãŠÀãã Òì † ,ãÌã³ã ãñ£ãã ÒãñÒããý †ñ¶ã ‡ ãŠ ‡ ãñŠ
 'ãÆñŠ½ã ½ãò ãã³£ã³ããè ãñ¶ãñ ÌããÊãã ‡ ãŠãúPã ‡ ãŠã
 ›ì ‡ ãŠüã ÊãòÔã Òãñãã Ööý fÔããè 'ãÆ ‡ ãŠãÀ Üãüãè
 Ôãã•ã ¼ããè Üãüãè ‡ ãñŠ œãñ›ñ-œãñ›ñ 'ài•ããò ‡ ãŠãñ
 ãñ£ã¶ãñ ‡ ãñŠ ããÊã† 'ãÆñŠ½ã ½ãò ÊãÒãñ ‡ ãŠãúPã ‡ ãŠã
 ›ì ‡ ãŠüã 'ãÆ³ããñÒã ‡ ãŠÀãã Ööý ‡ ã<³ãã ,ãã¹ã •ã¶ããñ
 Öö ãã‡ãŠ ¾ãÖ ‡ ãŠãúPã ‡ ãŠã ›ì ‡ ãŠüã ‡ ã<³ãã Öö ? ¾ãÖ
 ‡ ãŠãúPã ‡ ãŠã ›ì ‡ ãŠüã ¼ããè ÊãòÔã Öö,ããñ œãñ›ãè
 Pããè•ã ‡ ãŠã °ãüã 'ãÆããããã°ã½ã °ã¶ãããã Ööý

ÈòÔã ãã ‡ ãŠÔããè 'ããÀ¹ããè ½ãã£³ã½ã ‡ ãŠã †ñÔãã ›ì ‡ ãŠüã Öö,
 ãã•ãÔã ‡ ãñŠ ãñ¶ããò 'ãðÖÝ Ìã %ãŠ ,ã©ãÌãã † ‡ ãŠ 'ãðÖÝ Ìã %ãŠ
 'ã©ãã ãÔãÀ 'ãðÖÝ Ôã½ããÊã Òãñý

Ôãã½ã¶ã³ãã: ÈòÔã ããñ 'ãÆ‡ãŠãÀ ‡ ãñŠ Òãñãã Öö -

1. „ãÊã ÊãòÔã 2. ,ãÌããÊã ÊãòÔã

ãã•ãÔã ÊãòÔã ‡ ãñŠ ½ã£³ã ‡ ãŠã ¼ããÒã ½ãã›ã (...¹ãÀ „Ýã Òì,ãã) 'ã©ãã
 ãã ‡ ãŠ¶ããñ 'ãÀ 'ããÊãã Öö, „Ôã ÊãòÔã ‡ ãŠãñ „ãÊã ÊãòÔã ‡ ãŠÖãñ
 Ööý ãã•ãÔã ÊãòÔã ‡ ãñŠ ½ã£³ã ‡ ãŠã ¼ããÒã 'ããÊãã 'ã©ãã ãã‡ã¶ããñ
 'ãÀ ½ãã›ã Öö, „Ôãñ ,ãÌããÊã ÊãòÔã ‡ ãŠÖãñ Ööý „ãÊã ÊãòÔã ‡ ãñŠ

ⁱāñ¶āāò ¹āđÓỲ „||āÊā |ā©āā ,ā|ā|āÊā Êāñ¶Ôā ‡āñŠ ⁱāñ¶āāò ¹āđÓỲ ,ā|ā|āÊā Ôāñ|āñ Ööý

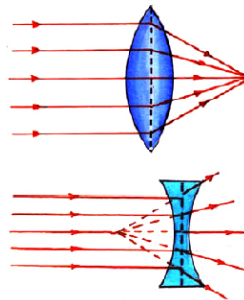
1. „||āÊā (,āāā¼āÔāāÀāē)ÊāòÔā (Convex converging lens) :-

„||āÊā ÊāòÔā „Ôā ¹āÀ ,āā¹āā|ā|ā Ôā½āā¶āā¶āÀ ¹āÆ ‡āŠā|ā ‡āŠāē āā ‡āŠÀŲāāò ‡āŠāñ ½āìĲ¾ā ,āāā ‡āŠāē ,āāñÀ ½āāñü|āā Öö, fÔāāāÊā ‡fÔāñ ,āāā¼āÔāāÀāē ÊāòÔā ¼āāē ‡āŠÔ|āñ Öö āāPāā 6.7ý

2. ,ā|ā|āÊā(,ā¹āÔāāÀāē) ÊāòÔā (Concave diverging lens):-

¾āÖ ÊāòÔā „Ôā¹āÀ ,āā¹āā|ā|ā Ôā½āā¶āā¶āÀ āā ‡āŠÀŲāāò ‡āŠāñ āāPāā 6.8 ‡āñŠ ,ā¶āìÔāāÀ ½āìĲ¾ā ,āāā Ôāñ ¹āÀ ¹āđŠÊāā|āā Ööý fÔāāāÊā ‡fÔāñ ,ā¹āÔāāÀāē ÊāòÔā ‡āŠÔ|āñ Ööý

,āā¼āÔāāÀāē ÊāòÔā



,ā¹āÔāāÀāē ÊāòÔā
āāPāā Ôāâ0 6.8

ÊāòÔā Ôāñ Ôā½āā¶āā¶ā|ā ‡āìŠœ ½āÖ|ā¹āŲāĀ |ā©¾ā :-

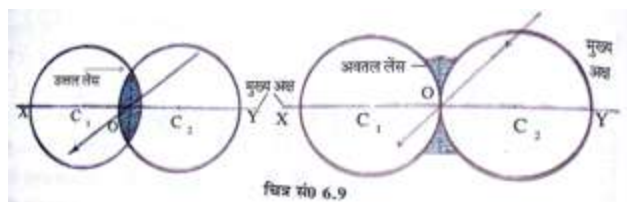
C₁|ā©āā C₂ ÊāòÔā ‡āñŠ ⁱāñ¶āāò ¹āđÓỲāò ‡āñŠ |ā % āŠ|āā ‡āñŠ¶ Ööý Êāñ¶Ôā ‡āŠā ¹āÆ|¾āñ ‡āŠ ¹āđÓỲ āā•āÔā ÔāñÊāñ ‡āŠā ¼āāÔā Ôāñ|āā Öö, „Ôā ‡āŠāē āā•¾āā ÊāòÔā ‡āŠāē |ā % āŠ|āā āā•¾āā¼āāò ‡āŠÔÊāā|āē Ööây

½āìĲ¾ā ,āāā :-

|ā % āŠ|āā ‡āñŠ¶ C₁, C₂ Ôāñ Ôāì•āÀ¶āñ |āāÊāāē ĀñĲāā XY ÊāòÔā ‡āŠā ½āìĲ¾ā ,āāā ‡āŠÔÊāā|āē Öö ý

¹āÆ‡āŠāā|ā‡āŠ ‡āñŠ¶ :-

½āìĲ¾ā ,āāā ¹āÀ āāÔ©ā|ā |āÖ āā¶ā¶ā āā•āÔāÔāñ Ôāì•āÀ¶āñ |āāÊāāē ¹āÆ‡āŠā|ā ‡āŠāē āā ‡āŠÀŲāāò ½āò āā|āPāÊā¶ā ¶āÔāē Ôāñ|āā Öö, ÊāòÔā ‡āŠā ¹āÆ ‡āŠāā|ā ‡āŠ ‡āñŠ¶ ‡āŠÔÊāā|āā Ööý āāPāā ½āò āā¶ā¶ā O ÊāòÔā ‡āŠā ¹āÆ‡āŠāā|ā‡āŠ ‡āñŠ¶ Öö ý



¹ãŠãñ‡ãŠÔã ‡ã³/₄ãã Öõ ?

- ☐ †‡ãŠ „||ãÊã ÊãoÔã Êão ý
☐ *f*Ôã‡ãñŠ 'ãÀã Ôãĩ³/₄ãÃ ‡ãñŠ 'ãÆ‡ãŠãÎã ‡ãŠãñ ãã‡ãŠÔããè Ôã|ãÖ 'ãÀ
‡ãñŠãã¶³|ã ‡ãŠÀò ý
☐ ‡ã<³/₄ãã ãã^aÇãã *f*Ã ^añ|ãã Öö ?

Ôã|ãÖ ¹ãÀ †‡ãŠ Þã½ã‡ãŠãæÊãã ¹ãÆ‡ãŠãíã ãã°ã¶¹ã ããªÆããƒÃ ¢ñ|ã Ööý
¾ãÖ ãã°ã¶¹ã ÊãòÔã ‡ãŠã ¹ãŠãñ‡ãŠÔã Ööý

„||āÊā ÊãoÔā ‡ āñŠ ½āìĈ¾ā ,āāā ‡ āñŠ Ôā½āā¶āÀ ¹āÆ ‡ āŠāĪā
āā ‡ āŠÀŸāò, ÊãoÔā Ôāñ ,ā¹āĪā¹āĀ¶ā ‡ āñŠ ¹āĪāāā¹āā ½āìĈ¾ā ,āāā
‡ āñŠ āä•āÔā āä°ā¶¹ ¹āÀ ‡ āñŠāā¶³|ā Öāñ¹āäè Öö, ĪāÖ āä°ā¶¹ „||āÊā
ÊãoÔā ‡ āŠā ¹āŠāñ‡ āŠÔā ‡ āŠÖÊāā¹āā Ööý fÔāñ F ´āĀ ¹āÆ³āāĪāĀ¹ā
‡ āŠÀ¹āñ Ööý

,ăĭă|ăĖă ĖăòÔă ½ăò ½ăĭĖ¾ă ,ăăă ‡ăăŤ Ôă½ăă¶ăĀ ,ăă'ă|ăăè|ă 'ăĖ‡ăŤăĭă
 äă ‡ăŤăŤăăò ,ă'ăĭă|ăĀ¶ă ‡ăăŤ 'ăĭĤăă|ăă äă•ăÔă äă°ă¶ăĭ Ôăă ,ăă|ăăè ÔĭfĂ
 'ăĖ|ăăè|ă Öăă|ăăè Öö, ĩăÖ äă°ă¶ăĭ ,ăĭă|ăĖă ĖăòÔă ‡ăăŤ 'ăŤăăă ‡ăăŤă
 ‡ăŤÖĖăă|ăă Ööý

¹ãŠãñ‡ãŠÔã ²îÀãè ‡ã¼ãã Öõ ?

1aŠān † aŠŌā |ā©āā 1aÆ † aŠāāāIā † aŠ † ānŠ¶³ † ānŠ ½ā£¾ā † aŠāè 1iÀāè
 † aŠān ÊāòŌā † aŠāè 1aŠān † aŠŌā 1iÀāè † aŠŌ|ān Ōö ý fŌān (f) 1aĀ
 1aÆªāāIāĀ|ā † aŠĀ|ān Ōö ý

ÊãòÔã 'ãÀã 'ãÆãä|ãää°ã½°ã °ã¶ã¶ãñ ‡ãñŠ äã¶ã³⁄ã½ã :-

(i) ½āīē³⁄₄ā , āāā ‡ āñŠ Ōā½āā¶āÀ PāĒā¶āñ ĪāāĒāāē 'āĒ‡āŠāĪā āā‡āŠĀ¥ā , ā¹āĪāāĀ¶ā ‡ āñŠ 'āĪPāāāā ,||āĒā ĒāòŌā ‡ āñŠ 'āŠāñ‡āŠŌā F Ōāñ Ōāñ‡āŠĀ •āāāāē Ōōý , āĪāāĒā ĒāòŌā ‡ āñŠ 'āŠāñ ‡ āŠŌā F Ōāñ , āāāāē ŌīfĀ 'āĒāāēā Ōāñāāē Ōō ý

(ii) „||āÊā ÊāòÔā ‡ āñŠ ¹āŠāñ ‡ āŠÔā Ôāñ ÞāÊā¶āñ ÌāāÊāāè ¹āÆ ‡ āŠāÌā āā ‡ āŠÅ¥āò ‚ā¹āÌā¹ā¶ā ‡ āñŠ ¹āÌÞāā¹ā ½āìÆ¾ā ‚āā ‡ āñŠ Ôā½āā¶āÀ Ôāñ ‡ āŠÀ •āā¹āāè Ôö ý ‚āÌā¹āÊā ÊāòÔā ½āò ¹āŠāñ ‡ āŠÔā ‡ āŠāè ‚āñÀ ‚āā¹āè ÒìfÃ ¹āÆ ‡ āŠāÌā āā ‡ āŠÅ¥āò ‚ā¹āÌā¹ā¶ā ‡ āñŠ ¹āÌÞāā¹ā ½āìÆ¾ā ‚āā ‡ āñŠ Ôā½āā¶āÀ Ôāñ ‡ āŠÀ •āā¹āāè Ôö ý

(iii) ÊãoÔã ‡ añŠ^m 'āÆ ‡ āŠāāāīā ‡ āŠ ‡ añŠ¶³ Ôãn Øai•āÀ¶āñ īāāÊāāē
'āÆ‡āŠāīā āā‡āŠÀ¥ào āā°ā¶āā āāīāPāāāĒā'ā Õi† āā¶āØāÃ'ā Ōāñāāē Ööý

[illegible]

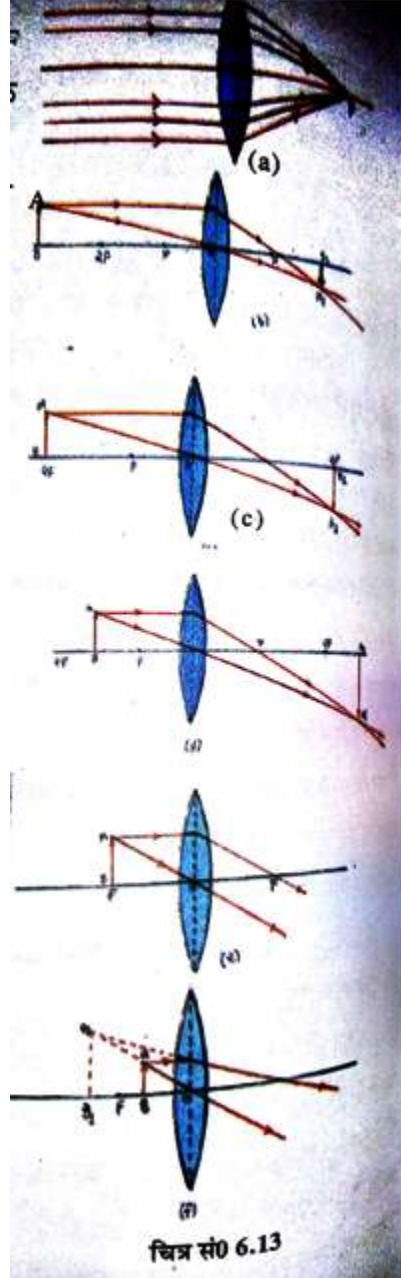
‡āñŠ ʳĬŌāÀāè ,āāñÀ ʳāŠāñ‡āŠŌā |ā©āā ʳāŠāñ‡āŠŌā ʳĬÀāè ‡āñŠ ʳāñŌāi¶āāè
ʳĬÀāè (2F) ‡āñŠ ʳāāèƲā ʳā¶ā|āā Öō ý

(c) •ā°ā ĬāŌ|āi AB „||āĒā ĒāòŌā Ōāñ ʳāŠāñ‡āŠŌā ʳĬÀāè ‡āŠāè ʳāñŌāi¶āāè
ʳĬÀāè (2F) ʳĬÀ ÀĒāāè •āā|āāè Öō |āāñ „Ōā‡āŠā ĬāŌ|āāāĬā‡āŠ, „Ē>ā |ā©āā
ĬāŌ|āi ‡āñŠ ʳāÀā°āÀ ʳāĒāā|āāā°ā¹/₂ā ĒāòŌā ‡āñŠ ʳĬŌāÀāè ,āāñÀ
ʳāŠāñ‡āŠŌā ʳĬÀāè ‡āŠāè ʳāñŌāi¶āāè ʳĬÀāè 2F ʳĬÀ ʳā¶ā|āā Öōý

(d) •ā°ā ĬāŌ|āi ABĒāòŌā Ōāñ ʳāŠāñ‡āŠŌā ʳĬÀāè ‡āŠāè ʳāñŌāi¶āāè ʳĬÀāè
(2F),āāòÀ ĒāòŌā ‡āñŠ ʳāŠāñ‡āŠŌā F ‡āñŠ ʳāāèƲā Ōāñ |āāñ „Ōā‡āŠā
ĬāŌ|āāāĬā‡āŠ, „Ē>ā |ā©āā ĬāŌ|āi Ōāñ ʳāü|ā ʳāĒāā|āāā°ā¹/₂ā A₁B₁ ĒāòŌā
‡āñŠ ʳĬŌāÀāè ,āāñÀ ʳāŠāñ‡āŠŌā ʳĬÀāè ‡āŠāè ʳāñŌāi¶āāè ʳĬÀāè (2F) Ōāñ
,āāāfā‡āŠ ʳĬÀāè ʳĬÀ ʳā¶ā|āā Öō ý

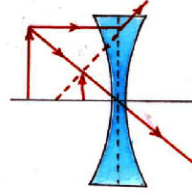
(e)•ā°ā ĬāŌ|āi F (ʳāŠāñ ‡āŠŌā) ʳĬÀ Ōāñ|āāè Öō |āāñ „Ōā‡āŠā
ʳāĒāā|āāā°ā¹/₂ā ĬāŌ|āi Ōāñ ʳāü|ā, „Ē>ā |ā©āā ĬāŌ|āāāĬā‡āŠ ʳĬŌāÀāè ,āāñÀ
,ā¶ā¶ā ʳĬÀ ʳāĒ ʳāĒā¹ā Ōāñ|āā Öōý

(f) •ā°ā ĬāŌ|āi AB, ʳāŠāñ‡āŠŌā F |ā©āā ʳāĒ‡āŠāāĬā‡āŠ ‡āñŠ¶³ O ‡āñŠ
¹/₂āf³/₄ā Ōāñ|āāè Öō, |āāñ ʳāĒāā|āāā°ā¹/₂ā (A₁B₁)āāƲāā¶āiŌāāÀ „Ōāāè
|āÀ¹āŠ ʳā¶ā|āā Öō āā•āŌā |āÀ¹āŠ ĬāŌ|āi Ōāñ|āāè Öō ý ³/₄āŌ ʳāĒāā|āāā°ā¹/₂ā
ĬāŌ|āi Ōāñ ʳāü|ā, Ōāāèfāā |ā©āā ‡āŠāĒāā¶ā‡āŠ (,āā¹/₄āāŌāāè) Ōāñ|āā
Öōý



,āīā|āÊā ÊāòÔā 'āÀā 'āÆāā|āāā°ā½°ā ‡āŠā °ā¶ā¶āā :-

İāÔ|āī ,āīā|āÊā ÊāòÔā ‡ āñŠ Ôā½ā¶āñ ‡ āŠÔāé ¼āāè ÀÆāāè Öāñ,
 'āÆāā|āāā°ā½°ā Ö½āñİāā İāÔ|āī Ôāñ œāñā, Ôāāè£āā |ā©āā ,āā¼āāÔāāè
 °ā¶āāā Öō ý 'āÆāā|āāā°ā½°ā 'āŠāñ ‡ āŠÔā 'āÀ ¾āā 'āŠāñ ‡ āŠÔā |ā©āā
 'āÆ ‡ āŠāāāİā ‡ āŠ ‡ āñŠ¶ ‡ āñŠ ½ā£¾ā İāÔ|āī ‡ āŠāè Öāè ,āāñÀ °ā¶āāā Öō
 (āāPāā 6.14)ý



āāpā"ā Ōāā0 6.14

†āīŠœ ,āāōÀ ¼āāè •āā¶āò

- (i) „||āÊā ÊāòŌā † āñŠ 'āŠāñ † āŠŌā 'āÀ āāŌ©ā|ā ĩāŌ|āī † āŠā 'āÆāā|āāā°ā½°ā ,ā¶ā¶ā 'āÀ °ā¶ā|āā Ōō ý
- (ii) ,āĭā|āÊā ÊāòŌā † āñŠ 'āŠāñ † āŠŌā 'āÀ āāŌ©ā|ā ĩāŌ|āī † āŠā 'āÆāā|āāā°ā½°ā 'āÆ†āŠāāĭā†āŠ † āñŠ¶ Ōāñ 'āŠāñ†āŠŌā † āŠāè 'āĀāè † āñŠ ,āāfāñ 'āĀāè 'āÀ ĩāŌ|āī † āŠāè ,āāñÀ °ā¶ā|āā Ōōý
- (iii) ĩāāŌ|āāāĭā†āŠ 'āÆāā|āāā°ā½°āāò † āŠāñ 'āó 'āÀ 'āÆā¹ā āā†āŠ¾āā •āā Ōā † āŠ|āā Ōō •ā°āāā † āŠ † āŠāÊ¹āāā¶ā † āŠ (,āā¼āāŌāāè) 'āÆāā|āāā°ā½°āāò † āŠāñ 'āó 'āÀ 'āÆā¹ā ¶āŌāé āā † āŠ¾āā •āā Ōā†āŠ|āā Ōō ý

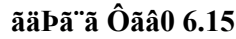
'āÆ†āŠāāĭā†āŠ ¾āā"āāò †āŠā āā¶ā½āāŶā :-

°ōāā¶ā † āŠ •āāèĭā¶ā ½āò † āŠ¼āāè- † āŠ¼āāè °āŌĭā 'āĀ † āŠāè ĩāŌ|āī,āāò † āŠāñ |ā©āā °āŌĭā œāñ>āè ĩāŌ|āī,āāò † āŠāñ Ō¹āŌ> Ā¹ā Ōāñ 'āñĒā¶āñ † āŠāè ,āāĭāĭ¾ā † āŠ|āā Ōāñ|āāè Ōōý fŌā†āñŠ āāÊā¾āñ 'āÆ†āŠāāĭā†āŠ ¾āā"āāò † āŠā āā¶ā½āāŶā āā†āŠ¾āā Ōā¾āā Ōōý f¶ā½āò ÊāòŌāāò † āŠā „'ā¾āāñŌā āā†āŠ¾āā •āā|āā Ōōý fŌā ,āāfāāĀ 'āĀ 'āÆ†āŠāāĭā†āŠ ¾āā"ā 'āñ 'āÆ†āŠāĀ † āñŠ Ōāñ|āñ Ōōý

(i) Ōāĭā½ā¹ĭāāè (Microscope) (ii) 'āĀ¹ĭāāè (Telescope)

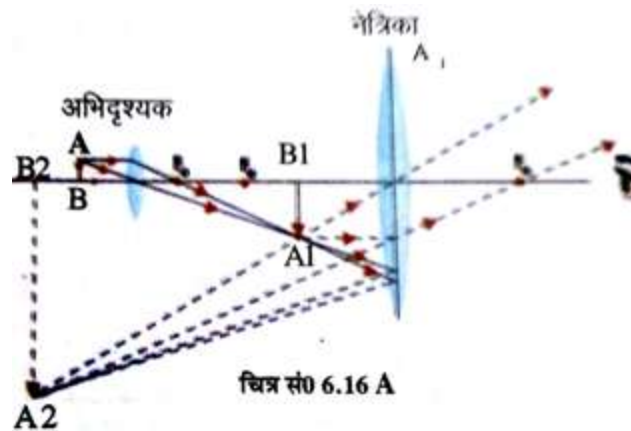
1. ŌāĀÊā Ōāĭā½ā¹ĭāāè (Simple Microscope):-

fŌā½āò † āŠ½ā 'āŠāñ†āŠŌā 'āĀāè ĩāāÊāā † āŠ „||āÊā ÊāòŌā 'āÆ¾āāñŌā āā†āŠ¾āā •āā|āā Ōōý fŌā½āò ĩāŌ|āī † āŠāñ ÊāòŌā † āñŠ 'āÆ†āŠāĭā † āñŠ¶ |ā©āā 'āŠāñ † āŠŌā † āñŠ ½āf¾ā ĀĒā|āñ Ōōý ŌāĀÊā Ōāĭā½ā¹ĭāāè 'āĀ 'āÆāā|āāā°ā½°ā † āŠā °ā¶ā¶ā āā†āŠĀŶā ,āāĀñĒā 'āĀ 'āĭāĀ¾āā Ōā¾āā Ōō (āāpā"ā 6.15)ý fŌā † āñŠ 'āĀ ĩāŌ|āī † āñŠ Ōāā¹āñāā ÊāŌā¼āŌā 20 Ōāĭ¶āā °āū|ā ,āā¼āāŌāāè 'āÆāā|āāā°ā½°ā °ā¶ā Ōā † āŠ|āā Ōōý ,āĭ¾ā¶ā œāñ>āè ĩāŌ|āī,āāò † āŠāñ 'āñĒā¶āñ † āñŠ āāÊā † ,āāāfā † āŠ ,āāĭāfāĀ¶ā āā½ā|āā ĩāāÊāñ Ōāĭā½ā¹ĭāāè † āŠā 'āÆ¾āāñŌā āā†āŠ¾āā •āā|āā Ōōý

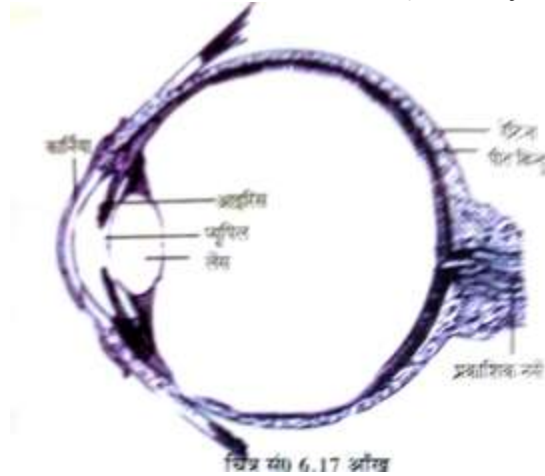


$\lambda =$ वस्तु की लम्बाई

fÔã½ãò ºañ º||ãÊã ÊãoÔã Öãñ|ãñ Ööý ¾ãñ ÊãoÔã † ‡ ãŠ ŒããñŒãÊããè ºãñÊã¶ãã †ãŠÀ ¶ãÊããè †ãñŠ ºãñ¶ãão ããÔãÀãò ¹ã ããÔŒã|ã Öãñ|ãñ Öö ý ÊãoÔããò †ãñŠ ºããèPã †ãŠãè º¹ããè †ãŠãñ ,ãã¹ã¹¾ã†ãŠ|ãã¶ã¹ÔããÀ Üãã¾ãã ºãüŒ¾ãã •ãã Ôã†ãŠ|ãã Öö ý ¹ãÔã¹ AB †ãŠãñ ,ããã¹ãÔ¹¾ã†ãŠ †ãñŠ ¹ããÔã ããPããã¶ã¹ÔããÀ ÀŒã|ãñ Ööý ãã•ãÔã † ãŠã ,ããã¹ãÔ¹¾ã † ãŠ ¹ãÀã ¹ã/Œãã|ãããºã½ºã A₁B₁ ¶ãñãããã†ãŠã †ãñŠ ¹ãŠãñ†ãŠÔã Fₑ †ãñŠ ,ã¶ãÀ ÀÖñý ¶ãñãããã†ãŠã ¹ãÀã A₁B₁ †ãŠã ,ãã¼ããÔããè ¹ã/Œãã|ãããºã½ºã A₂B₂ ºã¶ã|ãã Ööý •ããñ ¹ãÔã¹ Ôãñ ÊãØã¹ãØã 10 Ôãñ 100 Øã¹¶ãã ºãüã Öãñ Ôã†ãŠ|ãã Ööý ¾ããõããØã † ãŠ Ôã¹ã¹ã½ã¹ããè ¹ãÀã ¹ã/Œãã|ãããºã½ºã †ãñŠ ºã¶ã¶ãñ †ãŠã ãã†ãŠÀ¶ã ,ããÀñŒã ããPãã Ôãã0 6.16 A ½ãò ¹ããÃ¾ãã Øã¾ãã Ööý



Ööy fÔã†ãñŠ Ÿãè†ãŠ 'ããèœñ „||ãÊã ÊãòÔã †ãŠãè ,ãã†ãðŠãã|ã †ãŠãè ††ãŠ
 ÔããÀPã¶ãã Öãñ|ããè Öö ãã•ãÔãñ ¶ãñã ÊãòÔã †ãŠÖ|ãñ Ööy ½ãã¶ã|ã ¶ãñã
 ½ãò ÔããÔãñ ,ã¶À ††ãŠ 'ããÀã|ããè ããçãÊÊããè Öãñ|ããè Öö, ãã•ãÔãñ
 Àñãã¶ãã †ãŠÖ|ãñ Öö ý Àñãã¶ãã †ãñŠ ÊãÔã¼ãÔã °ããèPã ½ãò ††ãŠ
 Ô©ãã¶ã Öãñ|ãã Öö, ãã•ãÔãñ 'ããè|ããã°ã¶ã †ãŠÖ|ãñ Ööy 'ããè|ããã°ã¶ã 'ãÀ
 °ã¶ãã 'ãÆãã|ããã°ã½°ã Ô'ãÓ> ããÆãã¾ããè ãñ|ãã Ööy



ãã †ãŠÔããè |ãÔ|ã| Ôãñ PãÊã¶ãñ |ããÊããè 'ãÆ †ãŠã|ãã ãã †ãŠÀ¥ãò
 †ãŠããã¶ã¾ãã Ôãñ Øã|ã¶ã¶ãñ †ãñŠ °ãã¶ã ¶ãñã ÊãòÔã 'ãÀ ,ããããã|ãã
 Öãñ|ããè Ööy fÔãÔãñ ,ã|ãããã|ãã Ôãñ †ãŠÀ Àñãã¶ãã 'ãÀ |ãÔ|ã| †ãŠã
 „Êã †|ãã |ããÔ|ããã|ãã †ãŠ 'ãÆãã|ããã°ã½°ã °ã¶ã|ãã Ööy Ô|ãÔ©ã ,ããúÆã Ôãñ
 ãã†ãŠÔããè |ãÔ|ã| †ãŠãñ Ô'ãÓ> ãñÆã¶ãñ †ãñŠ ããÊã† ¶¾ãñ|ãã|ã½ã 'ãÀãè 25
 cm Öãñ|ããè Öö ý

ÒããÓ> ãñÓã (Defects of vision)†ã¾ãã Öö ?

•ã°ã ½ãã¶ã|ãã ¶ãñã †ãñŠ Ôãã½ã¶ãñ Ô'ãÓ> ÒããÓ> †ãŠãè ¶¾ãñ|ãã|ã½ã 'ãÀãè
 (25 cm) 'ãÀ ÀÆããè |ãÔ|ã| ÔãããŠ-ÔãããŠ ããÆããfÃ ¶ãÔãé ãñ|ããè |ããñ
 fÔãñ ÒããÓ> ãñÓã †ãŠÖ|ãñ Öö ý ¾ãÖ ãñ 'ãÆ†ãŠãÀ †ãŠã Öãñ|ãã Öö ý

1. ãã¶ã†ãŠ> ÒããÓ> ãñÓã (Short Sightedness):-

†ã|Šœ |¾ããã†ã<|ã¾ããò †ãñŠ ¶ãñã ÊãòÔã °ãÔ|ã ,ããããã†ãŠ |ã%ãŠ Öãñ
 •ãã¶ãñ †ãñŠ †ãŠÀ¥ã ÊãòÔã †ãŠãè 'ãŠãñ†ãŠÔã 'ãÀãè †ãŠ½ã Öãñ •ãã|ããè
 Öö ý †ñÔããè 'ãã ½ãò 'ãÀ ããÔ©ã|ã |ãÔ|ã| †ãŠã 'ãÆãã|ããã°ã½°ã Àñãã¶ãã
 'ãÀ ¶ã °ã¶ã †ãŠÀ „Ôã†ãñŠ 'ãÔÊãñ Öãè °ã¶ã •ãã|ãã Ööy 'ãŠÊãÔ|ãÀ'ã 'ãÀ
 ããÔ©ã|ã |ãÔ|ã| ÔãããŠ ããÆãã¾ããè ¶ãÔãé ãñ|ããè fÔã 'ãÆ †ãŠãÀ †ãñŠ
 ÒããÓ> ãñÓã †ãŠãñ ãã¶ã†ãŠ> ÒããÓ> ãñÓã †ãŠÖ|ãñ Öö (ããPãã 6.18-a)ý
 ãã¶ã†ãŠ> ÒããÓ> ãñÓã †ãŠãñ 'ãÀ †ãŠã¶ãñ †ãñŠ ããÊã† Pã|½ãñ ½ãò
 „ããPã|ã 'ãŠãñ†ãŠÔã 'ãÀãè †ãŠã ,ã|ããÊã ÊãòÔã 'ãÆ¾ããñÔã ãã†ãŠ¾ãã
 •ãã|ãã Öö ý ¾ãÖ ÊãòÔã 'ãÆ†ãŠã|ãã ãã†ãŠÀ¥ããò †ãŠãñ ,ã'ãÔãããÀ|ã

चित्र सं० 6.19

‡āiŠœe l̥¼āāā ‡ā<ā̃¼āāō ‡āñŠ ¶āñ̃āāō ‡āŠāē l̥ā%āŠ|āā ‡āš½ā Ōāñ •āā¶āñ
 ‡āñŠ ‡āŠāÀƳā ¹āŠāñ‡āŠŌā ¹īĀāē °āu∞ •āā|āāē Ōō āā•āŌāŌāñ ¶āñ̃ā ‡āñŠ
 āā¶ā ‡āŠ> āāŌ©ā|ā l̥āŌ|āi, āāō ‡āñŠ ¹āÆāā|āāā°ā½°ā Āñāā>¶āā ¹āÀ ¶ā °ā¶ā
 ‡āŠĀ „Ōā ‡āñŠ ¹āāēœñ °ā¶ā|āñ Ōō (āāPā̃ā 6.19), ¹āŠĒāŌīĀĀ¹ā āā¶ā ‡āŠ>
 ÀÆāāē ŌīfĀ l̥āŌ|āi†ā Ō¹āŌ> ¶āŌāē āāÆāāfĀ ¹ñ|āāē Ōōý fŌā ¹āÆ‡āŠāÀ
 ‡āñŠ ŌāāŌ> ¹āñŌā ‡āŠāñ ¹īĀ ŌāāŌ> ¹āñŌā ‡āŠŌ|āñ Ōō ý
 ¹īĀ ŌāāŌ> ¹āñŌā ‡āŠāñ ¹īĀ ‡āŠĀ¶āñ ‡āñŠ āāĒā† „āāPā|ā ¹āŠāñ‡āŠŌā
 ¹īĀāē ‡āŠā „||āĒā ĒāōŌā PāĬ½āñ ½āō ĒāŌāā|āñ Ōōý „||āĒā ĒāōŌā ¹āĀā
 āāPā̃āā¶āiŌāāÀ l̥āŌ|āi Ōāñ PāĒā¶āñ l̥āāĒāē ¹āÆ ‡āŠāĬā āā ‡āŠĀƳāō
 Āñāā>¶āā ¹āÀ ‡āñŠāā¶³ā (¹āŠāñ‡āŠŌā) Ōāñ •āā|āāē Ōōā ý āā•āŌāŌāñ
 āā¶ā‡āŠ> ‡āŠāē l̥āŌ|āi†ā āāÆāāfĀ ¹ñ¶āñ ĒāŌā|āāē Ōō ý

,ãā|ãā|ã|ã ãā‡ãŠÀ¥ã AB |ãã³⁄₄ã ½ããƒ³⁄₄ã½ã Ôãn ãā¹ãÆ•½ã ‡ãnŠ ‡ãŠãPã
 ½ããƒ³⁄₄ã½ã ½ãò •ã°ã ¹ãÆ|ãñ|ã ‡ãŠÀ|ããè Öò |ãñ ,ã¹ã¶|ãñ ½ããØãÃ XF Ôãn
 ãã|ãPãããÊã|ã Öãn ‡ãŠÀ XY ãã¹|ãã ½ãò •ãã|ããè Öö ý ãã¹ãÆ•½ã Ôãn
 ãã¶|ã ‡ãŠÊã|ãn Ôã½ã³⁄₄ã ¹ãÆ ‡ãŠã|ã ãã‡ãŠÀ¥ã Y ãã°ã¶¹| ¹ãÀ ÇããéPãñ
 Øã³⁄₄ãn ,ããã¹⁄₄ãÊã½°ã Ôãn ¹|À ‡ãŠãè ãã¹|ãã ½ãò ãã|ãPãããÊã|ã
 Öãn‡ãŠÀ YCD ãã¹|ãã ½ãò •ãã|ããè Ööý¹ãÆ‡ãŠã|ã ãã‡ãŠÀ¥ã ‡ãŠã ,ã¹ã¶|ãñ
 ¹ã©ã Ôãn ãã|ãPãÊã¶|ã ‡ãŠãúPã ‡ãnŠ ãã¹ãÆ•½ã ¹ãÃ ,ã¹ã|ã|ãÃ¶|ã ‡ãnŠ
 ‡ãŠãÀ¥ã Öãn|ãã Ööý ããPã~ã ½ãò ABX ,ãã¹ããã|ã|ã

lãÓããÃ ‡ãñŠ ¹ãlPãã|ãá ‡ãŠ¹⁄₄ããè-‡ãŠ¹⁄₄ããè ,ãã‡ãŠSaía ½ãò fã¶ãlÓã ‡ãñŠ
,ãã ‡ãŠãÀ ½ãò °ãöOã¶ããè, •ã¹⁄₂ãl ‡ãŠãè, ¶ããèÊãã, ÖÀã, ¹ããèÊãã,
¶ããÀâOããè |ã©ãã ÊããÊã Ôãã|ã ÀâOããò ‡ãŠãè ¹ããã>á³⁄₄ããú ããªEããfÃ
ªñ|ããè Ööý fÔãñ **f¶³£ã¶ãlÓã** (Rainbow) ‡ãŠÖ|ãñ Öö ý lãÓããÃ ‡ãñŠ

$\text{ }^1\text{ãÍPãã|ãá } \text{ }^1\text{ãã}^3/4\text{ãí}^1/2\text{ã¥ÍÊã } ^1/2\text{ãò } \text{ }^1\text{ãããÔ}^{\circ}\text{ã|ã } \bullet\text{ãÊã } \ddot{\text{ }}\text{ãŠãè } ^1\text{ãÆ}^3/4\text{ãñ } \ddot{\text{ }}\text{ãŠ } ^{\circ}\text{ãúí}^{\text{a}}$
 $\ddot{\text{ }}\text{ãŠ } \text{ }^{\circ}\text{ãññ}^{\text{b}}\text{ñ } \text{ }^1\text{ãã}^1\text{ãÆ}^{\bullet}\text{ } ^1/2\text{ã } \ddot{\text{ }}\text{ãŠãè } ^1/4\text{ãúúãã|ã } \text{ }^1\text{ã}^3/4\text{ãÍãÔãÀ } \ddot{\text{ }}\text{ãŠÀ|ããè } \text{Ööý } \bullet\text{ }^{\circ}\text{ã}$
 $\text{Ôãí}^3/4\text{ãÃ } \ddot{\text{ }}\text{ãŠã } \text{ }^1\text{ãññ|ã } ^1\text{ãÆ} \ddot{\text{ }}\text{ãŠãÍã } \bullet\text{ãÊã } \ddot{\text{ }}\text{ãŠãè } ^{\circ}\text{ãúí}^{\text{a}} \text{Ôãñ } \text{ }^{\circ}\text{ãì}^{\bullet}\text{ãÀ|ãã } \text{Öö } |ããñ$
 $\text{ }^1\text{ãÖ } \text{ }^1\text{ã}^1\text{ã¥ãñ } \text{Üã} \ddot{\text{ }}\text{ãŠ } \text{ }^1\text{ã}^{\circ}\text{ããñ } ^1/2\text{ãò } \text{ }^1\text{ãã}^1\text{ã}^1/4\text{ã } \ddot{\text{ }}\text{ã}^{\text{c}}\text{ã } \text{Öãñ } \bullet\text{ãã|ãã } \text{Öö } \text{ }^1\text{f}^{\circ}\text{ãÔãñ}$
 $\text{ }^1\text{ãã } \ddot{\text{ }}\text{ãŠãÍã } ^1/2\text{ãò } \text{ }^1\text{Ôã|ã|ã } \text{ }^1\text{ã}^1\text{ã } \text{Öãñ } \text{ }^1\text{Ôãã|ã } \text{ }^1\text{ã}^{\circ}\text{ããò } \ddot{\text{ }}\text{ãŠãè } ^1\text{ããã}^{\text{a}}\text{ã}^3/4\text{ãú } \text{ }^1\text{f}^{\circ}\text{ã}$
 $\text{ }^1\text{ã¥ãíÔã } \ddot{\text{ }}\text{ãñŠ } \text{ }^1\text{ã}^1\text{ã } ^1/2\text{ãò } \text{ }^1\text{ãã}^{\text{a}}\text{Æããf}^{\text{a}}\text{ }^1\text{ãñ|ããè } \text{Öö } \text{ý}$

Íã^{°a}ãÍãÊããè

$\text{ }^1\text{ãã}^1/4\text{ãÔ}^{\text{í}}^3/4\text{ã} \ddot{\text{ }}\text{ãŠ}$ Objective

$\text{ }^1\text{ããÍãPãÊã¥ã }$ Deviation

$\text{ }^1\text{ã}^{\circ}\text{ãŠ|ãã } \ddot{\text{ }}\text{ãò}^{\text{S}^3}$ Centre of Curvature

$\text{ }^1\text{ãã}^1/4\text{ã} \ddot{\text{ }}\text{ã}^{\text{c}}\text{ã }$ Divided, Partitioned,

$\text{ }^1\text{ãñ}^{\text{a}} \text{ }^1\text{ÔããÔ}^{\text{b}}$ Eye sight

$\text{ }^1\text{ãñãã}^{\text{a}} \ddot{\text{ }}\text{ã} \ddot{\text{ }}\text{ãŠã }$ Eye piece

$\text{ }^1\text{ãÆãã|ããã}^{\circ}\text{ } ^1/2\text{ }^1\text{ã}$ Image

$\text{ }^1\text{ãèè}^1\text{ã } \text{ }^1\text{ãã}^{\circ}\text{ã}^1\text{ }^1\text{ã}$ Yellow point

$\text{ }^1\text{ãÆ} \ddot{\text{ }}\text{ãŠãããÍã} \ddot{\text{ }}\text{ãŠ } ^3/4\text{ãã}^{\text{a}}\text{ã }$ Optical Centre

$\text{ }^1\text{ã}^1/4^3/4\text{ããÔã } ^1\text{ãÆÍ¥ã}$

1. $\text{ }^1\text{ãã¥ã}^1/2\text{ }^1\text{ãããÊãããÆã|ã } ^1\text{ãÆÍ¥ããò } ^1/2\text{ãò } \text{ }^1\text{ÔãÔãè } \text{ }^1\text{ãã}^1\text{ã } \ddot{\text{ }}\text{ãŠÊ}^1\text{ã } \text{ }^{\circ}\text{ãú}^{\text{b}} \ddot{\text{ }}\text{ãŠÀ}$
 $\text{ }^1\text{ã}^1/4^3/4\text{ããÔã } ^1\text{ãããÔ}^1\text{ã} \ddot{\text{ }}\text{ãŠã } ^1/2\text{ãò } \text{ }^1\text{ãÊãããÆã}^{\text{a}} \text{ -}$

($\ddot{\text{ }}\text{ãŠ}$) $\bullet\text{ }^{\circ}\text{ã } \ddot{\text{ }}\text{ãŠãñf}^{\text{a}}\text{ } ^1\text{ãÆ } \ddot{\text{ }}\text{ãŠãÍã } \text{ãã } \ddot{\text{ }}\text{ãŠÀ¥ã } \text{ }^1\text{ãã}^1\text{ãÀÊã } ^1/2\text{ããf}^3/4\text{ã}^1/2\text{ã } \text{Öãñ}$
 $\text{ }^1\text{ÔãÜã¥ã } ^1/2\text{ããf}^3/4\text{ã}^1/2\text{ã } ^1/2\text{ãñã } \bullet\text{ãã|ããè } \text{Öö } |ããñ \text{ -}$

(i) $\text{ }^1\text{ãã}^1/4\text{ãÊã}^1/2\text{ }^1\text{ã} \text{Öãñ } ^1\text{ãÀ } \text{ }^1\text{Ö}^1\text{ããè } \text{Öö } \text{(iii) } \text{ }^1\text{ãã}^1/4\text{ãÊã}^1/2\text{ }^1\text{ã } \ddot{\text{ }}\text{ãŠãè } \text{ }^1\text{ããñÀ}$
 $\text{ }^1/2\text{ãìü|ããè } \text{Öö } \text{ý}$

(ii) $\text{ }^1\text{ãã}^1/4\text{ãÊã}^1/2\text{ }^1\text{ã } \ddot{\text{ }}\text{ãŠãè } \text{Öãè } \text{ }^1\text{ãã}^1\text{ãã } ^1/2\text{ãò } \bullet\text{ãã|ããè } \text{Öö } \text{ý}$ (iv) $\text{ }^1\text{ãã}^1\text{ãPãããÊã|ã}$
 $\text{ }^1\text{ãÔãé } \text{Öãñ|ããè } \text{Ööý}$

(Æã) $\text{ }^1\text{ãÊã } \text{ }^1\text{ÊãòÔã } \text{Öãñ|ãã } \text{Öö} \text{ -}$

(i) $\text{ }^1\text{ããèPã } ^1/2\text{ãò } ^1/2\text{ããñ}^{\text{a}}\text{ã } |ã^{\circ}\text{ãã } \text{ãã} \ddot{\text{ }}\text{ãŠ¥ããÀãò } ^1\text{ãÀ } ^1\text{ã}^1\text{ãÊãã } \text{(iii) } \text{ãã} \ddot{\text{ }}\text{ãŠ¥ããÀãò}$
 $\text{ }^1\text{ãÀ } ^1/2\text{ããñ}^{\text{a}}\text{ã } \text{ }^1\text{ããèPã } ^1/2\text{ãñã } ^1\text{ã}^1\text{ãÊãã } \text{ý}$

(ii) $\text{ }^1\text{ãí¥ãÃ } \text{ }^1\text{Ôã}^1/2\text{ã|ãÊã } \text{(iv) } \text{ }^1\text{Ôã}^1/2\text{ãã¥ã } ^1/2\text{ããñ}^{\text{a}}\text{ãf}^{\text{a}} \ddot{\text{ }}\text{ãŠã } |ã^{\circ}\text{ãã } \text{ }^1\text{ã}^{\circ}\text{ãŠ } |ãÊã$

(Øã) $\text{ }^1\text{ãìã|ãÊã } \text{ }^1\text{ÊãòÔã } ^1\text{ãÃã } \text{ãã} \ddot{\text{ }}\text{ãŠÔããè } \text{ }^1\text{ãÔ}^1\text{ãì } \ddot{\text{ }}\text{ãŠã } ^1\text{ãÆãã|ããã}^{\circ}\text{ } ^1/2\text{ }^1\text{ã}^{\circ}\text{ã|ãã}$
 $\text{Öö } ?$

(i) $\text{ }^1\text{ãã}^1/4\text{ãÔããè } \text{ }^1\text{ã}^1\text{ã} \text{ }^1\text{ãü}^1\text{ã } \text{(iii) } \text{ }^1\text{ãã}^1/4\text{ãÔããè } \text{ }^1\text{Ôããèf}^{\text{a}}\text{ã } \text{ }^1\text{ãññ}^{\text{a}}\text{ã}$

(ii) $\text{ }^1\text{ãã}^1/4\text{ãÔããè } \text{ }^1\text{ã}^1\text{ã} \text{ }^1\text{ãññ}^{\text{a}}\text{ã } \text{(iv) } \text{ }^1\text{ãã}^1/4\text{ãÔããè } \text{ }^1\text{Ôããèf}^{\text{a}}\text{ã } \text{ }^1\text{ãü}^1\text{ã}$

(Üã) $\text{ }^1\text{ãñ } ^1\text{ããÀ}^1\text{ãÃ} \ddot{\text{ }}\text{ãŠ } ^1/2\text{ããf}^3/4\text{ã}^1/2\text{ãò } \ddot{\text{ }}\text{ãŠãñ } \text{ }^1\text{ãÊãØã } \ddot{\text{ }}\text{ãŠÀ¥ãñ } \text{ }^1\text{ããÊãñ } ^1\text{ãðÓÝ}$
 $\text{ }^1\text{ãÀ } ^1\text{ãÆ} \ddot{\text{ }}\text{ãŠãÍã } \ddot{\text{ }}\text{ãŠãè } \text{ãã } \ddot{\text{ }}\text{ãŠÀ¥ã } \text{ }^1\text{ãã}^1/4\text{ãÊã}^1/2\text{ }^1\text{ã}^1\text{ã|ãá } \text{ }^1\text{ãã}^1\text{ãã|ã|ã } \text{Öãñ¥ãñ}$

$\text{ }^1\text{ãÀ } \text{ }^1\text{ã}^1\text{ã}^1\text{ã|ãÃ¥ã } \ddot{\text{ }}\text{ãŠãñ¥ã } \ddot{\text{ }}\text{ã}^{\text{c}}\text{ãã } \text{Öãñ|ãã } \text{Öö } ?$

(i) 90° (ii) 45° (iii) 0° (iv) 60°

(0ã) „||ãÊã ÊãòÔã ‡ ãñŠ Ôãã½ã¶ãñ 2F ¹ãÀ ããÔ©ã|ã ÌãÔ|ãi ‡ ãŠã
¹ãÆãã|ããã°ã½°ã ‡ ãŠÖãú ¹ãÀ °ã¶ã|ãã Öõ ?

(Üã) ää' | ääë³⁄₄ä ½ääf³⁄₄ä½ä ½äò 'äÆ † äŠäÍä † äŠäè PääÊä | ä©ää 'äÆ©ä½ä ½ääf³⁄₄ä½ä ½äò 'äÆ † äŠäÍä † äŠäè PääÊä † äñŠ , ä¶äi' ää|ä † äŠän † ä<³⁄₄ää † äŠÖ|än Öö ?

(Ý) 'äŠän† äŠÔä 'äÄäè † ä<³⁄₄ää Öö ?

(Pä) ÊäòÔä † äñŠ 'äÆ † äŠäääÍä † äŠ † äñŠ¶ Ôän Øäi•äÀ¶än ÍääÊääè ää¶äØäÄ|ä 'äÆ† äŠäÍä ää† äŠÄ¥ä † äŠä ½ääØäÄ † äöŠÔää Öän|ää Öö ?

5. ääPä¬ä † äŠäè ÔäÖä³⁄₄ä|ää Ôän ÊäòÔä † äñŠ Íä%äŠ|ää † äñŠ¶, ½äiÆ³⁄₄ä , äää | ä©ää 'äÆ† äŠäääÍä† äŠ † äñŠ¶ † äŠän Ô'äÓ> † äŠäèää•ä†ý

6. , äää¹⁄₄äÔääÄäè | ä©ää , ä¹äÔääÄäè ÊäòÔä ½äò † ä<³⁄₄ää , ä¶|äÄ Öän|än Öö ?

7. „|| äÊä ÊäòÔä † äñŠ 'äŠän† äŠÔä | ä©ää 'äÆ † äŠäääÍä † äŠ † äñŠ¶ † äñŠ ½äf³⁄₄ä ääÔ©ä|ä ÍäÔ|äi † äŠä 'äÆää|äää¹⁄₂ä °ä¶ä¶ä ääPä¬ä 'äÄä 'äÄä†ý

8. ¾ääöääØä† äŠ Ôäiä¹⁄₂ä'ääè ½äò 'äÆää|äää¹⁄₂ä † äŠä °ä¶ä¶ä ää† äŠÄ¥ä , ääÄñÊä 'äÄä 'äÆääÍäÄ|ä † äŠäèää•ä†ý

9. , ää¹ä † äŠäè † äŠää † äñŠ œä¬ä Ôää•ä³⁄₄ä † äŠän Í³⁄₄ää½ä¹ä>ä> 'äÄ ääÊäÆää Íä^{oa} ÔäÖäè-ÔäÖäè Ô'äÓ> ¶äÖäè Öän|ää Ööý „Ôän ää† äŠÔä 'äÆ† äŠäÄ † äŠä ÔääÓ> 'äñÔä Öö ? „Ôä† äŠñ ää¶äÍääÄ¥ä ½äò ää† äŠÔä 'äÆ† äŠäÄ † äŠñ Êän¶Ôä † äŠä 'äÆ¾ääñØä ää† äŠ³⁄₄ää •ää†Øää ?

10. Íä¥äÄ %ä äŠ¹⁄₂ä † ä<³⁄₄ää Öö ? ÍäÓääÄ ¯äÉ|äi ½äò f¶£ä¶äiÓä † äöŠÔän °ä¶ä|ää Öö ?

11. ää¶äÍääÄ|ä ½äò 'äÆ † äŠäÍä † äŠäè PääÊä 3×10^5 km/s | ä©ää † äŠäüPä ½äò 2×10^8 m/s Öö, | ään † äŠäüPä † äŠä ää¶äÄ¹äñä , ä¹äÍä|äÄ¶äää† äŠ — ää|ä † äŠääÄ†ý

12. •äÊä ½äò 'äÆ † äŠäÍä † äŠäè PääÊä — ää|ä † äŠÄän, ¾äääª •äÊä † äŠä ää¶äÄ¹äñä , ä¹äÍä|äÄ¶äää† äŠ 4/3 Öö | ä©ää ää¶äÍääÄ|ä ½äò 'äÆ † äŠäÍä † äŠäè PääÊä 3×10^8 ½ääè>Ä/ Ôän† ääŠj Ööý

13. 'ää¶ääè ½äò ÄÆääè 'äöääÔäÊä † äŠä 'ää¶ääè ½äò j¹ää Öi, ää ¼ääØä >ñüçä ääªÆää³⁄₄ääè ªñ|ää Öö, † ä<³⁄₄ääò ?

ÜãÄ 'äÄ † äŠÄò

, ä¹ä¶än , ääÔä-¹äü|änÔä ½äò ÄÖ¶än ÍääÊän Í³⁄₄ää † ä<¹⁄₄ääò † äñŠ ÔääÓ>¹äñÔä † äŠä 'ä|ää ÊäØää † äŠÄ ÔäiPääè °ä¶ä†úý ¾äÖ ¼ääè °ä|ää†ä ää † äŠ „¶ä † äñŠ Päi¹⁄₂än ½äò ää † äŠÔä 'äÆ † äŠäÄ † äñŠ ÊäòÔä † äŠä 'äÆ¾ääñØä ÖänØää ý

[back](#)

f‡ãŠãfÃ : 7

Pãì½°ã‡ãŠ|Ìã

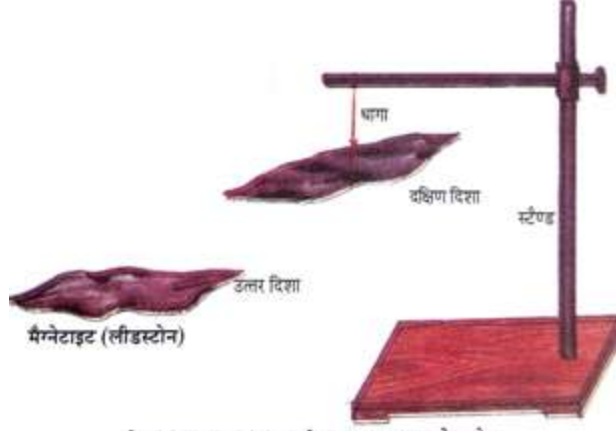


Pãì½°ã‡ãŠ ‡ãñŠ Øãì¥ã ý

Pãì½°ã‡ãŠ|Ìã ‡ãŠã ããÌã²ãì|ã £ããÀã Ôãñ Ôã½°ã® Öãñ¥ãã ý

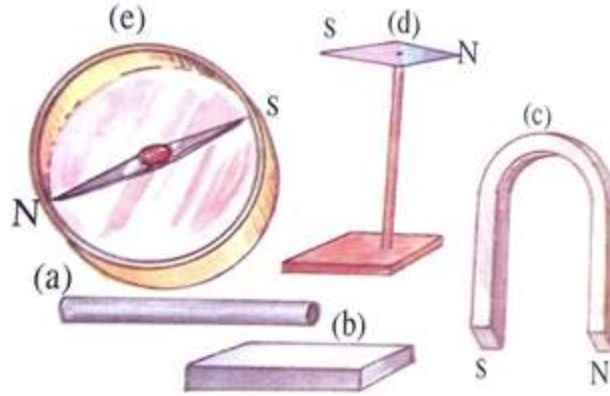
,ãã'ã¥ãñ 'ãÆã³⁄ã: ºñÆãã Öö ãã ‡ãŠ Àñãã;³⁄ããñ, ããÆãÊããõ¥ãñ,
>ñ'ãããÀ ‡ãŠã|ÃÀ, >ñÊããèããÌã•ã¥ã ,ããããª ‡ãñŠ ‡ãìŠœ †ñÔãñ >îñ ¼ããØã
'ãÆã¹|ã Öãñ|ãñ Öö •ããñ ÊããñÖñ ‡ãŠãè ‡ãŠãèÊãò, ÊããñÖñ ‡ãŠãè œãèÊã¥ã
°ããñ|Ã ãã'ã¥ã |ã©ãã ÊããñÖñ Ôãñ °ã¥ããè ÌãÔ|ãì,ããò ‡ãŠãñ ,ã'ã¥ããè ,ããñÀ
,ãã ‡ãŠããÓãÃ|ã ‡ãŠÀ|ããè Öö ¾ãã ÆããéPã|ããè Ööý †ñÔãñ 'ãªã©ãÃ •ããñ
ÊããñÖñ ¾ãã ÊããñÖñ Ôãñ °ã¥ããè ÌãÔ|ãì,ããò ‡ãŠãñ ,ã'ã¥ããè ,ããñÀ
ÆããéPã|ãñ Öö **Pãì½°ã‡ãŠ ‡ãŠÖÊãã|ãñ Ööý •ããñ 'ãªã©ãÃ Pãì½°ã‡ãŠ ‡ãŠãè**
,ããñÀ ,ãã ‡ãŠããÓãÃ|ã Öãñ|ãñ Öö **Pãì½°ã ‡ãŠãè³⁄ã 'ãªã©ãÃ ‡ãŠÖÊãã|ãñ**
Ööý Pãì½°ã ‡ãŠ ‡ãŠãñ ,ããØãÆñ•ããè ½ãò ½ãõØ¥ãñ> (**Magnet**) ‡ãŠÖ|ãñ
Ööý

,ããf† •ãã¥ãò ãã‡ãŠ Pãì½°ã‡ãŠ ‡ãŠãñ ½ãõØ¥ãñ> ‡ã<¾ããò ‡ãŠÖ|ãñ Öö ?
ÊãØã¼ãØã 2500 ÌãÓãÃ 'ãìÌãÃ ¾ãì¥ãã¥ã ºñÌã ‡ãñŠ ÊããñØã ‡ãŠãÊãñ
'ã|©ãÀ Ôãñ Pã½ã| ‡ãŠãÀ ããÆãã³⁄ãã ‡ãŠÀ|ãñ ©ãñ ý ¾ãÖ 'ã|©ãÀ
†ããÌã³⁄ãã ½ããf¥ãÀ ‡ãñŠ ½ãõØã¥ãñããÌã³⁄ãã ¥ãØãÀ ½ãò 'ãã³⁄ãã •ãã|ãã ©ãã
ý fÔã ¥ãØãÀ ½ãò ãã½ãÊã¥ãñ ‡ãñŠ ‡ãŠãÀ¥ã fÔã ‡ãŠã ¥ãã½ã
½ãõØã¥ãñ>ãf> 'ãü;ã ý ,ããØãÆñ•ããè ½ãò fÔãñ ½ãõØã¥ãñ> |ã©ãã ããÖ¥ãè
¼ããÓãã ½ãò Pãì½°ã ‡ãŠ ‡ãŠÖ|ãñ Ööý fÔã½ãò ÊããñÖñ ‡ãŠãñ ,ã'ã¥ããè
,ããñÀ ,ãã ‡ãŠããÓãÃ|ã ‡ãŠÀ¥ãñ ‡ãŠã Øãì¥ã Öãñ|ãã Ööý ‡ãìŠœ Óã½ã³⁄ã
°ããª ÊããñØããò ¥ãñ fÔã‡ãñŠ ,ã¥ã Øãì¥ããò ‡ãŠã ¼ããè 'ã|ãã ÊãØãã³⁄ããý
fÔã 'ã|©ãÀ ‡ãŠãñ fÔã‡ãñŠ ØãìÁ|Ìã ‡ãñŠ³ Ôãñ Ôìã|ã¥ã|ãã 'ãìÌãÃ ‡ãŠ
Êã ‡ãŠã¥ãñ 'ãÀ fÔã ‡ãñŠ ããÔãÀñ ÔãªòÌã „||ãÀ-ªãããã¥ã ããªÌã ½ãò
ããÔ©ãÀ Öãñ •ãã|ãñ Ööý fÔã Øãì¥ã ‡ãñŠ ‡ãŠãÀ¥ã fÔãñ ããªÌã °ã|ãã¥ãñ
ÌããÊãã 'ã|©ãÀ (Êães;Ô>ãñ¥ã) ¼ããè ‡ãŠÖã •ãã¥ãñ ÊãØãã (ããPãª 7.1)ý



चित्र सं० 7.1 स्वतंत्रता पूर्वक लटकता हुआ लोडस्टोन

'ãÆ‡ãðŠãã|ã ½ãò Ôìã|ã¶ã Á¹ã Ôãñ 'ãã¾ãñ •ã¶ãñ ÌããÊãñ fÔã 'ãÆ‡ãŠãÀ ‡ãñŠ Þãì½°ã‡ãŠ ‡ãŠãñ 'ãÆã‡ãðŠãã|ã‡ãŠ Þãì½°ã‡ãŠ ‡ãŠÔ|ãñ Öôây ‡ã¾ãã ,ãã¹ã •ã¶ã|ãñ Öô ãã ‡ãŠ 'ãÆãÞããè¶ã ‡ãŠãÊã ½ãò ¶ããããìã ‡ãŠ ãã¹ãã ‡ãðŠÔãñ —ãã|ã ‡ãŠÀ|ãñ ©ãñ ? 'ãÆãÞããè¶ã ‡ãŠãÊã ½ãñâ ¶ããããìã ‡ãŠ Þãì½°ã‡ãŠ ‡ãŠã ,¹ã¾ããñÔã Ôã½ãì³ãè ¾ãããã ½ãò ãã¹ãã —ãã|ã ‡ãŠÀ¶ãñ ‡ãñŠ ããÊã† ‡ãŠÀ|ãñ ©ãñý °ãã¹ã ½ãò ,ããìãì³ã‡ãŠãã¶ãìÔããÀ ããìããã¼ã¶ã 'ãÆ‡ãŠãÀ ‡ãñŠ ‡ãðŠããã½ã Þãì½°ã‡ãŠ ¼ããè °ã¶ãã ‡ã¾ãñ ý Ìããã ‡ã¾ãããÊããè Þãì½°ã‡ãŠ ‡ãŠãñ°ããÊã -ÔããèÊã, ãã¶ããã ‡ãŠÊã ÔããèÊã ‡ãñŠ °ã¶ãã† •ãããñ Öô ý f¶ã½ãò ,||ãÀ ãã¹ãã 'ãÆãããìãã|ã ‡ãŠÀ¶ãñ ÌããÊãñ ããÔãÀñ 'ãÀ 'N' |ã©ãã ããããã¶ã ãã¹ãã 'ãÆãããìãã|ã ‡ãŠÀ¶ãñ ÌããÊãñ ããÔãÀñ 'ãÀ 'S' ,ãããã‡ãŠã Öãñ|ãã Öôý ‡ãðŠããã½ã Þãì½°ã‡ãŠãò ‡ãñŠ ¶ãã½ã f¶ã‡ãñŠ ,ãã‡ãðŠãã|ã ‡ãñŠ ,ããfããÀ 'ãÀ ÀÊãñ Øã†, ãã•ã¶Öñ ããÞãã 7.2 ‡ãñŠ 'ãÀ ããÀÊãã¾ãã Øã¾ãã Öôý



चित्र सं० 7.2

(i) ¶ããÊã Þãì½°ã‡ãŠ (Horse shoe Magnet)- ¾ãÖ ,ãúÔãÆñ•ããè ‡ãñŠ ,ããÀ ¾ãì (U) ‡ãñŠ ,ãã‡ãŠãÀ ‡ãŠã Öãñ|ãã Öô (ããÞãã 7.2-c)ý

(ii) **°a; Pāi½°ā ‡ āŠ (Bar Magnet)-** ¾āÖ , āā¾ā|āā ‡ āŠāÀ , āāōÀ °āñĒāāāāŠāÀ Ōāñ|āā Ōōý (āāPā̄ā 7.2-b) |ā©āā (āāPā̄ā 7.2-a)

(iii) **Pāi½°ā‡āŠāē¾ā ŌāifĀ (Magnetic Needle):-**

ŌāifĀ ‡āñŠ , āā‡āŠāÀ ‡āŠā Ōāñāñ ‡āñŠ ‡āŠāÀā fŌāñ **Pāi½°ā‡āŠāē¾ā ŌāifĀ** ‡āŠŌ|āñ Ōō (āāPā̄ā 7.2-d)ý ¾āÖ , ā¹āāñ ½āf¾ā āā°āī (ŌāiÁ|lā ‡āñŠ³) ¹āÀ ‡āŠ āī‡āŠāēĒāāē ‡āŠāēĒā ¹āÀ āā‡āŠāē ÀŌ|āāē Ōō ý ¾āÖ āāōāā|ā•ā |āĒā ½āō Ōlā|āā|āā ¹āīlāĀ‡āŠ Ūāi½ā Ōā‡āŠ|āāē Ōō ý fŌā‡āŠā ,||āÀ ‡āŠāē , āāñÀ ‡āŠā āāŌāĀ ,||āĀē fāÆilā (N) , āāōÀ °āāāāā ‡āŠāē , āāñÀ ‡āŠā āāŌāĀ °āāāāāē fāÆilā (S) Ōāñ|āā Ōōý

(iv) **Pāi½°ā‡āŠāē¾ā ‡āŠ½¹āāŌā (‡āŠ½¹āāŌā ŌāifĀ) :-**

¾āÖ ‡āŠ œāñ>āē Pāi½°ā‡āŠāē¾ā ŌāifĀ Ōō •āāñ ‡āŠ āā|āā°¾āā ½āō °āī ÀŌ|āāē Ōō ý āā|āā°¾āā ‡āñŠ ...¹āÀ ‡āŠāúPā ‡āŠāē ¹Ēāñ ĒāŌāē Ōāñ|āāē Ōō ý fŌā½āō ¼āāē ,||āÀ ‡āŠāē , āāñÀ ‡āŠā āāŌāĀ ,||āĀē fāÆilā (N) , āāōÀ °āāāāā ‡āŠā āāŌāĀ °āāāāāē fāÆilā (S) Ōāñ|āā Ōō (āāPā̄ā 7.2-e)ý

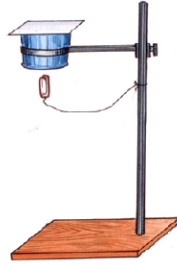
¾ā¾āā , āā¹ā •āāā|āñ Ōōā ?

ĒāŌā¼āŌā 1800 lāŌāĀ ¹āīlāĀ ŌālāĀ¹āÆŌā½ā Pāāēā ¹ñlā āñ Pāi½°ā‡āŠ ‡āñŠ āā¹āā °āāāāñ ‡āñŠ Ōāīā ‡āŠā , ¹¾āāāñŌā ‡āŠĀ ‡āñŠ Pāi½°ā‡āŠāē¾ā ‡āŠ½¹āāŌā (Ōā½āi³āē ‡āŠ½¹āāŌā) ‡āŠā , āāāālāŌ ‡āŠāĀ āā‡āŠ¾āā ý fŌā‡āŠāē Ēāāñ•ā Ōāñ Ōā½āi³āē ¾āā̄āā ‡āā lāā lāāĀ ‡āñŠ āāñ̄ā ½āō āāfĀ %āāŠāāāā , āāfĀ ý fŌā‡āñŠ , āāā|āāāĀ‡ā<ā āālālā ‡āñŠ °āŌlā Ōāñ ā† Ō©āāāāō ‡āŠāē Ēāāñ•ā ‡āŠāē ŌāfĀ ý

Pāi½°ā‡āŠ ‡āñŠ Ōāīā :-

āā%āŠ¾āā ‡āŠĒāā¹ā 7.1

¹ĒāāāāŌ>‡āŠ , āāāāā ‡āŠāŌā•ā ‡āŠā ‡āŠ ¹¾āāĒāā Ēāāēāā•ā†ý fŌāñ ‡āŠ Ō>ōj ¹āÀ ‡āĒāō¹ā ‡āŠāē ŌāŌā¾ā|āā Ōāñ ‡āŠŌā °āēāā•ā† (āāPā̄ā 7.3)ý ¹¾āāĒāñ ‡āñŠ , āāÀ ‡āŠ Pāi½°ā‡āŠ ÀāāĒā† |ā©āā fŌāñ ‡āŠāŌā•ā Ōāñ □‡āŠ °āēāā•ā† , āā•āŌāŌāñ āā‡āŠ Pāi½°ā‡āŠ āāāāāfĀ āāñý ĒāāñŌñ ‡āñŠ °āāñ ‡āŠ āā‡āĒā¹ā ‡āŠāñ ‡āŠ fāāŌāñ Ōāñ °āāāāāfā†ý fāāŌāñ ‡āñŠ °īŌāĀñ āāŌāĀñ ‡āŠāñ Ō>ōj ‡āñŠ , āāfāāÀ ‡āñŠ Ōāā©ā °āāāfā °āēāā•ā†ý āā‡āĒā¹ā ‡āŠāñ ¹¾āāĒāñ ‡āñŠ , āāfāāÀ ‡āñŠ Ōā½āāē¹ā Ēāāf†ý āā‡āĒā¹ā āā°āāā āā‡āŠŌāē ŌāŌāĀñ ‡āñŠ ‡āŠ ¹āāāŌā ‡āŠāē ¼āāāāā|ā Ōlāā ½āō Á‡āŠĀ ÀŌ|āā Ōō , ¾ā¾āāō ? ¹¾āāĒāñ ‡āñŠ , āā¹ā , ¹āāāŌā|ā Pāi½°ā‡āŠ ĒāāñŌñ ‡āñŠ āā‡āĒā¹ā ‡āŠāñ , ā¹āāē , āāñÀ ĒāāēPā|āā Ōōý



ããPã"ã Ôãã0 7.3 Pãi½°ã†ãŠ ‡ãŠã 'ãÆ¼ããlã

ãã%ãŠ¾ãã ‡ãŠÊãã'ã 7.2

□ ããlããã¼ã¶¶ã 'ãÆ ‡ãŠãÀ ‡ãŠãè lãÔ|ãl ‡ú •ãõÔãñ -'ãòããÔãÊã, À°ãÀ, |ããú°ãã, 'ããè|ãÊã ‡ãñŠ œãñ>ñ »ì†ãŠüjñ, ãã'ã¶ã, ããÔãÊããfÃ ÔãlfÃ, °ããñjÃ ãã'ã¶ã, ÊããñÔñ ‡ãñŠ œãèÊã¶ã Êãòý

□ ‡†ãŠ Pãi½°ã†ãŠ ‡ãŠãñ Êãñ†ãŠÀ °ããÀãè-°ããÀãè Ôãñ 'ãÆ¼ããñ†ãŠ lãÔ|ãl ‡ãñŠ 'ããÔã Êãñ •ãã†úý ‡ã<¾ãã Ôãñ|ãã Öö ?

,ãã'ã 'ãã|ãñ Öö ãã ‡ãŠ ãã'ã¶ã, ÔãlfÃ (ããÔãÊããfÃ), °ããñjÃ ãã'ã¶ã |ã©ãã ÊããñÔñ ‡ãñŠ œãñ>ñ »ì†ãŠüjñ Pãi½°ã†ãŠ ‡ãŠãè ,ããñÀ ,ãã†ãŠããÓãÃ|ã Öãñ •ãã|ãñ Öö ý

□ 'ãòããÔãÊã, À°ãÀ, |ããú°ãã ‡lãã 'ããè|ãÊã ‡ãñŠ »ì†ãŠüjñ ,ãã ‡ãŠããÓãÃ|ã ¶ãÔãé Öãñ|ãñ Öò ý ‡ã<¾ããò ?

Pãi½°ã†ãŠ ãã•ã¶ã 'ãã©ããò ‡ãŠãñ ,ã'ã¶ããè ,ããñÀ ,ãã†ãŠããÓãÃ|ã ‡ãŠÀ|ãñ Öö „¶Öò Pãi½°ã†ãŠãè¾ã 'ãã©ãÃ ‡ãŠÖ|ãñ Öö ý •ããñ 'ãã©ãÃ Pãi½°ã†ãŠ ‡ãŠãè ,ããñÀ ,ãã ‡ãŠããÓãÃ|ã ¶ãÔãé Öãñ|ãñ „¶Öò ,ãPãi½°ã ‡ãŠãè¾ã 'ãã©ãÃ ‡ãŠÖ|ãñ Öö ý fÔã ãã%ãŠ¾ãã ‡ãŠÊãã'ã Ôãñ ¾ãÖ ãã¶ãÓ†ãŠÓãÃ ãã¶ã ‡ãŠÊã|ãã Öö ãã ‡ãŠ ãã'ã¶ã, ÔãlfÃ (ããÔãÊããfÃ) °ããñjÃãã'ã¶ã |ã©ãã ÊããñÔñ ‡ãñŠ œãñ>ñ-œãñ>ñ »ì†ãŠüjñ Pãi½°ã†ãŠãè¾ã 'ãã©ãÃ Öö |ã©ãã 'ãòããÔãÊã, À°ãÀ, |ããú°ãã ‡lãã 'ããè|ãÊã ,ãPãi½°ã†ãŠãè¾ã 'ãã©ãÃ Ööý

ãã%ãŠ¾ãã ‡ãŠÊãã'ã 7.3

□ ‡†ãŠ ‡ãŠãØã•ã 'ãÀ ÊããñÔñ ‡ãŠã °ãlÀããã Êãñ†ãŠÀ 'ãõŠÊãã °òý

□ ‡†ãŠ œüj Pãi½°ã†ãŠ ‡ãŠãñ ÊããñÔñ ‡ãñŠ °ãlÀããñ 'ãÀ Êãñ •ãã ‡ãŠÀ PããÀãò ,ããñÀ Üãl½ãã†úý ‡ã<¾ãã ãñÊã|ãñ Öö ?

,ãã'ã ãñÊã|ãñ Öö ãã ‡ãŠ Pãi½°ã†ãŠ ‡ãñŠ ãã¶ããò ããÔãÀãò 'ãÀ ÊããñÔñ ‡ãŠã °ãlÀããã ÔããÔãñ ,ãããfã ‡ãŠ ½ãããã ½ãò ããPã'ã ‡ãŠ|ãã Öö (ããPãã 7.4)ý

□ ‡ã<¾ãã ãã¶ãÓ†ãŠÓãÃ ãã¶ã†ãŠÊã|ãã Öö ?



चुम्बकीय सूई का ध्रुव किस ध्रुव की ओर आकर्षित होता है ?
 • चुम्बकीय ध्रुव

□, पृथ्वी के दक्षिणी ध्रुव (South Pole) की ओर चुम्बकीय ध्रुव आकर्षित होता है।

चुम्बकीय ध्रुव किस ध्रुव की ओर आकर्षित होता है ?
 • चुम्बकीय ध्रुव

□ चुम्बकीय ध्रुव किस ध्रुव की ओर आकर्षित होता है ?

पृथ्वी के दक्षिणी ध्रुव (South Pole) की ओर चुम्बकीय ध्रुव आकर्षित होता है।
 पृथ्वी के दक्षिणी ध्रुव (South Pole) की ओर चुम्बकीय ध्रुव आकर्षित होता है।

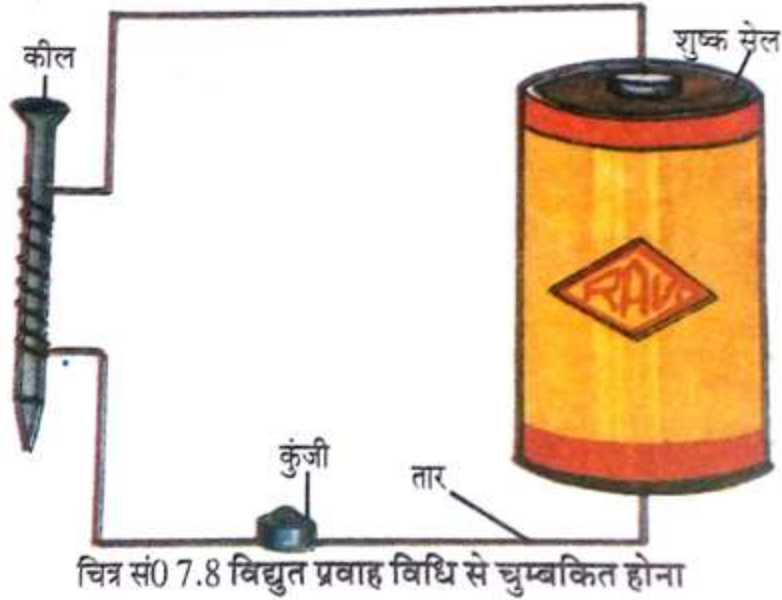
पृथ्वी के दक्षिणी ध्रुव की ओर चुम्बकीय ध्रुव आकर्षित होता है :-

□ पृथ्वी के दक्षिणी ध्रुव (South Pole) की ओर चुम्बकीय ध्रुव आकर्षित होता है।
 पृथ्वी के दक्षिणी ध्रुव (South Pole) की ओर चुम्बकीय ध्रुव आकर्षित होता है।

□ पृथ्वी के दक्षिणी ध्रुव (South Pole) की ओर चुम्बकीय ध्रुव आकर्षित होता है।
 पृथ्वी के दक्षिणी ध्रुव (South Pole) की ओर चुम्बकीय ध्रुव आकर्षित होता है।

□ पृथ्वी के दक्षिणी ध्रुव (South Pole) की ओर चुम्बकीय ध्रुव आकर्षित होता है।
 पृथ्वी के दक्षिणी ध्रुव (South Pole) की ओर चुम्बकीय ध्रुव आकर्षित होता है।

पृथ्वी के दक्षिणी ध्रुव की ओर चुम्बकीय ध्रुव आकर्षित होता है :-



□ $\frac{1}{2}$ से अधिक कोइल के धातु के तारों से बनाई जायेगी $\frac{1}{4}$ से अधिक, $\frac{1}{2}$ से अधिक तारों से बनाई जायेगी

□ $\frac{1}{4}$ से अधिक कोइल के धातु के तारों से बनाई जायेगी ?

कोइल के धातु के तारों से बनाई जायेगी $\frac{1}{4}$ से अधिक, $\frac{1}{2}$ से अधिक तारों से बनाई जायेगी $\frac{1}{2}$ से अधिक तारों से बनाई जायेगी

कोइल के धातु के तारों से बनाई जायेगी $\frac{1}{4}$ से अधिक, $\frac{1}{2}$ से अधिक तारों से बनाई जायेगी $\frac{1}{2}$ से अधिक तारों से बनाई जायेगी

□ $\frac{1}{2}$ से अधिक कोइल के धातु के तारों से बनाई जायेगी ?

□ $\frac{1}{4}$ से अधिक कोइल के धातु के तारों से बनाई जायेगी ?

□ $\frac{1}{2}$ से अधिक कोइल के धातु के तारों से बनाई जायेगी $\frac{1}{4}$ से अधिक, $\frac{1}{2}$ से अधिक तारों से बनाई जायेगी

□ $\frac{1}{4}$ से अधिक कोइल के धातु के तारों से बनाई जायेगी ?

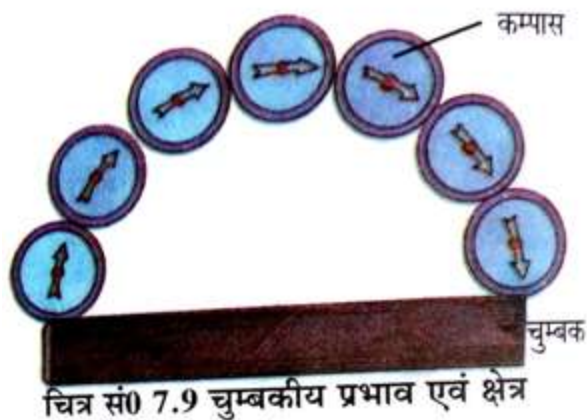
कोइल के धातु के तारों से बनाई जायेगी $\frac{1}{4}$ से अधिक, $\frac{1}{2}$ से अधिक तारों से बनाई जायेगी

$\frac{1}{2}$ से अधिक कोइल के धातु के तारों से बनाई जायेगी $\frac{1}{4}$ से अधिक, $\frac{1}{2}$ से अधिक तारों से बनाई जायेगी

(1) कोइल के धातु के तारों से बनाई जायेगी

(2) कोइल के धातु के तारों से बनाई जायेगी

कोइल के धातु के तारों से बनाई जायेगी $\frac{1}{4}$ से अधिक, $\frac{1}{2}$ से अधिक तारों से बनाई जायेगी :-



‡ aiŠœ †iÀæ ‡ añŠ †aa ‡ aŠ½¹aaÔa ÔaifÃ †aÀ Pài½°a ‡ aŠ ‡ aŠa ‡ aŠañfÃ
 †aÆ¼aaİlā ¶āÖæ †aüj|āā Ööý ‡ a<³⁄₄aa āā¶āÓ‡aŠÓaÃ āā¶ā‡aŠÊā|āā Öö ?
 Pài½°a ‡ aŠ ‡ añŠ PāāÀāò ,āāñÀ † ‡ aŠ Ôāāèāā½ā|ā Ôāā¶ā |ā ‡ aŠ Öāè
 Pài½°a‡aŠæ³⁄₄ā †aÆ¼aaİlā Öāñ|āā Öö ý

**Pài½°a ‡ aŠ ‡ añŠ PāāÀāò ,āāñÀ ‡ aŠa İaÖ āāñ"ā āā•aÔa½āò
 Pài½°a‡aŠæ³⁄₄ā †aÆ¼aaİlā ‡aŠa ,ā¶āi¼āİlā Öāñ|āā Öö, Pài½°a‡aŠæ³⁄₄ā
 āāñ"ā ‡aŠÖÊāā|āā Ööý**

‡ a<³⁄₄aa Pài½°a ‡ aŠæ³⁄₄ā †aÆ¼aaİlā Ôā¼āāè İaÔ|ai,āāò ‡ añŠ ,āāÀ-†āāÀ
 ,ā¶āi¼āİlā āā‡aŠ³⁄₄āā •āā Ôā‡aŠ|āā Öö ?

□ āā%aaŠ³⁄₄āā ‡aŠÊāā'ā 7.9

□ † ‡ aŠ œüj Pài½°a ‡ aŠ Êāò ý fÔa ‡ añŠ Ôāā½ā¶āñ ‡ aiŠœ †iÀæ
 (Pài½°a‡aŠæ³⁄₄ā āāñ"ā ½āò) †aÀ ‡aŠ½¹aaÔa ÔaifÃ ÀÊāò ý

‡ a<³⁄₄aa Öāñ|āā Öö ? ÔaifÃ āāİāāñāā'ā|ā Öāñ •āā|āāè Öö ý

□ ,āā ‡ aŠ½¹aaÔa ÔaifÃ ,āāòÀ œüj Pài½°a‡aŠ ‡ añŠ †aāèPā † ‡ aŠ ÊāāñÖñ
 ‡ aŠæ İaÔ|ai (PāāÀ)Êāüjāè ‡ aŠa ‡ añŠ ÀÊāò (āāPā"ā 7.10)ý ‡ a<³⁄₄aa
 Öāñ|āā Öö ? ‡aŠ½¹aaÔa ÔaifÃ †aÀ ‡aŠañfÃ †aÆ¼aaİlā ¶āÖæ †aüj|āā Ööý
 ‡ a<³⁄₄aaò ? Pài½°a ‡ aŠ ‡ aŠa †aÆ¼aaİlā ÊāāñÖñ ‡ aŠæ PāāÀ ‡ añŠ ,āāÀ-
 †āāÀ ¶āÖæ āā¶ā‡aŠÊā †āā|āā Öö ý
 ‡aŠ½¹aaÔa ÔaifÃ



चित्र सं० 7.10 वस्तु के आर-पार चुम्बकीय प्रभाव

□ ,āā Pài½°a ‡ aŠ ,āāòÀ ‡ aŠ½¹aaÔa ÔaifÃ ‡ añŠ †aāèPā ‡ aŠāúPā ‡ aŠæ
 †Êāñ, Êā ‡ aŠüjāè ‡ aŠæ |āÊāāè, †a<³⁄₄aaè ‡ aŠa >ì ‡ aŠüjā ,āāāā †aāÀāè-
 †aāÀāè Ôāñ ÀÊāòý ‡ a<³⁄₄aa Öāñ|āā Öö ?

□ ‡aŠ½¹aaÔa ÔaifÃ āāİāāñāā'ā|ā Öāñ •āā|āāè Öö ý ‡ a<³⁄₄aaò ?

Pài½°a‡aŠ ‡ aŠa †aÆ¼aaİlā f¶ā †aā©āāò ‡ añŠ ,āāÀ-†āāÀ āā¶ā‡aŠÊā •āā|āā
 Öö ý fÔāāāÊā† f¶ā †aā©āāò ‡ añŠ †iÔāāè |āÀ'āŠ ¼āāè Pài½°a‡aŠæ³⁄₄ā
 ÔaifÃ āāİāāñāā'ā|ā Öāñ •āā|āāè Öö ý fÔāÔāñ ‡ a<³⁄₄aa āā¶āÓ‡aŠÓaÃ
 āā¶ā‡aŠÊā|āā Öö ?

‡ ãĩŠœ 'ãªã©ããô ‡ ãñŠ ,ããÀ-'ããÀ ¼ããè Þãĩ½ª ‡ ãŠãè¾ã 'ãÆ¼ããĩã
ãã¶ã‡ãŠÊã •ãã|ãã Öõ ý

•ãªã ãã‡ãŠÔããè Þãĩ½ª‡ãŠ ‡ãñŠ (,||ãÀãè ,ã©ãĩãã ªãããªããè) ããÆĩã ‡ãñŠ
'ããÔã ‡ãŠ½'ããÔã ÔãĩfÃ Æãã|ãñ Öõ |ãª „Ôã½ãò ããĩãããñ'ã ,ãããã‡ã ‡ãŠ
Ôãñ|ãã Öõ ,ããõÀ •ãªã Þãĩ½ª‡ãŠãè¾ã ããÆĩã Ôãñ ªĩÀ Æãã|ãñ Öõ |ãª
„Ôã½ãò ããĩãããñ'ã ‡ãŠ½ã Ôãñ|ãã Öõ ý
Þãĩ½ª‡ãŠ Ôãñ ªĩÀ •ãã¶ãñ 'ãÀ Þãĩ½ª‡ãŠãè¾ã àãñª ‡ãŠã ½ãã¶ã ‡ãŠ½ã
Ôãñ|ãã •ãã|ãã Öõ ý

**Þãĩ½ª‡ãŠ ‡ãŠã Þãĩ½ª‡ãŠãè¾ã àãñª „Ôã ‡ãñŠ ããÆĩããò ‡ãŠãè
'ãÆªãÊã|ãã |ã©ãã „Ôã ‡ãñŠ 'ãÆñãã‡ãŠ ‡ãŠãè ªĩÀãè 'ãÀ ãã¶ã¼ãÃÀ
‡ãŠÀ|ãã Öõ ý**

‡ã<¾ãã Þãĩ½ª‡ãŠ ‡ãñŠ ããÆĩããò ‡ãŠãñ †‡ãŠ ªĩÔãÀñ Ôãñ ,ãÊãØã
‡ãŠÀ‡ãñŠ Ôĩã|ã¶ã ããÆĩã 'ãÆã'ã ãã‡ãŠ¾ãã •ãã Ôã‡ãŠ|ãã Öõ ?

ãã%ãŠ¾ãã ‡ãŠÊãã'ã 7.10

- †‡ãŠ œü| Þãĩ½ª‡ãŠ |ã©ãã Þãĩ½ª‡ãŠãè¾ã ‡ãŠ½'ããÔã Êãò ý
- Þãĩ½ª‡ãŠ ‡ãŠ ‡ãŠãñ Ôĩã|ã¶ã|ãã 'ãĩãÃ ‡ãŠ Êã‡ãŠã ‡ãŠÀ „||ãÀãè †ĩãã
ªãããªããè ããÆĩã —ãã|ã ‡ãŠÀ Êãòý
- Þãĩ½ª‡ãŠ ‡ãŠãñ ªããèÞã Ôãñ |ããñü|ò (ããÞãª 7.11)ý



चित्र सं० 7.11 चुम्बक में ध्रुव उत्तर - दक्षिण

□ f¶ã ªĩ‡ãŠüãò ‡ãŠã ‡ãŠ½'ããÔã ÔãĩfÃ Ôãñ 'ãÀãèããã ‡ãŠÀò ý ‡ã<¾ãã
Ôãñ|ãã Öõ ?

ªñ Ôĩ † †ãŠüñ Þãĩ½ª‡ãŠ ‡ãŠ ‡ãŠãè ¼ããüãã|ã İ¾ãĩãÔãÀ ‡ãŠÀ|ãñ Öõ ý
f¶ã½ãò †‡ãŠ ããÔãÀã „||ãÀãè |ã©ãã ªĩÔãÀã ããÔãÀã ªãããªããè ããÆĩã Öõ
fÔãÔãñ œãñññ-œãñññ ªĩ‡ãŠüñ ‡ãŠÀ¶ãñ 'ãÀ ¼ããè 'ãÆ¾ãã‡ãŠ ªĩ‡ãŠüñ
½ãò „||ãÀãè ,ããõÀ ªãããªããè ããÆĩã 'ãã¾ãñ •ãã|ãñ Öõ ý

**Þãĩ½ª‡ãŠ ‡ãŠ ‡ãñŠ ããÆĩããò ‡ãŠãñ †‡ãŠ ªĩÔãÀñ Ôãñ ,ãÊãØã ¶ãÔãé
ãã‡ãŠ¾ãã •ãã Ôã‡ãŠ|ãã Öõý**

- †ã<³/₄ãã ãä¶ãÓ†ãŠÓãÃ ãä¶ã†ãŠÊã|ãã Öö ?

Pāi^{1/2}ā ‡ āŚ ‡ āŚā āā¶āāāI Pā|ā 'āÀāēāāYā 'āÆāā|ā ‡ āŚÓāĀYā Ōāñ Ōāñ|āā Ōō ý

‡ā<^{3/4}āā 'āð©Iāāē Pāi^{1/2}ā‡āŚ ‡āŚāē ¼āāāāā|ā I^{3/4}āIāŌāÀ ‡āŚÀ|āāē Ōō ?

āā%āŚ^{3/4}āā ‡āŚĒāā'ā 7.12

□ ÊāŌā¼āŌā 15 cm Êā^{1/2}āāfĀ ‡āŚā ‡‡āŚ Pāi^{1/2}ā‡āŚ |ā©āā ‡‡āŚ œāñ>ā 5 cm Êā^{1/2}āāfĀ ‡āŚā œāñ>ā Pāi^{1/2}ā ‡āŚ Êāñ ‡āŚÀ āāPā'āā¶āiŌāāÀ °āü|ñ Pāi^{1/2}ā ‡āŚ ‡āñŚ ...'āÀ œāñ>ñ Pāi^{1/2}ā ‡āŚ ‡āŚāñ āāIāā¼āā¶ā āāŌ©āāā|ā^{3/4}āā ðāñŚ ,ā¶āiŌāāĀ Êā>‡āŚā†úý‡ā<^{3/4}āā °ñÆā|āñ Ōōā ?

'āŌĒāāē †Iāā 'āāúPāIāāē āāŌ©āāā|ā ½āō œāñ>ā Pāi^{1/2}ā ‡āŚ ...fIāĀ |āĒā ½āō, |āāēŌāĀē āāŌ©āāā|ā ½āō āāōāā|ā•ā |āĒā ½āō, °IŌāĀē †Iāā Pāāð©āāē āāŌ©āāā|ā ½āō āāōāā|ā•ā |āĒā ‡āñŚ Ōāā©ā āā ‡āŚŌāāē āā¶āāāI Pā|ā ‡āŚāñYā 'āÀ çāi‡āŚā Ōi,āā āāÆāāfĀ °ñ|āā Ōō (āāPā'ā 7.13)ý



•āā Ōiā|ā¶ā|āā'āIāĀ‡āŚ Êā>‡āñŚ Ōi† āā‡āŚŌāāē °āü|ñ Pāi^{1/2}ā‡āŚ ‡āŚāñ 'āð©Iāāē |āĒā 'āÀ „|āĀē ŌāāñĒāā®Ā Ōāñ °āāāYāāē ŌāāñĒāā®Ā ‡āŚāē ,āāñĀ Êāñ •āā|āñ Ōō, |ā°ā °ā| Pāi^{1/2}ā ‡āŚ „Ōāāē ¼āāúāā|ā I^{3/4}āIāŌāÀ ‡āŚÀ|āā Ōō •āōŌāā āā‡āŚ °āü|ñ Pāi^{1/2}ā‡āŚ ‡āñŚ ...'āÀ œāñ>ā Pāi^{1/2}ā‡āŚ I^{3/4}āIāŌāÀ ‡āŚÀ|āā Ōōý fŌāŌāñ ‡ā<^{3/4}āā āā¶āŌ‡āŚŌāĀ āā¶ā‡āŚĒā|āā Ōō ? 'āð©Iāāē, Pāi^{1/2}ā‡āŚ ‡āŚāē ¼āāúāā|ā I^{3/4}āIāŌāÀ ‡āŚÀ|āāē Ōōý

Pāi^{1/2}ā‡āŚ ‡āŚā ÀÆā-ÀÆāāIā :-

Pāi^{1/2}ā ‡āŚ ‡āŚā Pāi^{1/2}ā ‡āŚ|ā °ā¶āā^{3/4}āñ ÀÆā¶āñ ‡āñŚ āāĒā^{3/4}āñ ,āfāāñāĒāāāÆā|ā ŌāāIāfāāā¶ā^{3/4}āāú °āÀ|āñā -

(i) °āñ Pāi^{1/2}ā ‡āŚāō ‡āŚāñ ,āā'āŌā ½āō ¶ā ÀŌāü|ñāý āāIā'āĀē|ā āā'Iāā ½āō ÜāŌāĀYā ¶ā ‡āŚĀòý

(ii) Pāi^{1/2}ā‡āŚ ‡āŚāñ ¶ā 'āāē>ò, ¶ā Yāñ‡āòŚ ,āāðÀ ¶ā Ōāē ...úPāāfĀ Ōāñ •ā^{1/2}āāē¶ā 'āÀ āāŌāĀ†úý

(iii) Pāi^{1/2}ā‡āŚ ‡āŚāñ Ōā^{1/2}āĀ ¶ā ‡āŚĀñòý

(iv) 'āāŌā-'āāŌā ÀÆāñ Pāi^{1/2}ā ‡āŚāō ‡āñŚ Ōā^{1/2}āā¶ā fāÆiIāāō ‡āŚāñ Ōāā©ā - Ōāā©ā ¶ā ÀÆāòý

(v) Ō©āā^{3/4}āāē Pāi^{1/2}ā ‡āŚāō ‡āñŚ Pāi^{1/2}ā ‡āŚ|ā ‡āŚāñ °ā¶āā† ÀÆā¶āñ ‡āñŚ āāĒā† ¶ā^{1/2}āĀ ÊāāñŌñ ‡āñŚ Àāā‡āŚ ‡āŚā „'ā^{3/4}āāñŌā āā‡āŚ^{3/4}āā •āā|āā Ōō ý (āāPā'ā 7.14) keās Devegmeej °āñ Pāi^{1/2}ā ‡āŚāō ‡āñŚ



□ ,ãª ããlã²ãl|ã £ããÀã ‡ãŠã ¹ãÆlããÖ °ãª ‡ãŠÀ °òý ‡ã<³⁄₄ãã Öãñ|ãã Öö
? Þãl¹⁄₂ã ‡ãŠãë³⁄₄ã ÔãlƒÃ ,ã¹ãªããè ¹ãlîlÃã ããÖ©ããã|ã ¹⁄₂ãò ,ãã •ãã|ããè Ööý

□ fÔã‡ãñŠ |ããÀ ‡ãñŠ ããÔãÀãò ‡ãŠãñ ããPããã¶ãìÔããÀ ÍãìÓ‡ãŠ ÔãñÊã
(B), ‡ããìŠ•ããè (K)ã©ãã £ããÀã ãã¶ã³/4ã¶ã‡ãŠ (R) Ôãñ •ããñüj ºò ý

□ 'āāāÀ¶āāāāĒā‡āŠā ‡āŠāñ fÔā‡āñŠ ØāīĀ|Īā ‡āñŠ¶ (½ā£¾ā) Ôāñ †òŸ¶ā ĀāāÖ|ā £āāØāñ Ôāñ °āāúfā ‡āŠĀ ÔĪā|ā¶ā|āā 'āīĪāĀ‡āŠ Ēā‡āŠā†ú (āāPāā 7.16)ý

□ ,ā°ā 'āāāÀ¶āāāāĒā‡āŠā ½āò āāĪā²āī|ā £āāĀā 'āĒĪāāāāÖ|ā ‡āŠĀò ‡ā<¾āā Ōāñ|āā Ōō ?

āāĪā²āī|ā £āāĀā 'āĒĪāāāāÖ|ā ‡āŠĀ¶āñ 'āĀ 'āāāÀ¶āāāāĒā‡āŠā „||āĀ-°āāāāŸā āāĪāā ½āò āāŌ©āĀ Ōāñ •āā|āāē Ōō ý ‡ā<¾āāò ? 'āāāÀ¶āāāāĒā‡āŠā ‡āŠ Pāī½°ā ‡āŠ ‡āŠāē ¼āāúāā|ā Ī¾āĪāŌāĀ ‡āŠĀ|āāē Ōō ý ,ā°ā fÔā 'āāāÀ¶āāāāĒā‡āŠā ‡āñŠ āā‡āŠŌāāē ‡āŠ āāŌāĀñ 'āĀ œüĵ Pāī½°ā‡āŠ ‡āŠā „||āĀāē fāĒĪĪā Ēāñ •āā †ú ý ¾āāā° 'āāāÀ¶āāāāĒā‡āŠā ‡āŠā ‡āŠā āāŌāĀā Pāī½°ā ‡āŠ ‡āñŠ āāŌāĀñ Ōāñ ,āā ‡āŠāāŌāĀ|ā Ōāñ|āā Ōō |āāñ 'āāāÀ¶āāāāĒā ‡āŠā ‡āŠā ¾āÖ āāŌāĀā °āāāāŸāāē fāĒĪĪā |ā©āā 'āĒāā|ā‡āŠāāŌāĀ|ā Ōāñ¶āñ 'āĀ ¾āÖ āāŌāĀā „||āĀāē fāĒĪĪā Ōāñ|āā Ōōý

□ 'āāāÀ¶āāāāĒā‡āŠā ½āò āāĪā²āī|ā ‡āŠāē āāĪāā °āĒā ‡āŠĀ œüĵ Pāī½°ā‡āŠ Ōāñ fÔā‡āñŠ āāŌāĀāò ‡āŠā 'āĀāēāāŸā ‡āŠĀòý 'āāāÀ¶āāāāĒā‡āŠā ½āò āāĪā²āī|ā £āāĀā ‡āŠāē āāĪāā °āĒā¶āñ 'āĀ „Ōā‡āñŠ āāŌāĀāò ‡āñŠ fāĒĪĪā ‡āŠāē 'āĒ ‡āðŠāā|ā °āĒā •āā|āāē Ōōý ‡ā<¾āā āā¶āŌ‡āŠŌāĀ āā¶ā‡āŠĒā|āā Ōō ?

£āāĀāĪāāŌāē 'āāāÀ¶āāāāĒā ‡āŠā † ‡āŠ Pāī½°ā ‡āŠ ‡āŠāē ¼āāúāā|ā Ī¾āĪāŌāĀ ‡āŠĀ|āāē Ōō, āā•āŌā ‡āŠā † ‡āŠ āāŌāĀā „||āĀāē fāĒĪĪā (N) |ā©āā °ĪŌāĀā āāŌāĀā °āāāāŸāāē fāĒĪĪā (S) ‡āŠāē |āĀŌ Ī¾āĪāŌāĀ ‡āŠĀ|āā Ōōý

□ 'āāāÀ¶āāāāĒā‡āŠā ½āò fāĒĪĪā ‡āŠā āā¶ā£āāĀŸā āāĪā²āī|ā £āāĀā ‡āñŠ 'āĒĪāāŌ ‡āŠāē āāĪāā ‡āñŠ ,āā£āāĀ 'āĀ Ōāñ|āā Ōōý

£āāĀāĪāāŌāē 'āāāÀ¶āāāāĒā ‡āŠā ‡āñŠ āā•āŌā āāŌāĀñ 'āĀ £āāĀā Īāā½āāĪā|āĀ (Üāüjāē ‡āŠāē Ōāīf¾āāò ‡āñŠ āāĪā'āĀāē|ā) āāĪāā ½āò 'āĒĪāāāāÖ|ā Ōāñ|āāē Ōō „Ōā āāŌāĀñ 'āĀ „||āĀāē fāĒĪĪā N |ā©āā āā•āŌā āāŌāĀñ 'āĀ °āāāāŸāāē|āĀ āāĪāā (Üāüjāē ‡āŠāē Ōāīf¾āāò ‡āŠāē āāĪāā ½āò) ½āò 'āĒĪāāāāÖ|ā Ōāñ|āāē Ōō „Ōā āāŌāĀñ 'āĀ °āāāāŸāāē fāĒĪĪā S °ā¶ā|āā Ōō ý

‡āīŠœ ,āāŌĀ •āā¶āò

āāĪā²āī|ā Pāī½°ā‡āŠ ‡āñŠ ‡ā<¾āā „'ā¾āāñŌā Ōōā ?

□ >ñĒāāēŌāĒā'āŠ †Īāā >ñĒāāē'āŠāñ¶ā ¾āā°āāò ½āò „'ā¾āāñŌā āā‡āŠ¾āā •āā|āā Ōō ý

□ āāĪā²āī|ā ½āāñ>Ā āā•ā¶ā ‡āŠā „'ā¾āāñŌā āāĪā²āī|ā ¾āā°āāò •āðŌāñ 'āāĒāā, ‡āŠ'āüjā £āāñ¶āñ ‡āŠāē ½āĪāāē¶ā ,āāāā ½āò āā‡āŠ¾āā •āā|āā Ōō

ý

- āāīā²āī|ā Üāā>āè †īāā Êāā,,ī Ō¹āāè‡āŠÀ ½āò ý
- ‡ āŠÊā- ‡ āŠāÀĈāā¶āāò ½āò ¼āāÀāè Ō>āèĒā † īāā ÊāāñŌñ ‡ āñŠ
>ì ‡ āŠü|āò / Ōāā¹½āā¶āāò ‡ āŠāñ „Ÿā ‡ āŠÀ † ‡ āŠ Ō©āā¶ā Ōāñ ¹īŌāĀñ
Ō©āā¶ā |ā‡āŠ ¹āŌùīPāā¶āñ ½āò ý
- ÍāÀāèÀ ‡ āñŠ Üāāīā † īāā ,āāúĈā ½āò ¹āū|ñ ÊāāñŌñ ‡ āñŠ œāñ>ñ-œāñ>ñ
‡ āŠŸāāò ‡ āŠāñ āā¶ā ‡ āŠāĒā¶āñ ½āò |āù ‡ ā<À fŌā ‡ āŠā „¹ā³⁄₄āāñŌā
‡ āŠÀ|āñ Ōö ý

Íā^{oa}āīāĒāē

„||āĀāè fāÆīlā North pole
Pāī½°ā‡āŠ Magnet
Pāī½°ā‡āŠāè³⁄₄ā ŌāīfĀ Magnetic Needle
¹āāāāŸāāè fāÆīlā South pole
fāÆīlā Pole
¶āāĒā Pāī½°ā‡āŠ Horse Shoe Magnet
¹āāāĀ¶āāāĒāĒāŠā Solenoid
āāīā²āī|ā Pāī½°ā‡āŠ Electro magnet

,ā¹⁄₃⁄₄āāŌā ¹āÆÍ¶ā

1. āā¶ā½¶āāāĒāāĈā|ā ¹āÆÍ¶āāò ½āò ŌāŌāè āāīā ‡ āŠĒ¹ā œāù> ‡ āŠÀ
,ā¹⁄₃⁄₄āāŌā ¹āīāāŌ|ā‡āŠā ½āò āāĒāāĈā† -
(‡āŠ) Pāī½°ā‡āŠ ¹āĀ ,āā‡āŠāāŌāĀ|ā Ōāñ|āā Ōö -
(i)Ēā‡āŠü|āè ‡ āŠā °āīÀāā (ii) ‡ āŠāúPā ‡ āŠā °āīÀāā (iii) ÊāāñŌñ ‡ āŠā
°āīÀāā (iv) |āāúāñ ‡ āŠā °āīÀāā
(Ĉā) ,āPāī½°ā‡āŠāè³⁄₄ā ¹āāā©āĀ Ōö -
(i) āā¶āā‡āŠĒā (ii) ÊāāñŌā (iii) ‡ āŠāñ°āāĒ> (iv) Ōāāñ¶āā
(Ōā) Pāī½°ā‡āŠāè³⁄₄ā ¹āÆ¹⁄₄āāīā ,āāÀ-¹āāĀ ¶āŌāé āā¶ā‡āŠĒā ¹āā|āā Ōö-
(i) ÊāāñŌñ ‡ āŠāè Pāā¹À Ōāñ (ii) ‡ āŠāúPā ‡ āŠāè ¹ā>á>āè Ōāñ (iii)
Ēā‡āŠü|āè ‡ āñŠ |āĈ|āñ Ōāñ (iv) ‡ āŠāŌā•ā Ōāñ
2. āā¶ā½¶āāāĒāāĈā|ā īāā ‡ ā<³⁄₄āāò ½āò āā¹ † Ōā † Íā^{oa}āò Ōāñ ¹āīāā|āĀ
,ā¹ā¶āāè ,ā¹⁄₃⁄₄āāŌā ¹āīāāŌ|ā‡āŠā ½āò ‡ āŠāèāā•ā† -
(,āā‡āŠāāŌāĀ|ā „||āĀāè, ¹āāāāŸāāè, ¹āÆā‡āđŠāā|ā‡āŠ, ‡ āđŠāā·ā¹⁄₂ā)
(‡āŠ) Pāī½°ā‡āŠ ÊāāñŌñ ‡ āñŠ PāīŸāĀ ‡ āŠāñ ,ā¹ā¶āāè ,āāñÀ
‡ āŠÀ|āā Ōöý
(Ĉā) Pāī½°ā‡āŠ ½āò†īāā fāÆīlā Ōāñ|āñ Ōöý
(Ōā) ¹āÆ‡āđŠāā|ā ½āò ¹āā³⁄₄āñ •āā¶āñ īāāĒāñ Pāī½°ā‡āŠ ‡ āŠāñ
Pāī½°ā‡āŠ ‡ āŠŌ|āñ Ōöý
3. āā¶ā½¶āāāĒāāĈā|ā īāā‡ā<³⁄₄āāò ½āò ŌāŌāè īāā‡ā<³⁄₄ā ‡ āñŠ Ōāā¹⁄₂ā¶āñ
(□) ,āāđÀ ŌāĒā|ā īāā‡ā<³⁄₄ā ‡ āñŠ Ōāā¹⁄₂ā¶āñ (X) ‡ āŠā āāPāŌā¶ā ,ā¹ā¶āāè

,ã¼¼ããÔã 'àiããÔ|ã‡ãŠã ½ãò ÊãØããfý
 (‡ãŠ) Ô›ñŕãÊãñÔã Ô›ãèÊã ‡ãñŠ °ã|ãÃŕããò ‡ãŠãè •ããúPã Pãi½°ã‡ãŠ Ôãñ
 ŕãÔãé ‡ãŠãè •ãã Ôã‡ãŠ|ããè Öó ý ()
 û(Êã) Pãi½°ã‡ãŠ ‡ãŠã ÔãÖãè 'ãÃãèàãŕã 'ãÆãã|ã‡ãŠÓãÃŕã Öóý ()
 (Øã) Pãi½°ã‡ãŠ ‡ãñŠ Ôã½ããŕã ãÆãìããò ½ãò ,ãã‡ãŠÓãÃŕã Öãñ|ãã Öóý ()
 (Üã) Pãi½°ã ‡ãŠ ‡ãŠãúPã ‡ãñŠ œãñ›ñ-œãñ›ñ ›ì ‡ãŠü|ãò ‡ãŠãñ
 ,ãã‡ãŠããÓãÃ|ã ‡ãŠÃ|ãã Öóý ()
 4. ããìã²ãì|ã Pãi½°ã ‡ãŠ Ôãñ ‡ã¼¼ãã ,ããã¼ã'ãÆã³¼ã Öó ? fÔã ‡ãŠã
 „¹ã³¼ããñÔã ããÊãããÆã³¼ããñý
 5. ããÃÀã ìããÖãè 'ããÃÀŕããããÊã ‡ãŠã Ôãñ ‡ã¼¼ãã ,ããã¼ã'ãÆã³¼ãã Öó ?
 ÔãããPãã ìãŕãÃŕã ‡ãŠÃóý
 6. ããÃÀãìããÖãè 'ããÃÀŕããããÊã ‡ãŠã ½ãò Pãi½°ã‡ãŠãè³¼ã ãÆãìããò ‡ãŠã
 ããŕããããÃŕã ‡ãòŠÔãñ ãã‡ãŠ³¼ãã •ãã|ãã Öó ?
 7. † ‡ãŠ ãã ‰ãã ãã¼ãã ããìãããã ãã ìãŕãÃŕã ‡ãŠÃò ãã ‡ãŠ
 'ãÆãã|ã ‡ãŠÓãÃŕã Öãè Pãi½°ã ‡ãŠ|ã ‡ãŠãè ìããÔ|ãããìã ‡ãŠ 'ãÖPããŕã
 Öóý
 8. ‡ãŠ'ãü|ã ããñŕãñ ‡ãŠãè ìããããìããÔã ½ãìããèŕã ½ãò ãã‡ãŠÔã 'ãÆ‡ãŠãÀ
 ‡ãñŠ Pãi½°ã‡ãŠ ‡ãŠã 'ãÆ³¼ããñÔã ãã‡ãŠ³¼ãã •ãã|ãã Öó ?
 9. ããŕã½ŕãããÊãããÆã|ã ‡ãŠ©ãŕã ‡ãñŠ PããÀ 'ãã Öó |ããèŕã 'ãã ãã‡ãŠÔããè
 ŕã ãã ‡ãŠÔããè Â¹ã ½ãò † ‡ãŠ Ôãñ Öó † ‡ãŠ 'ãã ,ãŕ³¼ãã |ããèŕããò Ôãñ
 ãã¼ãã ãã ãã¼ãã,ã 'ãã ‡ãŠãè 'ãÖPããŕã ‡ãŠÃ ,ã'ãŕããè ,ã¼¼ããÔã
 'àiããÔ|ã‡ãŠã ½ãò ããÊãããÆã³¼ããñ - Àã0 'ãÆ0 Êããñ0 'ãÃãèàãã
 (‡ãŠ) Pãi½°ã‡ãŠãè³¼ã 'ãã©ãÃ Öó- ãã'ãŕã, ÔãìfÃÃ, ÊããñÖñ ‡ãñŠ œãñ›ñ
 ›ì‡ãŠü|ñ, 'ãñããŕãÊã ý
 (Êã) ,ãPãi½°ã‡ãŠãè³¼ã 'ãã©ãÃ Öó - À°ãÀ, |ããú°ãã, 'ãñããŕãÊã, ÔãìfÃ
 (ããÔãÊããfÃ ‡ãŠãèý
 (Øã) Pãi½°ã‡ãŠ ‡ãŠã 'ãÆ¼ããìã fŕã 'ãã©ããò ‡ãñŠ ,ããÀ-¹ããÀ ããŕã‡ãŠÊã
 •ãã|ãã Öó -
 ‡ãŠãúPã ‡ãŠãè 'Êãñ›, Êã‡ãŠü|ãè ‡ãŠãè |ãÆ|ããè, ¹ãã|ããè ‡ãŠã ›ì‡ãŠü|ã,
 ÊããñÖñ ‡ãŠãè PããÀý

[back](#)

Ôâîà½ã •ããèìããò ‡ãŠãè ªìãä¶ã¾ãã



ää¹äöÊääè † äŠää,ääò ½ää Ò½ä¶āñ •ää¶ā āä † äŠ •ääèlä ,ā¶āñ † äŠ
 ,āä † äŠāÀ |ā©āā ,āä † äðŠāā|ā † āñŠ Òāñ|āñ Ööý °āüñ ,āä † äŠāÀ |ā©āā
 ,āä † äðŠāā|ā † āñŠ •ääèläääò † äŠāñ ¶āāØāāè ,ääâÊääò Ôāñ °ñÊāā •āā
 Ôā†āŠ|āā Ööý ,āā½ā ,ääòÀ f½āÊāāè †āñŠ läðāā āā†āŠÔā¶āñ ¶āÖāè °ñÊāñ
 Ööý fÔāāè |āÀÖ ÞāÊā|āāè ÒifÃ Þāāè»āè, „ü|āāè ÒifÃ ½ā†ā«Êāāè ¹ā¶āāè
 ½ääò |āòÀ|āāè ÒifÃ ½äöÊāāè, ½āñ» † äŠ, † äŠœì,āā |ā©āā ÞāÀ|āñ Òì †
 ¼āñü-°ā†āŠÀāè °ñÊāñ Ööý ¾āñ Ôā¹¼āāè •ääèlä °āüñ ,ääòÀ āāläāā¹¼ā¶ā
 ,āä † äŠāÀ |ā©āā ,āä † äðŠāā|ā † āñŠ Ööý •āÖā Ò½ā °āüñ •ääèläääò † äŠāñ
 ¶āØ¶ā ,ääâÊääò Ôāñ °ñÊā Êāñ|āñ Öö läÖāè Ò½ääÀñ ÞāāÀāñò ,āāñÀ
 ,ā¶āñ†āŠ ,ā|¾ā¶ā œāñ»ñ •ääèlä ¼āāè ¹āā¾āñ •ā|āñ Ööā āä•ā¶Öò Ò½ääÀāè
 ,ääâÊāò ¶āÖāè °ñÊā ¹āā|āāè Öö, fÔāāèääÊā† f¶Öñâ Ôāîà¹½ā •ääèlä † äŠÖā
 •ā|āā Ööý ¾āñ Öāā¶ā¶ā†āŠāÀ†āŠ |ā©āā Êāā¹¼ā°¾ā†āŠ °āñ¶āāò ¹āÆ†āŠāÀ
 †āñŠ Ôāñ|āñ Ööý †ñÔāñ Ôāîà¹½ā •ääèläāñâ † äŠāñ āā¹āŠÀ † äŠöÔāñ °ñÊāā
 •ā|āā Öö ? ,āā¹ā •ā¶ā|āñ Ööā āä † äŠ Ôāîà¹½ā¹āāèÃ ¾āā¹ā Ôāñ œāñ»āè
 Þāāè•āāñâ † äŠāñ °āüñ ,āä†āŠāÀ ½ääò °ñÊāā •ā|āā Ööý

ãä•ã¶ã •ãäèlãão ‡ ãŠãñ ºñĈã¶ãñ ‡ ãñŠ ãäĖã † Ôãîà½ãªlãäê ¾ã¶ã ‡ ãŠãè
,ãäîãl¾ã¶ãŠlãä ºãü|ãäè Öö „,Öò Ôãîà½ã •ãäèlã ‡ãŠÖlãñ Ööý

ʌ̃³⁄₄ā¹ā̃Sāfj, Öö•āā (‡ āSāÊāĀā) |ā©āā |ā¹āñāā¹ ‡ āS̃ (ʌ̃æ̃⁰ ʰāā̃æ̃⁰) •āōŌāñ
 ĀāñŌāāō ‡ āñS̃ ĀāñāāŌā³⁄₄āāō ‡ āS̃āē āāPāāā ‡ āS̃|Ōāā Ōñ|āi āā•āÊāā
 ,āŌ¹ā|āāÊāāō ½āō ,āÊāŌā Ōāñ ¹āÆ ‡ āS̃āñÓŸ Ō©āāāā¹ā|ā Ōāñ|āñ Ööý
 † ñŌāñ ,āŌ¹ā|āāÊāāō ‡ āS̃ā ¼āÆ¹⁄₂āŸā ‡ āS̃Āsáy ,āŌ¹ā|āāÊā ‡ āS̃āē
 āā‡āS̃Ōāāē ¼āāē Ōāā¹⁄₂āŌāÆāē ‡āS̃āñ Ō¹ā|āĀ ¶ā ‡āS̃Āōý ,āŌ¹ā|āāÊā ‡āñS̃
 āāPāāā ‡ āS̃|Ōā ‡ āS̃ † |āā ¶āŌāĀ Ōāñ Ōā¹⁄₂¹ā ‡ āĀS̃ ‡ āS̃Ā āā|āāā¹⁄₄ā¶ā
 ĀāñŌāāō |ā©āā „¶ā ‡ āñS̃ fÊāā•ā ‡ āñS̃ ¹āÆāā|ā Ōāā|āfāāā¶ā³⁄₄āāō ‡ āS̃āē
 •āā¶ā ‡ āS̃āĀāē ¹āÆā¹|ā ‡ āS̃Āōý ,āŌ¹ā|āāÊāāō ½āō fŌā ¹āÆ ‡ āS̃āĀ Ōāñ
 ,āÊāŌā ¹āÆ ‡ āS̃āñÓŸ ‡ āS̃āñ Ō©āāāā¹ā|ā ‡ āS̃Ā¶āñ ‡ āS̃āē ‡ ā<³⁄₄āāō
 ,āā|ā|¹⁄₄ā ‡ āS̃|āā Ōi fĀ ? Ōāīā¹⁄₂ā •āāē|ā Ōāñ ¹āāēāāü|ā ĀāñāāŌā³⁄₄āāō Ōāñ
 Ōāā% āS̃¹⁄₂āŸā |āāē|āÆ|āā Ōāñ Ōāñ|āā Ööý fŌāāēāāÊā† f¶ā‡āS̃āē ˆñĒā-
 ĀñĒā ,āÊāŌā Ōāñ ,āŌ¹ā|āāÊāāō ½āō ʰā¶āñ ‡ āS̃¹⁄₂āĀāō ½āō ‡ āS̃āē •āā|āāē
 Ööýāā¶ā¹⁄₂¶āāāÊāāāĒā|ā |āāāāÊā ‡ āS̃ā-1 ‡ āS̃āñ ˆñĒāōý f¶ā¹⁄₂āō Ōāīā¹⁄₂ā
 •āāē|āāō ˆāĀ Ōāñ¶āñ |āāÊāñ ‡ āiS̃œ Ōāā¹⁄₂āā¶³⁄₄ā ĀāñŌā āā³⁄₄āñ Ōā³⁄₄āñ
 Ööý ,āÊāŌā-,āÊāŌā Ōāāñ|āāō Ōāñ PāñPā ‡ āS̃, ½āÊāñāāĀ³⁄₄āā,
 ¹āS̃āfÊāñāāĀ³⁄₄āā ĀāñŌāāō ‡ āñS̃ āā|āŌā³⁄₄ā ½āō ¼āāē •āā¶ā ‡ āS̃āĀē
 ¹āÆā¹|ā ‡ āS̃āēāā•ā† |ā©āā fŌāāē ¹āÆ‡āS̃āĀ ŌāāĀŸāāēˆā® ‡ āS̃āēāā•ā†ý
 ‡ā<³⁄₄āā āā¶āŌ‡āS̃ŌāĀ ¹āÆā¹|ā Ōāñ|āñ Öö ?

,ãããCEãÀ ÀãñØãã¥ãì † ‡ ãŠ Ô©ãã¶ã Ôãñ ¶ÔãÀñ Ô©ãã¶ã |ã ‡ ãŠ ‡ ãõŠÔãñ
'ãÖúiPã •ãã|ãñ Öö ? ,ããf¾ãñ •ãã¶ãñý

Ìãã¾ãì 'ãÀã - Ôãªãê •ãì ‡ ãŠã½ã |ã©ãã f¶ãÊãî † ñ¶ãã Ôãñ 'ããèãü|ã
Ì¾ããã ‡ ã<|ã Ôãñ ÔÌãÔ©ã Ì¾ããã ‡ ã<|ã ‡ ãŠãñ •ãì ‡ ãŠã½ã ‡ ãõŠÔãñ Öãñ •ãã|ãã
Öö ? •ãì ‡ ãŠã½ã Ôãñ 'ããèãü|ã Ì¾ããã ‡ ã<|ã ‡ ãŠãè æãé ‡ ãŠ ‡ ãñŠ Ôãã©ã
'ãã¶ããè •ãõÔãñ ³Ìã ‡ ãŠãè ,ã¾ã¶ã Ôãîã½ã °ãúªò Ìãã¾ãì ½ãò 'ãõŠÊã
•ãã|ããè Öö ý fÔã ‡ ãñŠ Ôãã©ã •ãì ‡ ãŠã½ã ÀãñØã ‡ ãñŠ ÊãCEãò ããÌãÓãã¥ãì
ÖÌãã ½ãò 'ãõŠÊã •ãã|ãñ Öö ,ããõÀ ÔãããÔã ‡ ãñŠ Ôãã©ã ¾ãÖ ¶ÔãÀñ
Ì¾ããã ‡ ã<|ã ‡ ãñŠ ÌãÀãèÀ ½ãò 'ãÖìãPã •ãã|ãñ Öö ý ‡ ã<¾ãã ,ãã'ã Ìãã¾ãì
‡ ãñŠ 'ãÀã 'ãõŠÊã¶ãñ ÌããÊãñ ‡ ãìŠce ÀãñØãò ‡ ãñŠ ¶ãã½ã °ã|ãã Ôã ‡ ãŠ|ãñ
Ööã ?

ªããÖã|ã •ãÊã 'ãÀã - ½ã¶ãìÓ¾ã ½ãò ‡ ãŠfÃ Ôãã%ã Š½ã¥ããè¾ã ÀãñØã
ªããÓã|ã •ãÊã ‡ ãñŠ 'ããè¶ãñ Ôãñ Ôãñ|ãñ Ööý •ãõÔãñ Öö•ãã Ôãñ
ØãÆããÔã|ã ÀãñØããè ‡ ãñŠ ,ã'ãããÌãÓ> 'ãñ¾ã •ãÊã ½ããñ ãã½ãÊã •ãã|ãñ Öö
,ããõÀ ¾ãããª ‡ ãŠãñfÃ ÔÌãÔ©ã Ì¾ããã ‡ ã<|ã •ãã¶ãñ-,ã¶ã•ãã¶ãñ ½ãò fÔã
•ãÊã ‡ ãŠãñ 'ããè|ãã Öö |ããñ ÌãÖ Ì¾ããã ‡ ã<|ã ÀãñØãØãÆÔã Öãñ •ãã|ãã Ööý
ãã½ã>ã>ãè 'ãÀã - 'ãÆãñ>ãñ•ããñ,ãã ‡ ãŠãè ‡ ãŠfÃ •ãããã|ã¾ããú •ããñ
ãã½ã>ã>ãè ½ãò 'ãã¾ããè •ãã|ããè Öö Jene@b Gieves Jeeueer Ôããª•ã¾ããò
‡ ãñŠ Ôãã©ã ½ã¶ãìÓ¾ã |ã ‡ ãŠ 'ãÖúiPã|ããè Öö ,ããõÀ Ôãã%ã Šãã½ã|ã
‡ ãŠã|ããè Ööý °ãPããò ‡ ãñŠ Øãªãè ãã½ã>ã>ãè ½ãò CEãñÊã¶ãñ ‡ ãñŠ
'ãõÀã¶ã Ôãîã½ã •ããèÌããò ‡ ãñŠ Ôãã%ã Š½ã¥ã Ôãñ 'ãŠãñü|ñ-'ãìŠ¶Ôããè,
'ãñ> ‡ ãŠã ‡ ãñŠPãì,ãã |ã©ãã ãã'ã¶ã ‡ ãõŠãã½ã ‡ ãŠã Ôãã%ã Š½ã¥ã Ôãñ|ãã
Ööý

Ôãã%ã Šãã½ã|ã Ì¾ããã ‡ ã<|ã 'ãÀã - ‡ ã<¾ãã ,ãã'ã •ãã¶ã|ãñ Öö
ãã ‡ ãŠ ½ãÊãñãã¾ãã ÀãñØã ‡ ãõŠÔãñ 'ãõŠÊã|ãã Öö ? ,ããf¾ãñ peevesbý
•ãª † ‡ ãŠ ÔÌãÔ©ã Ì¾ããã ‡ ã<|ã ‡ ãŠãñ ½ããª † ¶ãããã'ãŠÊããè•ã ½ãPceÀ (•ããñ
½ãÊãñãã¾ãã ‡ ãñŠ ÀãñØãã¥ãì,ããò ‡ ãŠãè ÌããÖ ‡ ãŠ Öö) ‡ ãŠã|ããè Öö |ããñ
ÔÌãÔ©ã Ì¾ããã ‡ ã<|ã ½ãÊãñãã¾ãã ‡ ãñŠ ‡ ãŠãè>ã¥ãì,ããò Ôãñ
Ôãã%ã Šãã½ã|ã Ôãñ •ãã|ãã Ööý Fmeer Øekeâej peeheeveer ceefmle<keâ
pJej (pes0F&0) SJeb SkeäÜetš FvmesheâueeF&efšme efmev[^esce
(S0F&0Sme0) Skeâ efJe<eeCeg heâuewyeer JeeÜejme Éeje neslee nw~
peeheeveer ceefmle<keâ pJej yeerceejer meyemes henues 1924 ceW
peeheeve ceW henÜeeveer ieÜeer Leer~ pees keäÜetueskeâme ceoe
ceÜÜjeW Éeje hewâuelee nw~ Fme efJe<eeCeg keâe meb>eâceCe megDej-
ceÜÜj-megDej Üee hebÜer-ceÜÜj-hebÜer ceW neslee nw~ meb>eâefcele
ceÜÜjeW kesâ keâesves mes ceveg<Üe Yeer meb>eâefcele nes peelee nw~
peeheeveer ceefmle<keâ pJej SJeb SkeäÜetš FvmesheâueeF&efšme

efmev[^esce ceW ceefmle<keâ ceW metpeve, lespe yegKeej, Ûekeäkeâj
 Deevee, yesÛewveer, DeeuemÛe SJob yesnesMeer pewmes ue#eCe
 efoKeeF& osles nw~ ,ää'ä¶āñ ‡ ā<³⁄₄āā āā ‡ āŠÔāāè Ì³⁄₄āāā ‡ ā<|ā ‡ āŠā 'āōÀ
 Ôā©āāè ‡ āñŠ 'āōÀ ‡ āñŠ Ôā½āā¶ā ½āāñ>ā ªñŒāā Öö ? ‡ āŠ¹⁄₄āāè -‡ āŠ¹⁄₄āāè
 Ôā©ā ¼āāè ½āāñ>ñ Öāñ •āā|āñ Ööâý ¾āÖ ‡ ‡ āŠ ÀāñØā Ööō āā•āÔāñ
 'āāāèÊā 'āāü|ā ¾āā 'āŠāfÊāñāÀ¾āā ‡ āñŠ ¶āā½ā Ôāñ •āā¶ā|āñ Ööâý
 ¾āÖ ‡ ‡ āŠ āā¶ā½āō>āñ| (keâ=efce) ‡ āñŠ Ôāā%āŠ¹⁄₂ā¥ā Ôāñ Öāñ|āā Ööý

ÀāñØāāò Ôāñ 'āPāā|ā -

,ā°ā ,āā'ā Ôā½āçā Pāi ‡ āñŠ Öö āā ‡ āŠ Ôāā%āŠ¹⁄₂ā¥āāè³⁄₄ā ÀāñØā ‡ āñŠ
 'āōŠÊā¶āñ ‡ āñŠ āāÊā ‡ āā ‡ āŠÔāāè ½āāf³⁄₄ā½ā ‡ āŠāè ,āā|ā|³⁄₄ā ‡ āŠ|āā
 'āü|āāè Ööý ¾āāāª Ö½ā ½āāf³⁄₄ā½ā ‡ āŠāñ ÀāñØāā¥āi Ôāñ ½āi‡ā<|ā ‡ āŠÀ
 ª°|āāñ Ö½āò ‡ āŠāñfÅ ªāāè½āāÀāè ÊāØā¶āñ ‡ āŠāè Ôā½¼āā|ā¶āā ¶āÖāè
 Öāñ Ôā‡āŠ|āāè Ööý ,āāf ‡ ‡ āiŠœ Ôāā½āā¶³⁄₄ā •āā¶ā‡āŠāāÀ¾āāò ‡ āŠāñ
 Ôā½āçāñā ,āāōÀ „¶ā‡āŠā 'āāÊā¶ā ‡ āŠÀ ÀāñØāāò Ôāñ ½āi‡ā<|ā Öāñ¶āñ
 ‡ āŠā 'āÆ³⁄₄āāÔā ‡ āŠÀòý peeheever ceefmle<keâ pJej (pes0F&0-
 peeheever FvmesheâueeF&efšme) SJob SkeäÛetš FvmesheâueeF&efšme
 efmev[^esce (S0F&0Sme0) yeerceejer mes yeÛeves nsleg ceÛÛj jesOeer
 oJeeDeeW keâe ØeÛeesie keâjs SJob ieñeW, KesleeW ceW veerce keâer
 Keueer keâe ØeÛeesie keâjW~

āā½ā>á>āè |ā©āā •āÊā ‡ āŠāñ 'āÆ¹⁄₂Óā¥ā ½āi‡ā<|ā ‡ āŠÀ ‡ āñŠ |ā©āā
 ÀāñØā lāāÖ‡āŠ (½ā‡ā<Œāāè, ½āPœÀ) Ôāñ 'āPāā|ā ,āāōÀ ÔlāPœ|āā
 ‡ āŠāè ,āā¹āāò ,āāāª ‡ āŠāñ £¾āā¶ā ½āò ¶ā ÀŒā¶āñ Ôāñ Ö½ā ,ā¶āñ‡āŠ
 'āÆ‡āŠāÀ ‡ āñŠ ÀāñØāāò Ôāñ ØāÆāāÔā|ā Ôāñ Ôā‡āŠ|āñ Öö ý
 ‡ āŠ¹⁄₄āāè ,āā'ā¶āñ ÔāāñPāā Öö āā ‡ āŠ 'āÆāā|ā|āÓāÃ ªāÀÔāā|ā ‡ āñŠ
 ½āāòÔā½ā ½āò Ôāā%āŠ¹⁄₂ā‡āŠ ÀāñØāāò ‡ āŠāè ªāüœ Ôāāè ,āā •āā|āāè
 Ööý ,āāāŒŒā ‡ñÔāā ‡ā<³⁄₄āāò Öāñ|āā Öö ? ,āā'ā¶āñ ªñŒāā ÖāñØāā āā‡āŠ
 •ā°ā Ö½ā ªāÀÔāā|ā ‡ āñŠ ½āāòÔā½ā ½āò ªāāè½āāÀ 'āü|āñ Ööâ ,āāōÀ
 āāPāāā‡āŠ|Ôā‡āŠ ‡ āñŠ 'āāÔā fÊāā•ā ‡ āñŠ āāÊā ‡ āā|āñ Öö |āāñ ª|āā,āāò
 ‡ āñŠ Ôāā©ā āāPāāā‡āŠ|Ôā‡āŠ Ö½āò 'āā¶āāè „ªāÊā‡āŠÀ 'āāè¶āñ ‡ āñŠ
 āāÊā ‡ āŠÖ|āā Ööý ¾āÖ ¼āāè ÔāÊāāÖ ªāè •āā|āāè Öö āā‡āŠ 'āā¶āāè ‡ āñŠ
 ªā|ā¶āāò ‡ āŠāñ ‡āŠ‡āŠÀ lā „ÔāÔāñ 'āā¶āāè āā¶ā‡āŠāÊā¶āñ ‡ āñŠ āāÊā ‡
 Êā½°āñ Öö¥|Êā lāāÊāñ |āñ°ā‡āŠ ‡ āŠā 'āÆ³⁄₄āāñØā ‡ āŠÀòý ‡ñÔāā |āāñ
 Ö½āāÀñ ÛāAāò ½āò Öāñ|āā Ôāè ÀÖ|āā Ööý

fÔāāè |āÀÖ ,āā'ā¶āñ ªñŒāā Öö āā‡āŠ ªāÀÔāā|ā ‡ āñŠ Ôā½ā³⁄₄ā ‡ āŠāèü|ñ
 ½ā‡āŠāñü|āò ‡ āŠāè ÔāāŒ¾āā ½āò lāðāā® Öāñ|āāè Ööý meeLe ner Oeeve
 kesâ KesleeW, ie°eW, leeueeyeeW Deeefo ceW ceÛÛjeW kesâ ueeJee&
 heveheles nw efpememes pes0F&0 SJob S0F&0Sme0 yeerceejer keâe

meb>eâceCe nesves keâer mecYeeJeeve yeI{ peeleeer nw~ ½ã † ã<CEããè
 ,ããõÀ ½ãPceÀ Ôãn ,ãã'ã ¼ãÊããè ¼ããúãã|ã 'ãããÀããPã|ã Öö f¶ãÔãn ¼ããè
 Ö½ãò ,ã¶ãñ † ãŠ 'ãÀñÍãã¶ããè Ôãn|ããè Ööý ,ã¼ããè Ö½ã¶ãñ •ãã¶ãã Öö
 ãã † ãŠ ½ãPceÀ Ôãn ½ãÊãñããÀ¾ãã ÀãñØã 'ãõŠÊã|ãã Ööý |ãããÊã † ãŠã 1
 ½ãò Öö•ãã ÀãñØã † ãñŠ ÔããPããÀ¥ã † ãŠã ½ãã£¾ã½ã Íã Àãñ † ãŠ©ãã½ã
 ,ããããª † ãŠãè •ãã¶ã † ãŠãÀãè 'ãÆã¹|ã † ãŠãè Ööý f¶ãÔãn Ö½ãò ¾ãÖ
 ÔããèCEã ãã½ãÊã ÀÖãè Öö ãã † ãŠ Ö½ããÀñ ÜãÀò † ãñŠ ,ããÔã 'ããÔã
 Øã|œñ ¶ãÖãé Ôãn¶ãñ PããããÖ † ý ÜãÀ † ãŠãè ¶ããããÊã¾ããò ¾ãã ,ã¶¾ã
 •ãÖãÖãò 'ãÀ 'ãã¶ããè † ãŠãñ † † ãŠããªã ¶ãÖãé Ôãn¶ãñ ¢¶ãã PããããÖ † ý
 Ö½ããÀñ ÜãÀ † ãñŠ ¢Àãã•ããò |ã©ãã ããCEãü|ãã † ãŠ¾ããò ½ãò •ããÊããè
 ÊãØããè Ôãný Ôããñ|ãñ Ôã½ã¾ã ½ãPceÀªã¶ããè † ãŠã 'ãÆ¾ããñØã °ãÖì|ã
 Êãã¼ãª¾ã¾ã † ãŠ Öãn|ãã Ööý

Ö½ã Ôã¼ããè 'ãÆãã|ããªã Ô¶ãã¶ã † ã<¾ããò † ãŠÀ|ãñ Öö ? ,ã'ã¶ãñ ÍãÀãèÀ
 † ãŠãè Ôã'ãŠãfÃ •ãõÔãn ¶ããCEã¶ã † ãŠã¶ã¶ã, Öã©ã † ãŠãñ Ôãã°ãì¶ã ¾ãã
 ÀãCEã Ôãn £ããñ¶ãã, CEããÔããè ,ãã¶ãñ 'ãÀ ÊããñØããò † ãŠã ½ãíüÖ 'ãÀ
 À½ããÊã ÀCEã¶ãã ¾ãã Öã©ã ÊãØãã¶ãã † ã<¾ããò † ãŠÀ|ãñ Öö ?

**'ãÆãã|ãÀãã¥ã / >ãè † ãŠã † ãŠÀ¥ã •ãõÔãn 'ããñããÊã¾ããñ,
 °ããè.Ôããè.ããè., ;ãè.'ããè.>ãè.(ef|heäLeerefjÙee,hejşdYetefmeme,
 şşsveme) 'ãÀã :-**

,||ãÀ 'ãÆªñÍã ½ãò •ã¶½ã Êãñ¶ãñ ÍããÊãñ ¶ãìã•ãã|ã ããÍãÍãì,ããò ½ãò Ôãn
 ,ããÝ 'ãÆãã|ãÍã|ã ããÍãÍãì † † ãŠ ÍãÖãÃ † ãŠãè ,ãã¾ãì 'ãíÀãè † ãŠÀ¶ãñ Ôãn
 'ãÖÊãñ |ã©ãã ÊãØã¼ãØã 3% °ãPpãñ 'ããúPã ÍãÖãÃ † ãŠãè ,ãã¾ãì 'ãíÀãè
 † ãŠÀ¶ãñ Ôãn 'ãÖÊãñ Öãè † ãŠãÊã † ãŠìãããÊã|ã Öãn •ãã|ãñ Ööý f¶ã † ãŠãè
 ½ãõ¾ãì † ãŠã † ãŠãÀ¥ã Ôãì½ã •ããèìã •ããã¶ã|ã † ãìŠce ããÍãÍãñÓã ÀãñØã
 Ôãn|ãš Ööý ¾ãããª Ö½ã PããÖò |ããñ f¶ã ÀãñØããò Ôãn °ãÖì|ã ,ããÔãã¶ããè
 Ôãn °ãPãã •ãã Ôã † ãŠ|ãã Öö ,ããõÀ ÍãÖ |ãÀãè † ãŠã Öö Ôã½ã¾ã 'ãÀ >ãè † ãŠã
 ÊãØãìãã¶ã ý

‡ãìŠce ,ããõÀ ¼ããè •ãã¶ãò

peeheeveer ceefmle<keâ pJej SJeb SkeäUetş FvmesheâueeF&efşme
 efmev[^esce yeerceejer kesâ jmeeÙeve ueerÙeer (heâue) ceW Yeer
 heeÙes peeles nw~

>ãè † ãŠã † ãŠÀ¥ã † ãõŠÔãn ?

ÔãÖãè Ôã½ã¾ã 'ãÀ ÀãñØã •ã¶ † ãŠ † ãŠãè ©ããñü|ãè Ôããè ½ããªã
 >ãè † ãñŠ (Íãõ † ã<Ôããè¶ã) † ãñŠ Á'ã ½ãò, ÀãñØã Ôãn¶ãñ Ôãn 'ãíÍãÃ
 ÍãÀãèÀ ½ãò 'ãÖüìPãã¶ãñ Ôãn „Ôããè ÀãñØã † ãñŠ 'ãÆãã|ã † † ãŠ
 ããÍãÍãñÓã 'ãÆ † ãŠãÀ † ãŠãè 'ãÆãã|ãÀãñfã ãã½ã|ãã (Àããã½ã † ãŠ
 ,ã¥ãì,ããò † ãŠã ãã¶ã½ããÀ¥ã) † ãŠã ããìã † ãŠãÔã Öãn •ãã|ãã Öö ý ¾ãñ

›æè‡āñŠ ,āÊāŌā-,āÊāŌā 'āÆ‡āŠāÀ Ōāñ |āō³⁄₄āāÀ āā‡āŠ³⁄₄āñ •āā|āñ Ööý
 f¶ā ‡āŠā 'āÆ³⁄₄āāñŌā Ōāā¹⁄₂āā¶³⁄₄ā|ā: •āāè|āā¥āì |ā©āā āā|āŌāā¥āì 'āĀā
 Ōāñ¶āñ |āāÊāñ ĀāñŌāāò ‡āñŠ 'āÆāā|ā āā ‡āŠ³⁄₄āā •āā|āñ Ööý ‡āìŠœ
 ›æè‡āñŠ ĀāñŌā•ā¶ā ‡āŠ ‡āŠāñ |āā¹ā, 'āĀā°āōŌā¶āāè āā ‡āŠĀ¥āāò,
 ,āÊ ‡āŠāñŌÊā, 'āŠā¹⁄₂āĀñāāÊā¶ā ,āāāā¹ 'āĀā ¹⁄₂āāÀ ‡āŠĀ |āō³⁄₄āāÀ
 ‡āŠĀ|āñ Ööý •āōŌāñ ›ā³⁄₄ā¹āŠāf; |ā©āā Ōō•āā SJe
 pes0F&0/S0F&0Sme0 ‡āñŠ ›æè‡āñŠý ‡āìŠœ ›æè‡āñŠ ĀāñŌā•ā¶ā‡āŠ ‡āñŠ
 āā|āŌāōÊāā 'āā©āĀ ,|ā¶ā ‡āŠĀ¶āñ |āāÊāñ Ōāi¥ā ‡āŠāñ ¶āŌ› ‡āŠĀ¶āñ
 ‡āñŠ °āā ,Ōā ‡āŠāè 'āÆāā|ā•āōāā|ā ‡āŠ āā¹⁄₂ā|āā ‡āŠā 'āÆ³⁄₄āāñŌā
 ‡āŠĀ¶āñ ‡āñŠ āāÊā† |āō³⁄₄āāÀ āā ‡āŠ³⁄₄āñ •āā|āñ Öö •āōŌāñ āā›¶āñŌā
 ‡āŠā ›æè ‡āŠā ,āāāā¹ý fŌā āā|āāāfā Ōāñ ĀāñŌāāò ‡āŠā
 ,|āPāāÀ ›æè‡āŠā‡āŠĀ¥ā ‡āŠŌÊāā|āā Ööý

‡ā›æè°āā³⁄₄āāñāā› ‡āŠ f¶āāñ ‡āìŠÊāñ|ā¶ā Ōāñ Ōāā% āŠ¹⁄₂ā¥ā ‡āŠāè
 Āāñ‡āŠ©āā¹⁄₂ā -

'āñāā¶āāāŌāāāÊā¶ā,Ō›Èñ¹›āñ¹⁄₂āāfŌāāè¶ā ,āāāā¹ 'āÆāā|ā•āōāā|ā ‡āŠ
 ,āāōŌāāāfā³⁄₄āāū |āĀāèÀ ¹⁄₂āō ĀāñŌā •ā¶ā ‡āŠ Ōāīà¹⁄₂ā •āāè|āāò ‡āñŠ
 Ōāā%āŠ¹⁄₂ā¥ā ‡āŠāñ Āāñ‡āŠ|āāè Öö ý

'āā¹ā ĀāñŌāāò 'āĀ 'āñŌ›æèŌāāf;
 f¶Ōāñ ‡ā›æèŌāāf;(‡āŠāè›¶āā|ā ‡āŠ)āā;Ōāfâ¹āñŠ ‡ā›æè ‡āŠā
 'āÆ³⁄₄āāñŌā ‡āŠĀ‡āñŠ -

•ā¶ā|āì,āāò ‡āŠāè ¹⁄₄āāūāā|ā 'āñū;-¹āāōfāñ ¹⁄₄āāè āā|āāā|āŌ› 'āÆ‡āŠāÀ ‡āñŠ
 āā|āŌāā¥āì,•āāè|āā¥āì,'āŠ¹āúîŠ¹ ,āāāā¹ Ōāīà¹⁄₂ā •āāè|āāò 'āĀā ĀāñŌā
 ŌāÆāāŌā|ā Ōāñ|āñ Öö fŌā‡āŠāè •ā¶ā‡āŠāĀāè |āāāāÊā‡āŠā -2 ¹⁄₂āō °āè
 Ōā³⁄₄āāè Ööý f¶ā ĀāñŌāāò ‡āŠāè Āāñ‡āŠ©āā¹⁄₂ā ‡āñŠ āāÊā† 'āāōfāāò
 ‡āŠā °āāè•ā/¹āŠÊā 'āō¹ā Ōāñ¶āñ Ōāñ 'āŌÊāñ ,|āPāāÀ ‡āŠĀ¶āñ Ōāñ ³⁄₄āñ
 ĀāñŌā¹⁄₂āì‡ā¶ā Ōāñ •āā|āñ Öö ,āāōÀ ,āPœāè 'āŠŌāÊā 'āō¹ā Ōāñ|āāè Öö ý

āā%āŠ³⁄₄āā ‡āŠÊāā¹ā 8.4

āā‡āŠŌāā¶ā ,ā¹ā¶āāè 'āŠŌāÊā ‡āŠāñ ĀāñŌā, ‡āŠāè› |ā©āā 'āāÊāā ,āāāā¹
 Ōāñ °āPāā¶āñ ‡āñŠ āāÊā† ‡āā³⁄₄āā 'āÆ³⁄₄āāŌā ‡āŠĀ|āā Öö ? ‡āā³⁄₄āā
 ,āā¹ā¶āñ ‡āŠ¹⁄₄āāè āā‡āŠŌāāè āā‡āŠŌāā¶ā Ōāñ 'āŠŌāÊā ‡āŠāñ ĀāñŌā ³⁄₄āā
 ‡āŠāè› ³⁄₄āā 'āāÊāā Ōāñ °āPāā¶āñ ‡āñŠ āāÊā† āā ‡āŠ³⁄₄āñ •āā ĀŌñ
 'āÆ³⁄₄āāŌā ‡āŠāè •ā¶ā‡āŠāĀāè 'āÆā¹|ā ‡āŠāè Öö ? , ‡āā¶ā Ōāñ
 Ōā¹⁄₂āāā¶ā|ā 'āū|āñŌā ‡āñŠ āā ‡āŠŌāā¶ā Ōāñ |āā|āāĀ ‡āŠĀ
 āā¶āŌ‡āŠŌāĀ 'āÆā¹|ā ‡āŠĀòý

‡āìŠœ ,āāōÀ ¹⁄₄āāè •āā¶āò

¹ãã¹ããò † ãŠãñ ÀãñØã½àì † ã<|ã † ãŠÀ¶ãñ † ãñŠ ããÊã † |ãÀÖ-|ãÀÖ † ãŠãè
¹ãã,ããò † ãŠã ¹ãÆ³/ããñØã ãã † ãŠ³/ãã •ãã|ãã Öö ý ¹ãñÔ>ãèÔããf_i † ãŠãñ
f¶Ôãñ † ã<ãèÔããf_i, Ô°ããêÔããf_i, Àãñjñ¶>ãèÔããf_i |ã©ãã ¹ãŠ¶•ããèÔããf_i
½ãò ããlã½ã † ã<|ã ãã † ãŠ³/ãã Øã³/ãã Ööý jãè0jãè0>ãè0,
°ããè0 † ÞãÔÔããè0,ãã½ã©ããfÊã ¹ãõÀã©ãã³/ããñ¶ã, Öñ¹>ã † ã<ÊããñÀ,
† ÊããjÊ¶ã,ããõÀ † ã<ÊããñÀãñjñ¶ã,ãããã^a
ÀÔãã³/ã¶ã † ãŠãè>¶ããlã † ãŠ † ãŠÖÊãã|ãñ Öö ý † ãiŠœ ÀÔãã³/ã¶ã
ÆãÀ¹ãlããÀ † ãŠãñ ¶ãÓ> † ãŠÀ¶ãñ † ãñŠ † ãŠã½ã,ãã|ãñ Öö •ãõÔãñ 2, 4Dý
† ãiŠœ ¹ããèüj † ãŠ •ã¶|ãì,ããò •ãõÔãñ - ÞãiÖñ,ããõÀ ãã>ããjãj³/ããò † ãŠãñ
½ããÀ|ãñ Öö •ãõÔãñ ¶ããÀ°ãÆãñÔããf_iy † ãiŠœ ¹ãŠ¹ãúŠ^a ¶ããlããè
(¹ãŠ¶•ããèÔããf_i) Ôãñ ¹ãŠ¹ãúŠ^a † ãŠã ¶ããlã Öãñ|ãã Öö •ãõÔãñ-
,ããñ¹ãñŠ¶ããüÊã, † ãñŠ¹ã>¶ã,ãããã^ay ãã † ãŠ¶|ãì,ããããã † ãŠ ½ãããã ½ãò
f¶ã † ãñŠ ãã¶ãÀ¶ãÀ ¹ãÆ³/ããñØã Ôãñ Ôã½ãÔ³/ãã † â ¼ããè „¹ã¶¶ã Öãñ
•ãã|ããè Öö ý ¾ãñ ããlãÔãõÊãñ ¹ãã©ãÃ Öö ý ,ãlã: f¶ã † ãŠã ¹ãÆ³/ããñØã
ãã¶ãããÃããÀ|ã ½ãããã Ôãñ,ããããããããŠ ¶ãÖãé † ãŠÀ¶ãã ÞããããÖ† ý

Êãã¼ãã³/ãã†ãŠ Ôãìà½ã •ããèlã : -

Ôãìà½ã •ããèlã, ½ã¶ãìÓ³/ãã |ã©ãã,ã¶³/ãã •ããèlããò † ãñŠ ããÊã † ¼ããè
Êãã¼ã¹ãÆ^a Öãñ|ãñ Öö ý † ã<¾ãã,ãã¹ã •ãã¶ã|ãñ Ööã ãã†ãŠ-

(i) °Ôãè °ã¶ãã¶ãñ ½ãò Êãõ † ã<ãñ°ãõããÔãÊãÔã ¶ãã½ã † ãŠ •ããèlããããì
ÔãÔã³/ãã†ãŠ Öö ý

(ii) ¹ã¶ããèÀ,ããÔãÀ†ãŠã, j°ãÊãÀãñ>ãè, lãÀã°ã, fjÊããè,jãñÔãã, °ãñÆj,ããõÀ
Æã½ããèÀ,ãããã † ãñŠ °ã¶ãã¶ãñ ½ãò ¼ããè ¾ããèÔ> ¶ãã½ã † ãŠ ¹ãŠ¹ãúŠ^a
•ãõÔãñ Ôãìà½ã •ããèlããò † ãŠã ããlãlãñÔã ¾ããñØããã¶ã Ööý fÔã † ãñŠ
,ããã|ãããÀ † ã<|ã Ôãìà½ã •ããèlã Ö½ããÀñ ããÊã † ãã † ãŠ¶ã-ãã † ãŠ¶ã ããñããò
½ããñ Êãã¼ãã†ãŠãÀãè Öö ? °ãlããf¾ãñý

Ôãìà½ã •ããèlããò †ãŠã ¾ããñØããã¶ã -

(†ãŠ) †¶>ãè°ãã³/ããñãã>†ãŠ ¹ãã©ãÃ -

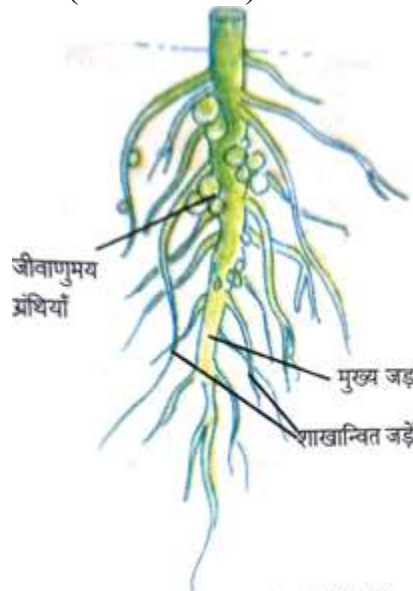
Ôãìà½ã •ããèlããò ¹ãÀã ¹ãÆãã|ã•ãõããlã † ãŠ,ããõÔããããã³/ããú °ã¶ãã³/ããè
•ãã|ããè Öö ý ¹ãÆãã|ã•ãõããlã † ãŠ,ããõÔããããã lãÖ ¹lãã Öö •ããñ
ÀãñØããããì,ããò † ãñŠ ¹ãÆãã|ãÀãñãã ½ãò ¹ãÆ³/ããì † ã<|ã Öãñ|ããè Öö,ããõÀ
lãÀãèÀ ½ãò ¹ãÖiãÞã|ãñ Öãè ÀãñØããããì † ãñŠ ¹ãÆ¼ããlã † ãŠãñ ¶ãÓ> † ãŠÀ
°ñ|ããè Öö,ããõÀ Ì¾ããã † ã<|ã ÀãñØã ½ãì † ã<|ã Öãñ •ãã|ãã Ööý † ãiŠœ
¹ãÆãã|ã•ãõããlã † ãŠ,ããõÔããããã³/ããú ¹ãñãã¶ãããÔãããÊã¶ã ¹ãŠ¹ããiŠ^a
Ôãñ, Ô>Ëñ¹>ãñ½ãããããÔã¶ã •ããèlããããì Ôãñ
|ã©ãã † ã<ÊããñÀãããÊã¶ã ¶ãã½ã † ãŠ ¹lãã lãõlããÊã Ôãñ °ã¶ãã³/ããè •ãã|ããè
Ööý

Pāñ|āā|āāē

†āē°āā^{3/4}āāñāā>‡āŠ °|āā,āāò ‡āŠā °āÆ^{3/4}āāñŌā āāPāāā‡āŠ|Ōā‡āŠ ‡āŠāē
 °ñCEā-ÀñCEā ½āò Ōāē ‡āŠÀāā PāāāāŌ†ý Ō|ā|ā: °āÆ^{3/4}āāñŌā •āā|āÊāñ|āā
 Ōāñ Ōā‡āŠ|āā Ōōý

(CEā) āāf>Êāñ•āā āāŌāāē‡āŠÀā -

,ā|āāñ CEāñ|ā ½āò ÊāŌāñ ½ā>À/Pāāā/½āñāāē/,āÀŌÀ ‡āñŠ
 °āāōfāā ‡āŠāñ •āüj ŌāāāŌ|ā „CEāāāāüj^{3/4}āñý fŌā °āā|ā ‡āŠāñ £^{3/4}āāā ½āò
 ÀāāCEā^{3/4}āñ āā ‡āŠ „CEāāüj|āñ Ōā½ā^{3/4}ā •āüjñā >|āāē āāŌāē PāāāāŌ†ý
 °āÆ^{3/4}āñ ‡āŠ °āāōfā ‡āŠāē •āüjāò ‡āŠāñ fāāñ ‡āŠÀ ,ā|āÊāñ ‡āŠā
 ‡āŠÀōý‡ā^{3/4}āñ °ñCEā|āñ Ōō (āāPāā 8.3) ?



चित्र सं० 8.3 मटर कुल के पौधों की

fā °āāōfāāò ‡āŠāē •āüjāñā ½āò ŌāāYò °āāāē •āā|āē Ōō ý fā ŌāāYāò
 ½āò Àāf•āāñāā°ā^{3/4}ā½ā āā½ā ‡āŠ •āē|āāāi °āāāñ •āā|āñ Ōō ý ^{3/4}āñ
 •āē|āāāi |āā^{3/4}āi ½āò Ōāñ āāf>Êāñ•āā ‡āŠāñ ,ā|āāāāāŌā|ā ‡āŠÀ‡āñŠ
 āāf>Êāñ•āā ^{3/4}āāōāāŌā ‡āŠ ‡āŠāñ āāf>Êāñ ,āāōÀ āāf>Êāf> ½āò
 °āāÀ|āāā|ā|ā ‡āŠÀ āā½ā>āē ½āò āāf>Êāñ•āā ‡āŠā āāŌāāē‡āŠÀā
 ‡āŠÀ °ñ|āñ Ōōý fŌāŌāñ ½āōā ‡āŠāē „|āÀ|āā °āüjāāē Ōō ý

(Ōā) Ōāîà½ā •āē|āāò °āā ‡āŠāāāāāā ‡āŠ °āāāāā ‡āŠā ,ā|āÜā>ā -

‡āiŠœ Ōāîà½ā •āē|ā °āāōfāāò |āāā •āā|āi,āāò ‡āñŠ ½āō|ā |āāēÀ °āÀ
 |āōāā® ‡āŠÀ ‡āñŠ •āāā>Êā ‡āŠāāāāā ‡āŠ °āāāāāò ‡āŠāñ ŌāÀÊā
 ,‡āŠāāāāāā ‡āŠ °āāāāāò ½āò ,ā|āÜāāā>|ā ‡āŠÀ °ñ|āñ Ōōý Pāūāā‡āŠ
 •āē|āāò ‡āŠā ½āō|ā |āāēÀ °āōāāē °āÀ Ōāē Ōāîà½ā •āē|āāò ‡āñŠ

ˉãĀã ,ã'ãÜã>¶ã (Ôãü;¶ãñ) Ôãñ ¶ãÓ> Öãñ|ãã Öö ,ã|ã: ½ãð|ã ÍãĀãèĀ ‡ãŠã
|ã|Īã äã½ã>á>æ ½ãð äã½ãĒã •ãã|ãã Ööý fÔã 'ãĒ‡ãŠãĀ ¾ãñ •ããèĪã ½ãðã
½ãð 'ããð£ããð ‡ãñŠ äãĒã† , 'ã¾ããñØããè 'ããñÓã‡ãŠ |ã|Īã ÔããefPã|ã ‡ãŠĀ|ãñ
Ööý

(Üã) ¼ããñ•ã¶ã ‡ãñŠ Ā'ã ½ãð -

¾ããèÔ> ½ãð 'ãĒãñ>æ>¶ã ‡ãŠãè ,ãPœãè ½ãã˘ãã 'ãã¾ããè •ãã|ããè Öö ,ã|ã:
fÔã ‡ãŠã 'ãĒ¾ããñØã Ąãã²ã 'ã³ã©ãĀ ‡ãñŠ Ā'ã ½ãð äã ‡ãŠ¾ãã •ãã|ãã
Ööý † ÔãñããĀ ‡ãŠÔã (½ãĪãĀ½ã) |ã©ãã ½ããĀÔãñĒãã (ÔãìPœãè)
¶ãã½ã‡ãŠ ‡ãŠĪã‡ãŠ Ôã°ããè ‡ãñŠ Ā'ã ½ãð 'ãĒ¾ããñØã äã‡ãŠ¾ãñ •ãã|ãñ
Ööý ‡ãìŠœ Ôã½ãì³ãè ĪãððĪããĒã ¼ããè ¼ããñ•ã¶ã ‡ãñŠ Ā'ã ½ãð 'ãĒ¾ããñØã
Ôãñ|ãñ Ööý

(.) ,²ããñØã £ã¶£ããð ½ãð 'ãĒ¾ããñØã -

'ã>ì,ãã/Ôã¶ãfĀ (Öñ½'ã) Ôãñ |ãð¾ããĀ ĀñĪãñ ĀÔÔããè °ã¶ãã¶ãñ ‡ãñŠ
‡ãŠã½ã ,ãã|ãñ Ööáy ¾ãÖ ĀñĪãñ 'ããð£ããð Ôãñ ‡ãðŠÔãñ ,ãĒãØã äã‡ãŠ¾ãñ
•ãã|ãñ Ööã?

ãã%ãŠ¾ãã ‡ãŠĒãã'ã 8.5

'ã>ì,ãã/Ôã¶ãfĀ ‡ãŠãè 'ããð£ãã ‡ãŠãñ ('ã¾ããĀ'ã Īãðãã® ‡ãñŠ 'ãĪPãã|ãã)
ãã ‡ãŠÔãã¶ã ‡ãŠã> ‡ãŠĀ 'ããã|ã¾ããð † Īãã ĪããĄãã,ããð ‡ãŠãè Ôã'ãŠãfĀ
‡ãŠĀ‡ãñŠ „Ôãñ ÔĒ‡ãŠãè £ãĪ'ã ½ãð 4 Ôãñ 5 ÜãŸñ ‡ãñŠ äãĒã† œãñü;
°ñ|ãã Ööý Ôãã'ãŠ äã ‡ãŠ¾ãñ Òì † ñ |ã¶ãñ ‡ãŠãñ äã'ãŠĀ ĪãÖ |ããĒãã°ã/
'ããñĄãĀ ‡ãñŠ 'ãã¶ããè ½ãð œãñ>ñ-œãñ>ñ Øã>áŸĀ °ã¶ãã‡ãŠĀ äã½ã>á>æ
Ôãñ °ãã °ñ|ãã Ööý ĒãØã¼ãØã 5 ¾ãã 6 äã¶ããð ½ãð 'ããð£ãã ‡ãñŠ
½ãĪĒãã¾ã½ã ¼ããØã Ôãü; •ãã|ãñ Öö ,ããðĀ ĀñĪãñ Ô'ãÓ> äãĄããfĀ °ñ¶ãñ
ĒãØã|ãã Ööý 'ããð£ããð ½ãð ¾ãÖ Ôãü;¶ã äã ‡ãŠÔã ‡ãñŠ 'ãĀã Ôãñ
Ôã‡ãŠããè Öö ?

ÔãĪã½ã •ããèĪããð ‡ãŠã „ã¾ããñØã ,ã¶ãñ‡ãŠ 'ãĒ‡ãŠĀ ‡ãñŠ „ãããð ‡ãŠãñ
|ãð¾ããĀ ‡ãŠĀ¶ãñ ½ãð äã ‡ãŠ¾ãã •ãã|ãã Ööý •ãðÔãñ ¾ããèÔ>
(‡ãŠĪã‡ãŠ)‡ãŠã „ã¾ããñØã |°ãĒ Āãñ>æ °ã¶ãã¶ãñ, °ãð‡ã>æèããĀ¾ãã ‡ãŠã
„ã¾ããñØã äãÔãĀ ‡ãŠã „²ããñØã, |ã½°ãã ‡ãĪŠ „²ããñØã, Pãã¾ã „²ããñØã
|ã©ãã Pã½ãüññ ‡ãñŠ „²ããñØã ½ãð äã‡ãŠ¾ãã •ãã|ãã Ööý

**ÔãĪã½ã •ããèĪããð Ôãñ °ãPããĪã Öñ|ãì Ôãã½ãØãĒãè ‡ãŠã
„ããPã|ã ĄĄã-ĄĄããĪã -**

Ôãã½ãØãĒãè ‡ãñŠ „ããPã|ã ÔããØãĒÖ |ã©ãã ÔããĀããŸã Ôãñ
•ããèĪããŸãì,ããð 'ãĀã Öããã¶ã 'ãÖüìPãã¶ãñ ‡ãŠãñ Āãñ ‡ãŠ Ôã ‡ãŠ|ãñ Öö
ýÔãĪã½ã •ããèĪã •ãÖãú Ö½ãð ĀãñØãØãĒÖ|ã ‡ãŠĀ °ñ|ãñ Öö ĪãÖãè
Ö½ããĀñ °ããã¶ã‡ãŠ •ããèĪã¶ã ‡ãŠãè ĪãÔ|ãì,ããð ‡ãŠãñ ¶ãÓ> ¼ããè ‡ãŠĀ °ñ|ãñ

Öö ý 'ªÊÄÄñ>æ, 'äiÔ|ä ‡ äòŠ, Pā½äüjñ ‡ äŠæ ÌäÔ|äi³äò, Ąää²ä
 Ôää½äŒÆæ ,äääª Ōäîà½ä •ääèÌääò ‡äñŠ 'äÄ ĄÄÄª Ōñ •ää|ääè Ööý
 „ÓŸä |ä©ää ¶ä½ä Ìää|ääÌäÄŸä ½äò Ōäîà½ä•ääèÌä f¶ä ÌäÔ|äi,ääò 'äÄ „Œä
 ,ää|äñ Öö ,ääòÄ „¶Öò ĄÄÄªª ‡äŠÄ ªñ|äñ Öö ý
 Ōäîà½ä •ääèÌääò Ōñ ŌäiÄäää|ä ÄĄ¶äñ † Ìää „¶äŌñ Ōñ¶äñ ÌääÊääè
 ,ääää©äÄ ‡ äŠ Ōää¶ä Ōñ ªPää¶äñ ‡ äñŠ ääÊä † ää¶ä½¶äääÊääĄä
 „¹ä³¼ä ää‡äŠ³äñ •ää Ōä‡äŠ|äñ Öö -

¹äŒäªªÆ‡äŠ |ä©ää Pā½äüjñ ‡äñŠ Ōää½ä¶ä¶äò ‡äŠä -

¹äŒäªªÆ ‡ äŠ |ä©ää Pā½äüjñ ‡ äñŠ Ōää½ä¶ä¶ä ‡ äŠä äääÄŸä Ōäîà½ä
 •ääèÌääò 'äÄä ¶ä Ōñ fŌä ‡ äñŠ ääÊä † f¶ä ‡ äŠä „ääPä|ä ŌääŒÆÖ
 ,ääÌäi³ä‡äŠ Ööý Pā½äüjñ ‡äŠñ ›Œä¶ä¶äŒä ‡äŠÄ‡äñŠ ŌäiÄäää|ä ÄĄä
 •ää Ōä ‡ äŠ|ää Ööý Ōäi³äÄ ‡ äñŠ 'äÆ ‡ äŠäÌä ½äò Pā½äüjñ 'äÄ ÊäŌñ
 Ōäîà½ä •ääèÌä ¶äŌ Ōñ •ää|äñ Ööý

**ää½ªÄ ‡ äŠñ Ōäîà½ä •ääèÌääò Ōñ ªPääÌä Ōñ|äi 'äñ¶>
 ‡äŠÄ‡äñŠ -**

ää½ªÄ (f½ääÄ|ääè Êä ‡ äŠüjæ) ‡ äŠñ Ōäîà½ä•ääèÌääò Ōñ ªPää¶äñ
 ‡äñŠ ääÊä† 'äñ¶> ‡äŠÄ¶ä ,ääÌäi³ä‡äŠ Öö ý 'äŠ¶äæPäÄ ,äääª Êä‡äŠüjæ
 Ōñ ª¶äæ ÌäÔ|äi,ääò ‡ äŠñ ªæ½ä ‡ äŠ ,äääª Ōñ ªPääÌä ‡ äñŠ ääÊä †
 f¶ä‡äñŠ ĄÄÊääè ¼ääŒä ‡äŠñ 'äi>æ¶ä 'äÄ ¼äÄ ªñ¶ä PäääÖ† |ä©ää
 ‡ äŠæ>¶ääÌä ‡ äŠ ªÌä,ääò •äŌŌñ ŒäŒ½ñ ‡ äŒäæ¶ä ,äääª ‡ äŠä
 ääüj ‡ äŠäÌä ‡ äŠÄ¶äñ Ōñ ‡ äŠæ> Ōäª % äŠ½äŸä Ōñ ªPää¼ää •ää
 Ōä‡äŠ|äñ Ööý

**¼ääñ•ä¶ä ‡ äŠñ ÄñäªªÆŠ•äÄñ>Ä, Ō>äÄÊääf•äñÌä¶ä 'äÄä
 ŌäiÄäää|ä ÄĄä‡äŠÄ -**

,ää¹ä ¶äñ ‡ äŠ¼ääè ŌääñPää Öö ää ‡ äŠ Œää³ä¼ä½äŒä ‡ äŠä ªíä ªiŒ¶äñ
 ‡ äñŠ ªäª „Ōñ „ªäÊää •ää|äñ Ööý ¾ääªª ªíä ‡ äŠñ „ªäÊää ¶äŒæ •ää †
 |äñ ‡ ä¼ää ŌñŒä?

"Ō>ÄÊääf•äñÌä¶ä" † ‡ äŠ ääÌäääŸä Öö ää•äŌä ‡ äñŠ 'äÄ ĄÄ²ä 'äª©ääò
 ‡ äŠñ Ōäîà½ä •ääèÌääò Ōññ ½äi ‡ äŒä ää ‡ äŠ³ää •ää|äñ Ööý fŌäŌñ
 ĄÄ²ä 'äª©äÄ † ‡ äŠ ää¶ääiPä|ä Ōä½ä¼ä |ä ‡ äŠ ĄÄÄªª ¶äŒæ Ōñ|äñ
 Ööý ää¹äÆŠª (ÄñäªªÆŠ•äÄñ>Ä) † ‡ äŠ „¹ä‡äŠÄŸä Öö ää•äŌä‡äñŠ 'äÄä
 Ōää½ä¶ä¶ä ¼ä |ä¹ä Ōñ ‡ äŠ½ä |ä¹ä (5°C Ōñ 10°C) „¹ä,ä ‡ äŠÄ Ōäîà½ä
 •ääèÌääò ‡ äŠæ „¹ä¹äPää¼ääè ää % äŠ¼ää † ò |ä©ää ÌäŒä® ‡ äŠñ
 ää¶ä¼äää|ä ää ‡ äŠ¼ää •ää|äñ Ööý fŌäæ ääÊä † ää¹äÆŠª ‡ äŠä
 „¹ä¼ääñŒä 'äŠÊä, Ōääªª¼ääò |ä©ää ĄÄ²ä 'äª©ääò ,äääª ‡ äŠñ

‡āiŠœ ,āāōÀ •āā¶āñ

1/4ããñ•3/4ã 1ãªã©ããô ‡ãŠãñ „°ããÊã‡ãŠÀ -

1ãîÔ|ã ‡ ãŠšò |ã©ãã ìãÔ"ãããä" ½ãò ‡ ãŠšè¶ããíã ‡ ãŠ "íãã,ããò
‡ãŠš „,1ã³ããñØã ‡ãŠÀ‡ãñŠ -

‡àiŠœ ,ããõÀ ¼ããè •ãã¶ãò

- ☐ ,āPāāÀ ½āò ¶ā½ā‡āŠ āā½āÊāā‡āŠÀ ÀĈā¶āñ Ôāñ ¶ā½ā‡āŠ ÔāāÀāā‡āŠ
‡āŠā ‡āŠā¾āĀ ‡āŠÀ|āā Ööý fÔā‡āñŠ ´āĀ „|ā¶ā ½āāf¾ā½ā ½āò
‡¶āāf½ā āā¶āāāÖ%āŠ¾ā Öāñ •āā|āñ Öö •āāñ Ôāā½āā¶¾ā |āā¹ā%āŠ½ā
½āò ¼āāñ•ā¶ā āāĪāĈāā¥|ā ‡āŠÀ ºñ|āñ Ööý
☐ •āð½ā, •āñÊāāè Īā ĪāºāĀ|ā āā•ā¶ā ºā|āĀ¶āāò ½āò ÔāĪĀāāā|ā ĀĈāñ
•āā|āñ Öö „¶ā‡āŠāñ •āāèĪāā¥āĪ ĀāāÖ|ā ¾āā Ô>āñĀÊāāf•ā āā‡āŠ¾āā
•āā|āā Ööý fÔā‡āñŠ āāÊā† ºā|āĀ¶āāò ‡āŠāñ āā¶āāāĪPā|ā Ôā½ā¾ā ‡āñŠ
āāÊā† ¹ā¶āāè ½āò ĈāāðÊāā¾āā •āā|āā Ööý fÔā‡āñŠ ,āāā|āāāÀ ‡āā|ā

$f\llbracket\tilde{a}$ $\hat{O}\tilde{a}\tilde{a}^{1/2}\tilde{a}\tilde{a}\tilde{a}\tilde{O}\tilde{a}\tilde{E}^{3/4}\tilde{a}\tilde{a}\tilde{o}$ $^{1/2}\tilde{a}\tilde{o}$ $\hat{O}\tilde{a}\tilde{a}\tilde{n}\tilde{a}\tilde{a}\tilde{j}^{3/4}\tilde{a}^{1/2}\tilde{a}$ $^{1/2}\tilde{a}\tilde{n}\rangle\tilde{a}$ $^{\circ}\tilde{a}\tilde{a}f\tilde{A}$ $\hat{O}\tilde{a}\hat{E}^1\tilde{a}\tilde{S}\tilde{a}f\rangle$
 $\lvert\tilde{a}\hat{O}\tilde{a}\tilde{a}$ $\hat{O}\tilde{a}\tilde{a}\tilde{n}\tilde{a}\tilde{a}\tilde{j}^{3/4}\tilde{a}^{1/2}\tilde{a}$ $^{\circ}\tilde{a}\tilde{o}\cdot\tilde{a}\tilde{a}\tilde{n}\dagger\rangle$ $\ddagger\tilde{a}\tilde{S}\tilde{a}\tilde{e}$ $\tilde{a}\tilde{a}\llbracket\tilde{a}\tilde{a}\tilde{a}\tilde{I}\tilde{P}\tilde{a}\lvert\tilde{a}$ $^{1/2}\tilde{a}\tilde{a}\tilde{a}\tilde{a}$ $\tilde{a}\tilde{a}^{1/2}\tilde{a}\hat{E}\tilde{a}\tilde{a}^{3/4}\tilde{a}\tilde{a}\tilde{e}$
 $\cdot\tilde{a}\tilde{a}\lvert\tilde{a}\tilde{a}\tilde{e}$ $\hat{O}\tilde{o}$ $\cdot\tilde{a}\tilde{a}\tilde{n}$ $^1\tilde{a}\tilde{a}\tilde{a}\tilde{A}\tilde{a}\tilde{a}\tilde{a}\tilde{a}\tilde{S}$ $\ddagger\tilde{a}\tilde{S}\tilde{a}$ $\ddagger\tilde{a}\tilde{S}\tilde{a}^{3/4}\tilde{a}\tilde{A}$ $\ddagger\tilde{a}\tilde{S}\tilde{A}\lvert\tilde{a}\tilde{a}\tilde{e}$ $\hat{O}\tilde{o}\acute{y}$
 $\square$ $\hat{O}\tilde{a}\tilde{a}\tilde{u}\hat{O}\tilde{a}$, $\tilde{P}\tilde{a}\rangle\llbracket\tilde{a}\tilde{a}\tilde{e}$ $^{1/2}\tilde{a}\tilde{o}$ $\dagger\hat{O}\tilde{a}\tilde{a}\tilde{e}\tilde{a}\tilde{a}\rangle\ddagger\tilde{a}\tilde{S}$ $_{,\tilde{a}^{1/2}\hat{E}\tilde{a}}$ $^1\tilde{a}\tilde{a}\tilde{a}\tilde{A}\tilde{a}\tilde{a}\tilde{a}\ddagger\tilde{a}\tilde{S}$ $\ddagger\tilde{a}\tilde{S}\tilde{a}$ $\ddagger\tilde{a}\tilde{S}\tilde{a}^{3/4}\tilde{a}\tilde{A}$
 $\ddagger\tilde{a}\tilde{S}\tilde{A}\lvert\tilde{a}\tilde{a}$ $\hat{O}\tilde{o}\acute{y}$
 $^{\circ}\tilde{I}\tilde{a}\tilde{a}\hat{O}\tilde{a}\lvert\tilde{a}$ $\cdot\tilde{a}\hat{E}\tilde{a}$ $\hat{I}\tilde{a}$ $^{1/4}\tilde{a}\tilde{a}\tilde{n}\cdot\tilde{a}\llbracket\tilde{a}$ $\hat{O}^{1/2}\tilde{a}\tilde{a}\tilde{A}\tilde{n}$ $\tilde{a}\tilde{a}\hat{E}\tilde{a}\dagger$ $\hat{O}\tilde{a}\tilde{a}\tilde{a}\llbracket\tilde{a}$ $\ddagger\tilde{a}\tilde{S}\tilde{a}\tilde{A}$ $\ddagger\tilde{a}\tilde{S}$ $\hat{O}\tilde{o}$
 $f\hat{O}\tilde{a}\tilde{a}\tilde{a}\hat{E}\tilde{a}\dagger$ $\hat{O}\hat{I}\tilde{a}\tilde{P}\tilde{e}$ $\cdot\tilde{a}\hat{E}\tilde{a}$ $^{3/4}\tilde{a}\tilde{a}$ $\lvert\tilde{a}\tilde{a}\cdot\tilde{a}\tilde{a}$ $^{1/4}\tilde{a}\tilde{a}\tilde{n}\cdot\tilde{a}\llbracket\tilde{a}$ $^{3/4}\tilde{a}\tilde{a}$ $_{,,\tilde{a}\tilde{a}\tilde{P}\tilde{a}\lvert\tilde{a}}$ $\sqcap\tilde{a}\hat{O}\tilde{a}$ $\hat{O}\tilde{a}\tilde{n}$
 $\hat{O}\tilde{a}\tilde{a}\hat{O}\tilde{a}\tilde{E}\tilde{a}\tilde{a}\hat{O}\lvert\tilde{a}$ $\tilde{a}\tilde{a}$ $\ddagger\tilde{a}\tilde{S}^{3/4}\tilde{a}\tilde{n}$ $\hat{O}\tilde{a}^{3/4}\tilde{a}\tilde{n}$ $^{1/4}\tilde{a}\tilde{a}\tilde{n}\cdot\tilde{a}\llbracket\tilde{a}$ $\ddagger\tilde{a}\tilde{S}\tilde{a}$ $\hat{O}\tilde{a}\tilde{e}$ $^1\tilde{a}\tilde{E}^{3/4}\tilde{a}\tilde{a}\tilde{n}\hat{O}\tilde{a}$
 $\ddagger\tilde{a}\tilde{S}\tilde{A}\llbracket\tilde{a}\tilde{a}$ $\tilde{P}\tilde{a}\tilde{a}\tilde{a}\hat{O}\dagger$ $\acute{y}$

Íā°āīāÊāāè

$^{\circ}\tilde{a}\tilde{a}\tilde{e}\cdot\tilde{a}\tilde{a}\tilde{y}\tilde{a}\tilde{i}$ Spore
 $\tilde{A}\tilde{a}\tilde{n}\hat{O}\tilde{a}\cdot\tilde{a}\llbracket\tilde{a}\ddagger\tilde{a}\tilde{S}$ $\tilde{A}\tilde{a}\tilde{n}\hat{O}\tilde{a}\tilde{a}\tilde{y}\tilde{a}\tilde{i}$ Pathogenic Pathogen
 $\tilde{a}\tilde{a}\lvert\tilde{a}\hat{O}\tilde{a}\tilde{a}\tilde{y}\tilde{a}\tilde{i}$ Virus
 $\hat{I}\tilde{a}\hat{o}\lvert\tilde{a}\tilde{a}\hat{E}\tilde{a}$ / $\ddagger\tilde{a}\tilde{S}\tilde{a}f\tilde{A}$ Algae
 $\hat{O}\tilde{a}\hat{I}\tilde{a}^{1/2}\tilde{a}$ $\cdot\tilde{a}\hat{o}\tilde{a}\tilde{a}\lvert\tilde{a}\ddagger\tilde{a}\tilde{S}\tilde{a}\tilde{e}$ Microbiology
 $_{,\tilde{a}\llbracket\tilde{a}\tilde{a}\tilde{u}\ddagger\tilde{a}\langle\hat{O}\tilde{a}\tilde{a}\tilde{e}^{3/4}\tilde{a}}$ $\hat{I}\tilde{I}\tilde{a}\hat{O}\tilde{a}\llbracket\tilde{a}$ Anaerobic Respiration
 $_{,\tilde{a}\tilde{a}\tilde{u}\ddagger\tilde{a}\langle\hat{O}\tilde{a}\tilde{a}\tilde{e}^{3/4}\tilde{a}}$ $\hat{I}\tilde{I}\tilde{a}\hat{O}\tilde{a}\llbracket\tilde{a}$ Aerobic Respiration
 $^1\tilde{a}\tilde{E}\tilde{a}\tilde{a}\lvert\tilde{a}\tilde{A}\tilde{a}\tilde{a}\tilde{a}\tilde{e}$ / $\tilde{A}\tilde{a}\tilde{a}\tilde{a}^{1/2}\tilde{a}\ddagger\tilde{a}\tilde{S}$ $_{,\tilde{a}\tilde{y}\tilde{a}\tilde{i}}$ Antibody
 $^1\tilde{a}\tilde{E}\tilde{a}\tilde{a}\lvert\tilde{a}\cdot\tilde{a}\hat{o}\tilde{a}\tilde{a}\lvert\tilde{a}\ddagger\tilde{a}\tilde{S}$ Antibiotic
 $^1\tilde{a}\tilde{S}\acute{u}^1\tilde{a}\tilde{i}\tilde{S}^a$ / $\ddagger\tilde{a}\tilde{S}\tilde{I}\tilde{a}\ddagger\tilde{a}\tilde{S}$ Mould / Fungi
 $\text{peeheeveer ceefmle}<\text{ke}\tilde{a}$ pJej Japanese encephalitis\

$\text{Ske}\tilde{a}\hat{U}\tilde{e}\tilde{t}\tilde{s}$ $\text{Fvmeshe}\tilde{a}\tilde{u}\tilde{e}\tilde{e}\text{F}\&\text{ef}\tilde{s}\text{me}$ $\text{efme}\nu[\wedge\text{esce}$ Acute encephalitis syndrome

,ā^{1/4}/₄āāÔā ¹āĒÍſā

- $\tilde{a}\tilde{a}\llbracket\tilde{a}^{1/2}\llbracket\tilde{a}\tilde{a}\tilde{a}\hat{E}\tilde{a}\tilde{a}\tilde{a}\text{C}\tilde{e}\tilde{a}\lvert\tilde{a}$ $^1\tilde{a}\tilde{E}\tilde{I}\llbracket\tilde{a}$ $_{,\tilde{a}^1\tilde{a}\llbracket\tilde{a}\tilde{a}\tilde{e}}$ $_{,\tilde{a}^{1/4}/_4\tilde{a}\tilde{a}\hat{O}\tilde{a}}$ $^1\tilde{a}\lvert\tilde{a}\tilde{a}\hat{O}\lvert\tilde{a}\ddagger\tilde{a}\tilde{S}\tilde{a}$ $^{1/2}\tilde{a}\tilde{o}$ $\hat{O}\hat{E}\tilde{a}$
 $\ddagger\tilde{a}\tilde{S}\tilde{a}\tilde{e}\tilde{a}\tilde{a}\cdot\tilde{a}\dagger\acute{y}$
 - $_{(,\tilde{a})}$ $\tilde{a}\tilde{a}\llbracket\tilde{a}^{1/2}\llbracket\tilde{a}\tilde{a}\tilde{a}\hat{E}\tilde{a}\tilde{a}\tilde{a}\text{C}\tilde{e}\tilde{a}\lvert\tilde{a}$ $^{1/2}\tilde{a}\tilde{o}$ $\hat{O}\tilde{a}\tilde{n}$ $\hat{O}\tilde{a}\hat{O}\tilde{a}\tilde{e}$ $\tilde{a}\tilde{a}\lvert\tilde{a}$ $\ddagger\tilde{a}\tilde{S}\hat{E}^1\tilde{a}$ $\tilde{P}\tilde{a}\hat{I}\llbracket\tilde{a}$ $\ddagger\tilde{a}\tilde{S}\tilde{A}$
 $\tilde{a}\tilde{a}\hat{E}\tilde{a}\tilde{a}\tilde{a}\text{C}\tilde{e}\tilde{a}\dagger$ -
 - $_{(\ddagger\tilde{a}\tilde{S})}$ $\tilde{a}\tilde{a}\llbracket\tilde{a}^{1/2}\llbracket\tilde{a}$ $^{1/2}\tilde{a}\tilde{o}$ $\hat{O}\tilde{a}\tilde{n}$ $^{1/2}\tilde{a}\hat{E}\tilde{a}\tilde{n}\tilde{a}\tilde{a}\tilde{A}^{3/4}\tilde{a}\tilde{a}$ $\ddagger\tilde{a}\tilde{n}\tilde{S}$ $\tilde{A}\tilde{a}\tilde{n}\hat{O}\tilde{a}\tilde{a}\tilde{y}\tilde{a}\tilde{i}$ $\ddagger\tilde{a}\tilde{S}\tilde{a}$ $\hat{I}\tilde{a}\tilde{a}\hat{O}\ddagger\tilde{a}\tilde{S}$
 $\ddagger\tilde{a}\tilde{S}\tilde{a}\tilde{o}\llbracket\tilde{a}$ $\hat{O}\tilde{o}$ -
 - $_{(i)}$ $\tilde{U}\tilde{a}\tilde{A}\tilde{n}\hat{E}\tilde{a}\hat{I}$ $^{1/2}\tilde{a}\ddagger\tilde{a}\langle\text{C}\tilde{e}\tilde{a}\tilde{a}\tilde{e}$ $_{(ii)}$ $\tilde{a}\tilde{a}\rangle\lvert\tilde{a}\lvert\tilde{a}$ $_{(iii)}$ $\tilde{a}\tilde{a}\lvert\tilde{a}\lvert\tilde{a}\hat{E}\tilde{a}\tilde{a}\tilde{e}$ $_{(iv)}$ $^{1/2}\tilde{a}\tilde{P}\tilde{e}\tilde{A}$
 $_{(\text{C}\tilde{e}\tilde{a})}$ $^1\tilde{a}\tilde{E}\tilde{a}\tilde{a}\lvert\tilde{a}\cdot\tilde{a}\hat{o}\tilde{a}\tilde{a}\lvert\tilde{a}\ddagger\tilde{a}\tilde{S}$ $_{,\tilde{a}\tilde{a}\hat{o}\hat{O}\tilde{a}\tilde{a}\tilde{a}\tilde{f}\tilde{a}}$ $\hat{O}\tilde{o}$ -
 - $_{(i)}$ $^1\tilde{a}\tilde{n}\tilde{a}\tilde{a}\llbracket\tilde{a}\tilde{a}\hat{O}\tilde{a}\hat{E}\tilde{a}\tilde{a}\tilde{e}\llbracket\tilde{a}$ $_{(ii)}$ $f\llbracket\hat{O}\tilde{a}\hat{I}\tilde{a}\tilde{a}\hat{E}\tilde{a}\llbracket\tilde{a}$ $_{(iii)}$ $_{,\tilde{a}\tilde{a}\tilde{a}\hat{E}\lvert\tilde{e}\llbracket\tilde{a}}$ $_{(iv)}$ $_{,\tilde{a}\tilde{a}\tilde{u}\tilde{a}\tilde{a}\ddagger\tilde{a}\langle\cdot\tilde{a}\llbracket\tilde{a}}$
 $_{(\hat{O}\tilde{a})}$ $\hat{O}\tilde{a}\tilde{a}\tilde{A}\lvert\tilde{a}$ $\hat{E}\tilde{a}\lvert\tilde{a}\ddagger\tilde{a}\tilde{S}$ $\tilde{A}\tilde{a}\tilde{a}\hat{O}\lvert\tilde{a}$ $^1\tilde{a}\tilde{a}\hat{o}\tilde{f}\tilde{a}\tilde{a}\tilde{o}$ $\ddagger\tilde{a}\tilde{S}\tilde{a}$ $\hat{O}\tilde{a}^{1/2}\tilde{a}\hat{I}\hat{O}$ $\hat{O}\tilde{o}$ -
 - $_{(i)}$ $\hat{I}\tilde{a}\hat{o}\lvert\tilde{a}\tilde{a}\hat{E}\tilde{a}$ $_{(ii)}$ $\ddagger\tilde{a}\tilde{S}\hat{I}\tilde{a}$ $\ddagger\tilde{a}\tilde{S}$ $_{(iii)}$ $_{,\tilde{a}\llbracket\tilde{a}\tilde{a}\lvert\tilde{a}\hat{o}\lvert\tilde{a}^{\circ}\tilde{a}\tilde{a}\tilde{e}\cdot\tilde{a}\tilde{a}\tilde{e}}$ $_{(iv)}$ $_{,,^1\tilde{a}^{3/4}\tilde{a}\hat{I}\tilde{A}}$ $\ddagger\tilde{a}\langle\lvert\tilde{a}$
 $\hat{O}\tilde{a}^{1/4}\tilde{a}\tilde{a}\tilde{e}$
- $^{\circ}\tilde{A}\tilde{a}\hat{O}\cdot\hat{E}\tilde{a}\tilde{e}^{3/4}\tilde{a}$ $_{,\tilde{a}\tilde{a}^{3/4}\tilde{a}}$ $\dagger\hat{I}\tilde{a}\tilde{a}$ $^{3/4}\tilde{a}\tilde{a}\tilde{n}\hat{O}^{3/4}\tilde{a}\lvert\tilde{a}\tilde{a}$ $_{,\tilde{a}\tilde{a}\tilde{f}\tilde{a}\tilde{a}\tilde{a}\tilde{a}\tilde{A}\lvert\tilde{a}}$ $^1\tilde{a}\tilde{A}\tilde{a}\tilde{e}\tilde{a}\tilde{a}\tilde{a}-2008"$
- $_{(\circ\tilde{a})}$ $\tilde{a}\tilde{a}\llbracket\tilde{a}^{1/2}\llbracket\tilde{a}\tilde{a}\tilde{a}\hat{E}\tilde{a}\tilde{a}\tilde{a}\text{C}\tilde{e}\tilde{a}\lvert\tilde{a}$ $^{1/2}\tilde{a}\tilde{o}$ $\hat{O}\tilde{a}\tilde{n}$ $\hat{O}\tilde{a}\hat{O}\tilde{a}\tilde{e}$ $\ddagger\tilde{a}\tilde{S}\hat{O}\tilde{a}\llbracket\tilde{a}$ $\ddagger\tilde{a}\tilde{n}\tilde{S}$ $_{,\tilde{a}\tilde{a}\hat{O}\tilde{a}\tilde{n}}$
 $\hat{O}\tilde{a}\hat{O}\tilde{a}\tilde{e}(\square)$ $\lvert\tilde{a}\hat{O}\tilde{a}\tilde{a}$ $\hat{O}\tilde{a}\hat{E}\tilde{a}\lvert\tilde{a}$ $\ddagger\tilde{a}\tilde{S}\hat{O}\tilde{a}\llbracket\tilde{a}$ $\ddagger\tilde{a}\tilde{n}\tilde{S}$ $_{,\tilde{a}\tilde{a}\hat{O}\tilde{a}\tilde{n}}$ $\hat{O}\tilde{a}\hat{E}\tilde{a}\lvert\tilde{a}$ $_{(X)}$ $\tilde{a}\tilde{a}\tilde{P}\tilde{a}\llbracket\hat{O}$

ÊãØããf† -

(‡ãŠ) Ôã¼ããè ‡ãŠlã‡ãŠ 'ãÀ•ããèlããè Öãñ|ãñ Öö ý

(Œã) 'ããñããÊã¾ããñ |Êã'ã ‡ãŠãñ °ãPããò ‡ãŠãñ ãã'ãÊãã¶ãñ Ôãñ °ãPããò
½ãò 'ããñããÊã¾ããñ ÀãñØã ‡ãñŠ ããÊã † 'ãÆãã|ãÀãã¥ã ãã½ã|ãã
ããlã‡ãŠããÔã|ã Öãñ •ãã|ããè Öö ý

(Øã) ,ãPããÀ ½ãò ¶ã½ã ‡ãŠ ‡ãŠã ãã½ãÊãã¶ãã fÔã‡ãñŠ ÔããÀãã¥ã ½ãò
½ã^{aa} ‡ãŠÀ|ãã Öö ý

(Ôã) ŒããÊããè Ô©ãã¶ã ‡ãŠãñ ¼ãÀò -

(‡ãŠ) Ôãlã½ã'ããè ‡ãŠãè ÔãÖã¾ã|ãã Ôãñ ‡ãŠãñ °ñŒãã •ãã
Ôã‡ãŠ|ãã Öö ý

(Œã) °ããÔã|ã •ãÊã ‡ãñŠ Ôãñlã¶ã Ôãñ ÀãñØã 'ãõŠÊã|ãã
Öö ý

(Øã) 'ããlPãÀãè ‡ãõŠ|ã °lã ‡ãŠãñ ãã°ã¶ãã „ããÊãñ Öãè „ã¾ããñØã ½ãò
Êãã¾ãã •ãã Ôã‡ãŠ|ãã Öö ‡ã¾ãããòãã‡ãŠ ¾ãÖ..... ÀããÖ|ã Öãñ|ãã Ööý

(Ie) peeheeveer ceefmle<keã pJej Skeã efJe<eeCeg..... JeeÙejme
Éeje neslee nw~

(^a) ãã¶ã½¶ãããÊãããŒã|ã ‡ãñŠ ÔãÖãè •ããñü|ñ °ã¶ããf¾ãñ -

Œã¥; ‡ãŠ

Œã¥; Œã

Ô>Èñ¹>ãñ½ããfããÔã¶ã

ãŠãè>¶ããlã‡ãŠ

|ãè0|ãè0>ãè0

'ãÆãã|ã•ãõããlã ‡ããŠ

,ããõÓãããfã

Êãõ‡ã<ãñ°ãõããÔãÊãÔã

>ãè0°ããè0

°ããè0Ôããè0•ããè0

°Öãè

2. 'ããlPãÀãè ‡ãŠÀ¥ã ‡ã¾ããã Öö ? °lã ‡ãŠãñ 'ãÆ¾ããñØã ½ãò Êãã¶ãñ
Ôãñ 'ãÖÊãñ „ããÊãã •ãã|ãã Öö, ‡ãŠãÀ¥ã ããÊãããŒã† ý

3. •ããèlãã¥ãl 'ããã Öãñ¶ãñ lããÊãñ °ãñ ÀãñØããò ‡ãñŠ ¶ãã½ã ããÊãããŒã† ý

4. Ôãlã½ã •ããèlããò ‡ãñŠ ãã ‡ãŠ¶Öãé °ãñ Ôã½ãlÔãò ‡ãñŠ ããPãã
°ã¶ããf¾ãñý

5. ÀãñØãã¥ãl•ã¶ã‡ãŠ Ôãlã½ã •ããèlããò Ôãñ °ãPã¶ãñ ‡ãñŠ ããÊã† ‡ãŠãõ¶ã-
‡ãŠãõ¶ã Ôãñ „ãã¾ãã ,ããlãl¾ã‡ãŠ Öö ? ããÊãããŒã† ý

6. Ôãlã½ã •ããèlããò ‡ãŠã Ö½ããÀñ •ããèlã¶ã ½ãò ½ãÖ|ã 'ãÀ PãPããÃ
‡ãŠããÀ¾ãñý

7. ãã‡ãŠ¶Öãé °ãñ 'ãÆãã|ã•ãõããlã‡ãŠ ,ããõÓãããfã¾ããò ‡ãñŠ ¶ãã½ã |ã©ãã
Öããñ|ã ããÊãããŒã† ý

8. Ô>ÀÊããf•ãñlã¶ã ããlãããfã Ôãñ Œãã²ã 'ãã©ããò ‡ãŠãñ Ôãlã½ã •ããèlããò
Ôãñ ãã‡ãŠÔã 'ãÆ‡ãŠãÀ ÔãlÀãããã|ã ÀŒãã •ãã Ôã‡ãŠ|ãã Öö ?

9. ¹ããõ£ããò ½ãò •ãæìãã¥ãì,ããò, ããìãÓãã¥ãì,ããò |ã©ãã ‡ãŠìã ‡ãŠãò Ôãñ
Öãñ¶ãñ ìããÊãñ ^aãñ-^aãñ ¹ãã^{a1}ã ÀãñØããò ‡ãñŠ ¶ãã½ã ããÊããäÇã†ý

10. peeheeveer ceefmle<keâ pJej keâe meb>eâceCe kewâmes neslee
nw? meb#eshe ceW efueefKeS~

[back](#)

f†āŠāfĀ : 9

āāīā²āì|ā £āāÀā



āāīā²āì|ā £āāÀā †āŠñ Ōāñ|ā ý
āāīā²āì|ā āāīā¹⁄₄āīāā¶āÀ ý
āāīā²āì|ā ÞāĒĒā†āŠ|āā ý
āāīā²āì|ā £āāÀā †āñŠ 'āÆ¹⁄₄āāīā ý
āāīā²āì|ā £āāÀā †āŠā Ōāāīā£āā¶āāè 'āīāĀ†āŠ 'āÆ³⁄₄āāñŌā ¶ā Ōāñ¶āñ
'āÀ Ōāāā¶ā†āŠāĀ†āŠ 'āÆ¹⁄₄āāīā ý

,āā'ā †āŠāè 'āĀāèāāā ÞāĒā ÀŌāè Ōō, ,āā'ā Āāāā'ā ½āō 'āĀāèāāā †āŠāè
|āō³⁄₄āāĀāè †āŠĀ ÀŌñ Ōō, ¾āāā^a, āÞāā¶ā†āŠ āāīā²āì|ā ,āā'āīāā|āĀ Ÿ'ā Ōāñ
•āā³⁄₄ā |āāñ ,āā'ā †āōŠŌāā ,ā¶āī¹⁄₄āīā †āŠĀ|āñ Ōō ? ,āā'ā 'āĀñīāā¶ā
Ōāñ†āŠĀ Ēāō½'ā ,āāāā^a †āŠāè Ĩ¹⁄₄āīāŌ©āā †āŠĀ|āñ Ōōý fŌāāè 'āÆ†āŠāĀ
¾āāā^a ŌāÆāèŌ½ā †āŠāĒā †āŠāè 'āñ'āŌĀāè ½āō ,āÞāā¶ā†āŠ āā°ā•āĒāāè
†āŠāè ,āā'āīāā|āĀ °āā^a Ōāñ •āā³⁄₄ā |āāñ ,āā'ā †āñŠ †āīŠĒāĀ, 'āāĒāñ ,āāāā^a
†āŠā ÞāĒā¶āā °āā^a Ōāñ •āā|āā Ōō „Ōā ,āīāŌ©āā ½āō ,āā'ā †ā<³⁄₄āā †āŠĀ|āñ
Ōō ? Ō½ā †āŠāāŸ¶āāfĀ †āŠā ,āī¶ā¹⁄₄āīā †āŠĀ|āñ Ōō |ā©āā Ōā©ā īāāĒāñ
'āāĒāñ †āŠā 'āÆ³⁄₄āāñŌā †āŠĀ†āñŠ †āīŠœ ĀāŌ|ā †āŠāè ŌāāāŌā Ēāñ|āñ
Ōōý Ēāñ|ā ½āō ŌĀāè-¼āĀāè 'āŠŌāĒā Ēāū|āè Ōō, āāŌāāÞāāfĀ †āŠāè
,āāīā¹⁄₄ā †āŠ|āā Ōō |āāñ āā †āŠŌāā¶ā Āā|ā-Āā|ā ¼āĀ •āāŌā †āŠĀ āāīā²āì|ā
,āā'āīāā|āĀ †āŠā fā|ā•āāĀ †āŠĀ|āā Ōō |ā©āā āāīā²āì|ā ,āā'āīāā|āĀ Ōāñ¶āñ
'āĀ īāŌ ,ā'ā¶āā 'āāā½ā'āŌā Ōāñ> ,āāāā^a ÞāĒāā†āŠĀ Ēāñ|ā ŌāāèÞā|āā Ōōý
,āā'ā †āñŠ °ōāā¶ā †āŠ •āāèīā¶ā †āŠāñ āāīā²āì|ā ,āā'āīāā|āĀ āāīāāā¹⁄₄ā¶ā
'āÆ†āŠāĀ Ōāñ 'āÆ¹⁄₄āāāāīā|ā †āŠĀ|āāè Ōōý ,ā|ā: ,āā'ā †āñŠ ½ā¶ā ½āō ¾āŌ
āā•ā—āāŌāā ,āīā¹⁄₄ā ŌāñŌāāè āā †āŠ āāīā²āì|ā £āāÀā †ā<³⁄₄āā Ōō, ¾āŌ
†āōŠŌāñ „|ā¶ā Ōāñ|āāè Ōō ? ,ā|ā: ,āāf† •āā¶ā¶āñ †āŠā 'āÆ³⁄₄āāŌā †āŠĀō
āā†āŠ āāīā²āì|ā £āāĀā †ā<³⁄₄āā Ōō ?

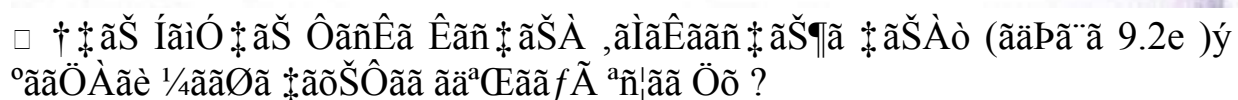
āā%āŠ³⁄₄āā †āŠĒāā'ā 9.1

□ >āÞāĀ ŌāñĒā, °āĒ°ā |ā©āā Ōāā³⁄₄āāñ•ā¶ā |āāĀ Ēāñ†āŠĀ āāÞā'ā āāÞā'ā 9.1
†āñŠ ,ā¶āīŌāāĀ •āāñū|āñý

$f^{\prime} \nabla \hat{O} \tilde{a} n \hat{E} \tilde{a} \tilde{o} \quad ^\circ \tilde{a} \tilde{A} \tilde{a} \quad \tilde{A} \tilde{o} \tilde{a} \tilde{a}^3 /_4 \tilde{a} \tilde{a} \tilde{a} \nabla \tilde{a} \ddagger \tilde{a} \tilde{S} \dots \cdot \tilde{a} \tilde{a} \tilde{A} \quad \ddagger \tilde{a} \tilde{S} \tilde{a} n \quad \tilde{a} \tilde{a} | \tilde{a}^2 \tilde{a} i | \tilde{a} \dots \cdot \tilde{a} \tilde{a} \tilde{A} \quad \frac{1}{2} \tilde{a} \tilde{o}$

āāPāā 9.2a †āŠāñ āñĒā†āŠÀ °ā|āāf³/₄āñ āā†āŠ Êāñ†āĒÊāāīāñ ÔāñĒā †āŠāē
 ÀPā¶āā †āĒ³/₄āā Ôō ? Êāñ†āĒÊāāīāñ ÔāñĒā ††āŠ Īāāēīāñ †āŠā °ā|āĀ¶ā Ôō
 āā•āÔā¹/₂āō ,ā¹/₂āāñāā¶ā³/₄ā¹/₂ā †āĒÊāāñÀāfĭ †āŠā āāīāÊā³/₄ā¶ā ¹/₄āĀ Ôāñ|āā
 Ôōý fÔā āāīāÊā³/₄ā¶ā ¹/₂āō •āÔ|āñ †āŠāē œüĭ |ā©āā ††āŠ ÀāĤāÆ ³/₄āī†āĒ|ā
 °āñĒā¶āā †āŠāÀ °ā|āĀ¶ā ÀĒāā Ôōý °āñĒā¶āā †āŠāÀ °ā|āĀ¶ā ¹/₂āō
¹/₂āōØā¶āāē•ā ĵāĤĀ ,āā †āĒÔāāfĭ |ā©āā †āŠā°āĀ¶ā †āŠā Pāī¥āĤĀ ¹/₄āĀ
 Ôāñ|āā Ôō |ā©āā fÔā¹/₂āō †āŠā°āĀ¶ā †āŠāē œüĭ ÀĒāāē ÀÔ|āāē Ôōý
 †āŠā°āĀ¶ā †āŠāē œüĭ Ĥā¶ā ĤāÆīlā |ā©āā •āÔ|āñ †āŠāē œüĭ ¨āÉ¥ā ĤāÆīlā
 †āŠā †āŠā³/₄āĀ †āŠÀ|āāē Ôōý fÔā ÔāñĒā †āŠā āāīā²āī|ā ĪāāÔ†āŠ °āĒā 1.4
 ĪāāñĒā Ôāñ|āā Ôōý

9.2



ÀaØãæ¶ā ½ãñ>ñ ‡ãŠaØã•ã ‡ãŠaè °ñÊa¶āã‡ãŠaÀ ,ãã‡ãðŠãã|ã ããªCããfÃ
 °ñ|ãæ Òõ,ãã•ãÔã ‡ãñŠ ...¹ãAãè ¼ããØã ‡ãñŠ ½ã£³¼ã ½ãð ‡ãŠ £ãã|ãì
 (¹ããè|ãÊã) ‡ãŠaè >ãñ¹ããè ÊãØããè Òõ ý Ìãð||ãã ‡ãŠaÀ ,ãã‡ãðŠãã|ã ‡ãŠaè
 ¹ãðªãè £ãã|ãì (•ãÔ|ãã) ‡ãŠaè °¶ããè ÒifÃ ããªCããfÃ °ñ|ãæ Òõ ý
 ,ãª ÔãñÊã ‡ãŠãñ ½ã£³¼ã Ôãñ ‡ãŠã>‡ãŠÀ (¹ãñüj‡ãŠÀ) ¼ããè|ãAãè ¼ããØã
 ‡ãŠã ,ãÌãÊããñ‡ãŠ¶ã ‡ãŠAò (ããPãª 9.2f)ý ‡ã³¼ãã ããªCããfÃ °ñ|ãæ Òõ ?
 ½ã£³¼ã ½ãð ‡ãŠãªã¶ã ‡ãŠaè œüj, fÔã‡ãñŠ PããAãð ,ããñÀ ‡ãŠãÊãñ ÀãØã
 ‡ãŠã Pãì¶ãÃ |ã©ãã fÔã Pãì¶ãÃ ‡ãñŠ PããAãð ,ããñÀ Ôã¹ãñŠª ÀãØã ‡ãŠã
 Pãì¶ãÃ £ãã|ãì (•ãÔ|ãã) ‡ãñŠ °ñÊa¶āã‡ãŠaÀ °ã|ã¶ã ‡ãñŠ ,ã¶ã ããªCããfÃ
 °ñ|ãæ Òõ ý

□ ‡ãŠãÊãñ ‡Ìãã Ôã¹ãñŠª ÀãØã ‡ãñŠ Pãì¶ãÃ ‡ã³¼ãã Òõã ?
 ‡ãŠãÊãñ ÀãØã ‡ãŠã Pãì¶ãÃ ½ãðØã¶ããè•ã |ãfÃ ,ããü ‡ã<Ôããfj (MnO₂)
 |ã©ãã ‡ãŠãªã¶ã ‡ãñŠ Pãì¶ãÃ ‡ãŠã ãã½ãÑã¶ã Òõ ý Ôã¹ãñŠª ÀãØã ‡ãŠã
 Pãì¶ãÃ ,ã½ããñãã¶ã³¼ã½ã ‡ã<ÊããñÀãfj (NH₄Cl) Òõ •ãñ ÔãñÊã ½ãð
 •ãÊããè³¼ã ¹ãñÔ> ‡ãñŠ Â¹ã ½ãð ¼ãAã •ãã|ãã Òõ ý ÔãñÊã ‡ãŠã CãìÊãã ...
 ¹ãAãè ããÔãAã Pã¹ãüjñ ¾ãã ãã¹ãPã Ôãñ °ã¶ã Òãñ|ãã Òõý
 ‡ãŠãªã¶ã ‡ãŠaè œüj ‡ãñŠ ...¹ãÀ ÊãØããè ¹ããè|ãÊã ‡ãŠaè >ãñ¹ããè £ã¶ã (+)
 £ãÆìã |ã©ãã •ãÔ|ãñ Ôãñ °¶ããè ÒifÃ ÔãñÊã ‡ãŠaè ¹ãðªãè ¯ãÉ¶ã (-) £ãÆìã
 ‡ãŠã ‡ãŠ³¼ãÃ ‡ãŠÀ|ããè Òõý
 fÔã ÔãñÊã ‡ãŠã ,ããã£ã‡ãŠ|ã½ã ããÌã¹¼ãÌã¶ã (ããÌã²ãì|ã ÌããÔ‡ãŠ °ãÊã) 1.5
 ÌããñÊ> Ôãñ|ãã Òõý ÔãñÊã ‡ãñŠ ããÌããã¼ã¶ã ÀÔãã³¼ã¶ãð ‡ãñŠ °ããèPã
 Ôãñ¶ãñ ÌããÊããè ãã%ãŠ³¼ãã Ôãñ ããÌã²ãì|ã £ããAã „¹ã¶ã Òãñ|ããè Òõ ý fÔã
 ÔãñÊã Ôãñ ©ãñüjñ Ôã¹ã³¼ã ‡ãñŠ ããÊã† ããÌã²ãì|ã £ããAã ¹ãÆã¹|ã ‡ãŠaè •ãã
 Ôã‡ãŠ|ããè Òõ (ããPãª 9.2b)ý |ã©ãã (ããPãª 9.2c) ‡ãŠãñ °ñCã‡ãŠÀ ,ãã¹ã
 %ãŠ½ãÍã: jñã¶ã³¼ãÊã ÔãñÊã |ã©ãã ÌããñÊ>ãè³¼ã ÔãñÊã ‡ãŠaè ÀPã¶ãã
 ¼ããè •ãã¶ã Ôã‡ãŠ|ãñ Òõý f¶ã °ãñ¶ãð ÔãñÊããð ‡ãŠã ããÌã²ãì|ã ÌããÔ‡ãŠ °ãÊã
 1.08 ÌããñÊ> Ôãñ|ãã Òõý
 ,ãã¹ã ãã¹ããè³¼ã ‡ãŠ ÔãñÊã ‡ãñŠ °ããÀñ ½ãð •ãã¶ã¶ãñ ‡ãñŠ ããÊã† ¼ããè
 „Ôãì‡ãŠ ÒãðØãñý ,ããf† •ãã¶ãð ãã‡ãŠ ãã¹ããè³¼ã‡ãŠ ÔãñÊã ‡ã³¼ãã Òõ ?

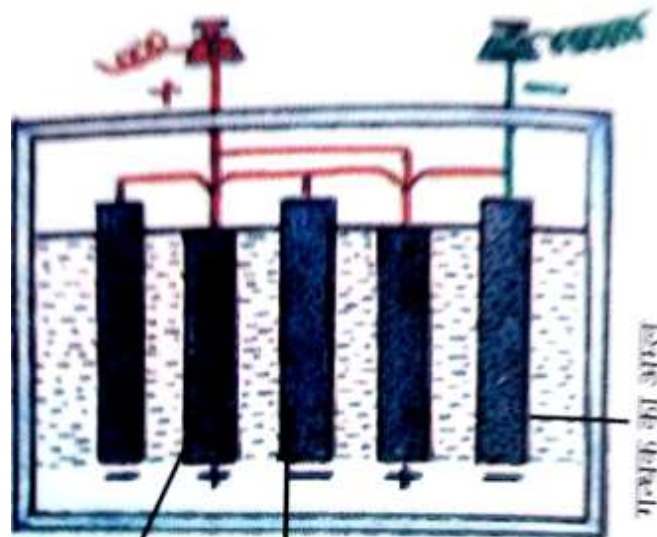
ãã¹ããè³¼ã‡ãŠ ÔãñÊã (Secondary Cell):-

f¶ã ÔãñÊããð ½ãð ããÌã²ãì|ã £ããAã ¹ãÆìããããÔ|ã ‡ãŠÀ‡ãñŠ ããÌã²ãì|ã ...•ããÃ
 ‡ãŠãñ ÀãÔãã³¼ãã¶ã ‡ãŠ ...•ããÃ ½ãð °ãÊãã •ãã|ãã Òõ fÔãñ ÔãñÊã
 ‡ãŠã ,ããÌãñã¶ã ‡ãŠÔ|ãñ Òõý ÔãñÊã ‡ãŠãñ „¹ã³¼ããñØã ½ãð Êãã¶ãñ ¹ãÀ
 ¹ã¶ã: ÀãÔãã³¼ãã¶ã‡ãŠ ...•ããÃ, ããÌã²ãì|ã ...•ããÃ ½ãð Â¹ãã¶ããÀ|ã Ôãñ|ããè
 Òõ ý fÔã ãã%ãŠ³¼ãã ‡ãŠãñ ÔãñÊã ‡ãŠã ãã¶ãÀãÌãñã¶ã ‡ãŠÔ|ãñ Òõý
 Pãìããã ‡ãŠ fÔã ÔãñÊã ‡ãŠãñ ,ããÌãñããÌã|ã ‡ãŠÀ|ãñ Ôã¹ã³¼ã ããÌã²ãì|ã ...
 •ããÃ ‡ãŠãñ ÀãÔãã³¼ãã¶ã‡ãŠ ...•ããÃ ‡ãñŠ Â¹ã ½ãð ÔããããPã|ã ‡ãŠÀ|ãñ Òõ

,ā|ā: f¶Öò ÔāâPāā^{3/4}ā ‡ āŠ ÔāñÊā ¼āāè ‡ āŠÖ|āñ Ööý ‡ ā^{3/4}āāòāā ‡ āŠ fÔā
 ÔāñÊā ‡ āñŠ āñ ‡ āŠā^{3/4}āĀ Öö 'āÆ©ā^{1/2}ā ,āā|āñāā|ā|ā ‡ āŠĀ|āñ Ôā^{1/2}ā^{3/4}ā
 āā|ā²ā|ā ...•āāĀ ‡ āŠā ĀāÔāā^{3/4}āā¶ā ‡ āŠ ...•āāĀ ‡ āñŠ Ā'ā ½āò ÔāâPāā^{3/4}ā
 |ā©āā āā'|āāè^{3/4}ā ‡ āŠā^{3/4}āĀ Öö ÔāñÊā ‡ āŠā ,ā^{3/4}āāñØā ‡ āŠĀ|āñ Ôā^{1/2}ā^{3/4}ā
 ÔāāāPā|ā ĀāÔāā^{3/4}āā¶ā ‡ āŠ ...•āāĀ ‡ āŠā 'ā|¶ā: āā|ā²ā|ā ...•āāĀ ‡ āñŠ Ā'ā
 ½āò Ā'āā¶āĀ¥ā fÔāāāĒā† fÔāñ āā'|āāè^{3/4}ā ‡ āŠ ÔāñÊā ‡ āŠÖ|āñ Ööý •āòÔāñ
 - ÔāāèÔāā ÔāâPāā^{3/4}ā ‡ āŠ ÔāñÊā, ¶āāè'āñŠ ÔāñÊā ý

ÔāāèÔāā ÔāâPāā^{3/4}ā ‡ āŠ ÔāñÊā :-

ÔāāèÔāā ÔāâPāā^{3/4}ā ‡ āŠ ÔāñÊā |ā|Ô ‡ āŠ ÔāñÊā ‡ āŠāè ,ā'āñāāā āā|ā²ā|ā
 £āāĀ ‡ āŠā ‡ āòŠÔāā Ôāāñ|ā Öö ?
 ÔāâPāā^{3/4}ā ‡ āŠ ÔāñÊā |ā|Ô ‡ āŠ ÔāñÊā ‡ āŠāè ,ā'āñāāā ,āāāfā ‡ āŠ Ôā^{1/2}ā^{3/4}ā
 |ā ‡ āŠ āā|ā²ā|ā £āāĀ 'āÆā¹|ā ‡ āŠĀ¶āñ ‡ āŠā Ôāāñ|ā Öö ý ,ā¶āā|āñāā|ā|ā
 Ôāñ¶āñ 'āĀ fÔāñ ,āā|āñāā|ā|ā ‡ āŠĀ ‡ āñŠ 'āÆ^{3/4}āāñØā ½āò Êāā^{3/4}āā •āā
 Ôā ‡ āŠ|āā Ööý āāPāā 9.3 ½āò ÔāāèÔāā ÔāâPāā^{3/4}ā ‡ āŠ ÔāñÊā ‡ āŠāè
 ĀPā¶āā Ôā^{1/2}āçāāè •āā Ôā ‡ āŠ|āāè Ööý fÔā ÔāñÊā ½āò ÔāāèÔāñ ‡ āñŠ ‡ ‡ āŠ
 °ā|āĀ¶ā ½āò |ā¶ā| Ôāāfā ‡ āŠ ‡ āŠā ,ā½Ēā āāĒā^{3/4}āā •āā|āā Ööý £ā¶āāñā Ēāñ;
 'āĀ ‡ ā<Ôāāf| ‡ āŠā |ā©āā āÆ¥āāñā Ēāñ; ‡ āŠā Ôāñ|āā Ööý ,āā|āñāā|ā|ā
 Ôāñ¶āñ 'āĀ fÔā ‡ āŠā āā|ā²ā|ā |āāÔ ‡ āŠ °āĒā 2.2 |āāñĒ> |ā©āā
 āā¶āĀā|āñāā|ā|ā Ôāñ¶āñ 'āĀ 1.8 |āāñĒ> Ôāñ|āā Ööý āā¶āĀā|āñāā|ā|ā
 Ôāñ¶āñ ½āò ÔāñÊā ‡ āŠāñ |ā| ‡ āŠāĒā ,āā|āñāā|ā|ā ‡ āŠĀ¶āā ,āā|ā^{1/4}ā ‡ āŠ Ööý
 ÔāâPāā^{3/4}ā ‡ āŠ ÔāñÊāāò ‡ āŠāñ Nāñ¥āāè ‰āš^{1/2}ā ½āò •āāñü; ‡ āŠĀ ,āāāfā ‡ āŠ
 āā|ā^{1/4}ā|āā¶āĀ ‡ āŠāè °āò>āāĀ^{3/4}āāú °ā¶āāfĀ •āā|āāè Ööāý



चित्र सं० १३ सीसा संचायक सेल

†ñÔããè °ãõ>Àãè ‡ãŠã „¹ã³⁄₄ããñÔã ‡ãŠÖãú äã‡ãŠ³⁄₄ãã •ãã|ãã Öõ ?
 †ñÔããè °ãõ>ããÀ³⁄₄ããò ‡ãŠã „¹ã³⁄₄ããñÔã ,ãã½ã|ããòÀ ¹ãÀ ½ããñ>À ‡ãŠãÀ,
 •ããè¹ã, >È ‡ãŠ, °ãÔã, ÀñÊãØããü|ãè, f¶ãlã>ÃÀ ,ãããã¹ ½ãò äã‡ãŠ³⁄₄ãã •ãã|ãã
 Öõ ý

,ããf† •ãã¶ãò äã‡ãŠ ,ããããã‡ãŠ lããñÊ>ñ•ã ¹ãã¶ãñ ‡ãñŠ äãÊã† •ããã¶ãã ‡ãŠã
 ¹ãÆ³⁄₄ããñÔã ‡ãòŠÔãñ ‡ãŠÀ|ãñ Öõ ?

•ããã¶ãã (Generator):-

ããlãlããÖ †lãã ,ã¶³⁄₄ã Ôã½ããÀãñÖãò, ‡ãŠãÀÆãã¶ããò †lãã ÜãÀãò ½ãò
 äãlã²ãl|ã ,ãã¹ãlãã|ãã ¶ã Öãñ¶ãñ ‡ãŠãè ¹lãã ½ãò ¹ãÆ‡ãŠãlã „¹ã¶¶ã ‡ãŠÀ¶ãñ,
 ¹ãÆãã PãÊãã¶ãñ ,ãããã¹ ‡ãŠã³⁄₄ããò ½ãò ¹ãÆ³⁄₄ãl ‡ãã|ã Öãñ¶ãñ lããÊããè
 äãlã²ãl|ã ããÀã äã‡ãŠÔã Ôãããã¶ã Öãñ ¹ãÆã¹|ã ‡ãŠãè •ãã|ããè Öõ ?

•ããã¶ãã (•ã¶ãÀñ>À) ¹ãÀ äãlã²ãl|ã ããÀã ¹ãÆã¹|ã ‡ãŠãè •ãã|ããè Öõý

•ã¶ãÀñ>À ¹ãÀ äãlã²ãl|ã ããÀã ‡ãòŠÔãñ ¹ãÆã¹|ã ‡ãŠãè •ãã|ããè Öõ ?

•ã°ã •ã¶ãÀñ>À ‡ãŠãè ,ãã½¹ãñPãÀ ‡ãlŠ¶jÊããè ‡ãŠãñ Pãl½°ã‡ãŠãè³⁄₄ã äãñã
 ½ãò Üãl½ãã|ãñ Öõ |ã°ã ‡ãlŠ¶jÊããè ½ãò äãlã²ãl|ã ããÀã „¹ã¶¶ã Öãñ •ãã|ããè
 Öõ, •ããñ äãÔÊã¹ã äãÀãØã |ã©ãã ‡ãŠã°ãÃ¶ã °ãÆlã ‡ãŠãè ÔãÖã³⁄₄ã|ãã Öãñ
 °ããÖÀãè ¹ãããÀ¹ã©ã ½ãò ¹ãÆlããããÖ|ã Öãñ¶ãñ ÊãØã|ããè Öõý

ããlããã¹⁄₄ã¶¶ã ‡ãŠã³⁄₄ããò ‡ãñŠ äãÊã† äã¹⁄₄ã¶¶ã-äã¹⁄₄ã¶¶ã äã½ã|ãã †lãã
 ,äã‡ãòŠãã|ã ‡ãñŠ •ã¶ãÀñ>À ¹ãÆ³⁄₄ããñÔã ½ãò Êãã† •ãã|ãñ Öõý •ã¶ãÀñ>À
 PãÊãã¶ãñ ‡ãñŠ äãÊã† |ãè•ãÊã, ¹ãñ>ÊãñÊã ,ã©ãlãã äã½ã>ã>ãè ‡ãŠã |ãñÊã
 fÃãã¶ã ‡ãñŠ ¹ã ½ãò ¹ãÆ³⁄₄ããñÔã äã‡ãŠ³⁄₄ãã •ãã|ãã Öõý

•ã¶ãÀñ>À ½ãò ³⁄₄ãããããã ‡ãŠ ...ããÃ äãlã²ãl|ã ...ããÃ ‡ãñŠ ¹ã ½ãò
 ¹ãããÀlããã|ãã Öãñ|ããè Öõý äãlã²ãl|ã ¹ããlãÀ Ô>ñlã¶ããò ½ãò äãlã²ãl|ã
 „¹ãã¶¶ã Öñ|ãl °ãü|ñ ,äã‡ãŠãÀ ‡ãñŠ •ã¶ãÀñ>À ‡ãŠã „¹ã³⁄₄ããñÔã äã‡ãŠ³⁄₄ãã

•ãã|ãã Öõ ý ¹ããlãÀ Ô>ñlã¶ããò ¹ãÀ •ã¶ãÀñ>À ‡ãŠãñ PãÊãã¶ãñ ‡ãñŠ äãÊã†

•ãÊã ...ããÃ ,ã©ãlãã ¼ãã¹ã ...ããÃ ‡ãŠã „¹ã³⁄₄ããñÔã äã‡ãŠ³⁄₄ãã •ãã|ãã Öõý
 äãlã²ãl|ã ¹ããlãÀ Ô>ñlã¶ããò Öãñ ÜãÀãò, ¹l ‡ãŠã¶ããò |ã©ãã ‡ãŠÊã-
 ‡ãŠãÀÆãã¶ããò |ã ‡ãŠ äãlã²ãl|ã ããÀã ‡ãòŠÔãñ ¼ãñ•ããè •ãã|ããè Öõ ?

äãlã²ãl|ã ¹ããlãÀ Ô>ñlã¶ããò Öãñ „Pã lããñÊ>|ãã ¹ãÀ ,Y;wehfu;e ‡ãñŠ ½ããñ>ñ
 |ããÀãñã ¹ãÀ äãlã²ãl|ã ããÀã ‡ãŠãñ ¹lÀÔ©ã äãÔ©ã|ã lãÖÀãò, ‡ãŠÔ°ããò
 ,ã©ãlãã ØãÆã½ããò ‡ãñŠ äãlã²ãl|ã äãlã|ãÀ¶ã Ôã°ã Ô>ñlã¶ã ¹ãÀ ¼ãñ•ãã

•ãã|ãã Öõ ý lãÖãú Öãñ ,Y;wehfu;e ‡ãñŠ |ããÀãò ¹ãÀ >ÊãúÔã¹ãŠã½ãÃÀ
 ‡ãñŠ ½ããã³⁄₄ã½ã Öãñ 220/440 lããñÊ>|ãã ¹ãÀ äãlã²ãl|ã ããÀã ÜãÀãò,
 ¹l ‡ãŠã¶ããò †lãã ‡ãŠãÀÆãã¶ããò ‡ãñŠ ½ãñ¶Ôã |ã‡ãŠ ¼ãñ•ã|ãñ Öõ ý ³⁄₄ãÖ

äãlã²ãl|ã ããÀã ¹ãÆ¹⁄₄ããlã|ããè ããÀã Öãñ|ããè Öõý

ÜãÄão, ºı ‡ ãŠãŒãão ,ã©ãlãã ‡ ãŠãÀŒããŒãão ½ão ¹ãŒ ‡ ãŠãlãã „¹ãŒŒã
‡ ãŠãÀŒãñ, ‡ ãlŠÊãÀ,ãã¹ãŒŠ•ã,›ãè0lããè0, ¹ããŒãão ‡ ãŠãñ ããlã²ãl¹ã Ôãñ
ÞãÊããŒãñ Öñ¹ãl ,ããlãl¹¾ã¹ãŠ¹ããŒãl¹ã ÔããÀ ããlã²ãl¹ã Êããfãão ãã°ãœãfÃ •ãã¹ãè
Ööý

ãäîã²ãì|ã ääîã¹/₄îãã¶|ãÀ (Potential difference) ‡ã<³/₄ãã Öö ?

āāīā²āī|ā fāāĀā ½āō āāīā²āī|ā ,āāīāñīāāō ‡ āñŠ ¹āÆīāāÖ ‡ āñŠ āāĒā †
 ,āāīā¹⁄₄ā ‡ āŠ ...•āāĀ āāīā²āī|ā ŌāñĒā Ōāñ ¹āÆā¹|ā Ōāñ|āāē Ōō ý āāīā²āī|ā
 ,āāīāñīā ‡ āñŠ ¹āÆīāāÖ ½āō āāīā²āī|ā ...•āāĀ Ī³⁄₄ā³⁄₄ā Ōāñ|āāē ÄŌ|āāē Ōō ý
 ŌāñĒā ‡ āñŠ ²āñ¶āāō fāÆīāāō (fā¶ā |ā©āā ²āÉ¥ā) ‡ āŠāñ āā ‡ āŠŌāāē
 PāāĒā ‡ āŠ |āāÄ Ōāñ •āāñü|¶āñ ¹āÄ PāāĒā ‡ āŠ ½āō āāīā²āī|ā fāāĀā ŌāñĒā
 ‡ āñŠ fā¶āā¹⁄₂ā ‡ āŠ fāÆīā (āāŌāĀñ) Ōāñ ²āÉ¥āā¹⁄₂ā ‡ āŠ fāÆīā (āāŌāĀñ)
 ‡ āŠāē ,āāñĀ ¹āÆīāāāāÖ|ā Ōāñ|āāē Ōō ý
 āā ‡ āŠŌāāē PāāĒā ‡ āŠ ‡ āñŠ † ‡ āŠ āāŌāĀñ Ōāñ ²ŌāĀñ āāŌāĀñ |ā ‡ āŠ
 † ‡ āŠāā ‡ āŠ fā¶ā ,āāīāñīā ¹āÆīāāāāÖ|ā Ōāñ¶āñ ½āñò Ī³⁄₄ā³⁄₄ā ...•āāĀ ‡ āŠāñ
 PāāĒā ‡ āŠ ‡ āñŠ āāŌāĀō ‡ āŠā āāīā¹⁄₄āīāā¶|āÄ ‡ āŠŌ|āñ Ōō ý

$$\text{विभवान्तर} = \frac{\text{व्यय ऊर्जा (जूल में)}}{\text{प्रवाहित आवेश (कूलॉम में)}}$$

माना चालक के एक सिरे से दूसरे सिरे तक Q कूलॉम आवेश प्रवाहित करने पर किया गया कार्य W है तो चालक के सिरे का

$$\text{विभवान्तर } V = \frac{W}{Q} \quad \text{यदि } W = 1 \text{ जूल, } Q = 1 \text{ कूलॉम}$$

$$\text{तो विभवान्तर } V = \frac{1 \text{ जूल}}{1 \text{ कूलॉम}} \\ = 1 \text{ वोल्ट (वोल्ट विभवान्तर का SI मात्रक है)}$$

■ किसी चालक के सिरे का विभवान्तर 1 वोल्ट होगा यदि चालक के एक सिरे से दूसरे सिरे तक 1 कूलॉम आवेश लाने में 1 जूल कार्य करना पड़े।

उदाहरण :- यदि किसी चालक से 1 एम्पियर की धारा 10 सेकेण्ड तक प्रवाहित होने में व्यय ऊर्जा 60 जूल हो तो चालक के सिरे का विभवान्तर कितना होगा ?

$$\text{चालक के सिरे का विभवान्तर} = \frac{\text{व्यय ऊर्जा}}{\text{प्रवाहित आवेश}}$$

$$\begin{aligned} \text{प्रवाहित आवेश} &= \text{धारा} \times \text{समय} \\ &= 1 \text{ एम्पियर} \times 10 \text{ सेकेण्ड} \\ &= 10 \text{ कूलॉम} \end{aligned}$$

$$\text{विभवान्तर} = \frac{60 \text{ जूल}}{10 \text{ कूलॉम}} = 6 \text{ वोल्ट}$$



एमीटर (बाह्य संरचना)



वोल्टमीटर (बाह्य संरचना)

चित्र सं० 9.4

विद्युत विभवान्तर (Voltage) का इकाई वोल्ट (Volt) है। यह विद्युत आवेश को चालक के एक सिरे से दूसरे सिरे तक ले जाने में किया गया कार्य के बराबर होता है।

यदि किसी चालक के एक सिरे से दूसरे सिरे तक 1 कूलॉम आवेश ले जाने में 1 जूल कार्य करना पड़े तो चालक के सिरे का विभवान्तर 1 वोल्ट होगा।

उदाहरण :- यदि किसी चालक से 1 एम्पियर की धारा 10 सेकेण्ड तक प्रवाहित होने में व्यय ऊर्जा 60 जूल हो तो चालक के सिरे का विभवान्तर कितना होगा ?

हल :- विभवान्तर = व्यय ऊर्जा / प्रवाहित आवेश

प्रवाहित आवेश = धारा × समय = 1 एम्पियर × 10 सेकेण्ड = 10 कूलॉम

विभवान्तर = 60 जूल / 10 कूलॉम = 6 वोल्ट

विद्युत विभवान्तर (Electromotive force):-

विद्युत विभवान्तर (EMF) वह विद्युत बल है जो चालक के सिरे से दूसरे सिरे तक आवेश को प्रवाहित करने के लिए कार्य करता है। यह विद्युत आवेश को चालक के एक सिरे से दूसरे सिरे तक ले जाने में किया गया कार्य के बराबर होता है।

fÔã 'aÆ ‡ aŠãÀ aa|ã²ai|ã ÔãnÊã ‡ añŠ Ôã½'1ai¥ãÃ 'aããÀ'a©ã ½ãò ‡ ‡ aŠ
‡ aiŠÊããu½ã ,aa|ãñlã 'aÆlããããÖ|ã Ôãn¶|ãn ‡ añŠ aaÊã† ÔãnÊã Ôãn •aãn .
•ããÃ 'aÆã¹|ã Ôãn|ããè Öö, „Ôãn ÔãnÊã ‡ aŠã aa|ã²ai|ã lããÖ ‡ aŠ
°ãÊã ‡ aŠÖ|ãn Öö ý aa|ã²ai|ã lããÖ ‡ aŠ °ãÊã ‡ aŠãn E 'ãã 'aÆaa|ãã|ã
‡ aŠÀ|ãn Ööý

Ôã½'ãĩ¥ãÃ 'ãããÀ'ã©ã ½ãò 'ã£lãããÖ|ã ,ããlãñlã (‡ãĩSÊããu'½ã ½ãò)

aaia²ai|ā ÔāñÊā Ôāñ aaia²ai|ā faaÀā ¶ā Êāñ¶āñ ‡ aŠāè º|āā ½āò
 ÔāñÊā ‡ āñŠ faÆi|āāò ‡ aŠā aaia¼a|āā¶||āÀ ,aaāfa ‡ aŠ|ā½ā Ôāñ|āā
 Öö, aa•aÔāñ ÔāñÊā ‡ aŠā aaia²ai|ā |āāÖ‡aŠ ºāÊā ‡ aŠÖ|āñ Ööý

'aō©ā † ā † āōŒ|ā |āāū°āñ † āñŒ |āāAāñā Ōāñ °ā¶āāē † † āŒ ,āā³⁄₄ā|āā † āŒāA
 † āiāŒjĒāāē °āñ † āŒāēĒāāō † āŒāē ŌāŌā³⁄₄ā|āā Ōāñ † † āŒ Ō©āā³⁄₄āāē |ā©āā
 lāāā † ā † ālāāĒāāē ¶āāĒā Pāi½°ā † āŒ † āñŒ fāÆilāĒāājāō N,S † āñŒ °āāēPā
 Ēā † āŒāē ÄŌ|āāē Ōō ý † āiāŒjĒāāē † āñŒ °āñ¶āāō āāŌāĒñ Ōāā³⁄₄āāñ•ā † āŒ
 'aōPāāō T₁|ā©āā T₂Ōāñ •āiüjñ ÄŌ|āñ Ōō ý † āiāŒjĒāāē † āŒ āālāāāñ'ā
 'āū°¶āñ † āñŒ āāĒā † āiāŒjĒāāē † āñŒ Ōāā©ā † † āŒ Ōāā†āñŒ|ā†āŒ P ĒāŌāā
 ÄŌ|āā Ōō •āāñ lāō||āā†āŒā 'aō½āā¶āñ 'āÄ Üāi½ā|āā Ōō ý 'aō½āā¶āñ † āŒā
 lāi¶³⁄₄ā °āāēPā ½āō Ōāñ|āā Ōōý (āāPā~ā 9.5)

[illegible]

•,āāf† •āā¶āò āā‡āŠ 'āÆāā|āÀāñfā (Resistance) ‡ā<³āā Öō ?

•ā°ā āā‡āŠÖāāē PāāÊā‡āŠ ½āò āālā²āi|ā fāāĀā 'āÆlāāāāÖ|ā Öāñ|āāē Öō |ā°ā PāāÊā‡āŠ fÖā‡āñŠ 'āÆlāāÖ ½āò Á‡āŠālā> |āÊā|āā Öōý PāāÊā‡āŠ ‡āŠā lāÖ Øāi¥ā āā•āÖā ‡āñŠ ‡āŠāĀ¥ā „Öā½āò 'āÆlāāāāÖ|ā Öāñ¶āñ lāāÊāñ ,āālāñlā ‡āñŠ 'āÆlāāÖ ½āò ,ālāĀāñfā „|ā¶¶ā Öāñ|āā Öō 'āÆāā|āÀāñfā ‡āŠÖÊāā|āā Öōý 'āÆāā|āÀāñfā 'āāāĀ'ā©ā ½āò 'āÆlāāāāÖ|ā Öāñ¶āñ lāāÊāāē fāāĀā ‡āŠāē lāāā ‡ā<|ā ‡āŠāñ āā¶ā³āāāā'ā|ā ‡āŠĀ|āā Öōý fÖāñ

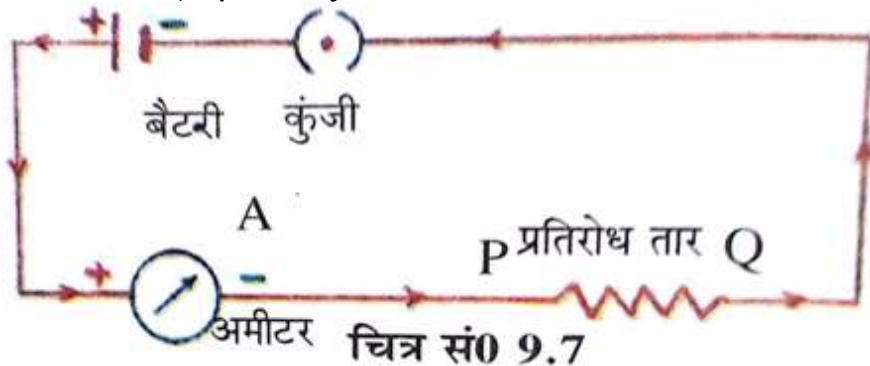


āālā²āi|ā 'āāāĀ'ā©ā ½āò Öō ý

āāPā¶Ö Öāñ 'āāĀ³āā •āā|āā

āā%āŠ³āā ‡āŠÊāā'ā 9.3

□ °āō>Āāē, ‡ā½āāē>Ā, ‡āāiŠ•āāē |ā©āā ¶āāf%āŠāñ½ā ‡āŠā 'āÆāā|āÀāñfā |āāĀ (20 Öāñ½āāē Êā½°āāfĀ ‡āŠā) ‡āŠāñ •āāñü|āāāĀ'ā©ā °ā¶āā†ú (āāPāā 9.7)ý ,ā°ā ‡āūiŠ•āāē ‡āŠāñ °āā‡āŠĀ fāāĀā 'āÆlāāāāÖ|ā ‡āŠĀòý 'āāāĀ'ā©ā ½āñò 'āÆlāāāāÖ|ā fāāĀā ‡āŠā ½āā¶ā ‡ā½āāē>Ā ‡āŠāē ÖāÖā³ā|āā Öāñ —āā|ā ‡āŠĀò ý



चित्र सं0 9.7

,ā°ā āā°ā¶āi P, Q ‡āñŠ ½āf³ā 40 Öāñ½āāē Êā½°āāfĀ ‡āŠā ¶āāf%āŠāñ½ā ‡āŠā 'ā|āÊāā |āāĀ ÊāØāā‡āŠĀ fāāĀā ‡āŠā ½āā¶ā ¶āāñ> ‡āŠĀò ý

□ ‡ā<³āā °ñĒĒ|āñ Öō ?

fāāĀā ‡āŠā ½āā¶ā ‡āŠ½ā Öāñ •āā|āā Öō ý

,ā°ā 'āÖÊāñ |āāĀ ‡āñŠ Ö©āā¶ā 'āĀ āā°ā¶āi P, Q ‡āñŠ ½āf³ā 40 Öāñ½āāē Êā½°āāfĀ ‡āŠā ¶āāf%āŠāñ½ā ‡āŠā ½āāñ>ā |āāĀ •āāñü|ō ý 'āāāĀ'ā©ā ½āò fāāĀā 'āÆlāāāāÖ|ā ‡āŠĀò |ā©āā ‡ā½āāē>Ā ‡āŠāē ÖāÖā³ā|āā Öāñ fāāĀā ‡āŠā ½āā¶ā ¶āāñ> ‡āŠĀò ý

□ ‡ā<³āā °ñĒĒ|āñ Öō ?

fāāĀā ‡āŠā ½āā¶ā 'āÖÊāñ ½āā¶ā ‡āŠāē ,ā'āñāāā ,āāāfā‡āŠ Öāñ •āā|āā Öō ý ‡ā<³āāò ?

प्रतिरोध (R) = $\frac{\text{विभवान्तर (V वोल्ट में)}}{\text{धारा (I एम्पियर में)}}$

प्रतिरोध का मापक 'ओम' होता है। इसे सक्षिप्त रूप में ग्रीक प्रतीक ओमेगा (Ω) से व्यक्त किया जाता है।

यदि V = 1 वोल्ट, I = 1 एम्पियर

तो प्रतिरोध R = $\frac{1 \text{ वोल्ट}}{1 \text{ एम्पियर}}$ = 1 ओम (ओम प्रतिरोध का SI मापक है)

„^aãÖÀ¥ã :

$$\ddot{O}\ddot{E}\ddot{a} : \ddot{P}\ddot{a}\ddot{a}\ddot{E}\ddot{a} \ddot{S} \ddot{S}\ddot{a} \text{ '}\ddot{a}\ddot{E}\ddot{a}\ddot{a}\ddot{a}\ddot{A}\ddot{a}\ddot{n}\ddot{f}\ddot{a} = \ddot{a}\ddot{a}\ddot{l}\ddot{a}'\text{1}\text{4}\ddot{a}\ddot{l}\ddot{a}\ddot{a}\text{¶}\ddot{a}\ddot{A}$$

$$\mathbb{P} \tilde{a} \tilde{E} \tilde{a} \ddagger \tilde{a} \check{S} \ddagger \tilde{a} \check{S} \tilde{a} \text{ } ^1 \tilde{a} \tilde{E} \tilde{a} \tilde{a} \tilde{a} \tilde{A} \tilde{a} \tilde{n} \tilde{f} \tilde{a} = 3 \text{ , } \tilde{a} \tilde{a} \tilde{n} \text{ } ^{1/2} \tilde{a}$$

□ Pāũúªāè, |āũúªāā, † Ê³⁄₄āĩ½āāèāā¶ā³⁄₄ā¹⁄₂ā, 'āāè|āÊā ,āāāª PāāÊā ‡ āŠāò
‡ āŠā 'āÆāā|āÀāñĤā °āÖĩ|ā ‡ āŠ¹⁄₂ā Öāñ|āā Öō ý ‡ āĩŠœ āāĩāĩāñÓā āā¹⁄₂āÑā

ƒãã|àì,ããò •ãõÔãñ - ¶ããƒ % ãŠãñ½ã, ½ãõØããã¶ã¶ã ,ããããª ‡ ãŠã
¹ãÊãã|ãÀãñƒã °ãÖì|ã ,ãããƒã‡ãŠ Ôãñ|ãã Öõ ý

**,ã¶¾ã ¹ãÆ ‡ ãŠãÀ ‡ ãŠãè ...•ããÃ ‡ ãŠã ããìã²ãì|ã ...•ããÃ ½ãò
Â¹ãã¶|ãÀãã :-**

ÔããñÊãÀ ÔãñÊã (Solar Cell) :- (¹ãÆ‡ãŠãíã ...•ããÃ ‡ãŠã Â¹ãã¶|ãÀãã)

Ôãñ¾ãÃ Ôãñ ¹ãÆ ‡ ãŠãíã ,ããòÀ ...Ó½ãã ‡ ãñŠ Â¹ã ½ãò ¹ãõ©ìããè ‡ ãŠãñ
,ãÔããèãã½ãì|ã ...•ããÃ ¹ãÆã¹|ã Öãñ|ããè Öõ ý ÔããòÀ ...•ããÃ ‡ ãŠã
,,¹ã¾ããñØã ããìã²ãì|ã ...•ããÃ ‡ ãñŠ Â¹ã ½ãò ãã ‡ ãŠ¾ãã •ãã ÀÖã Öõ ý
ÔããñÊãÀ ÔãñÊã ,ã¹ã¶ãñ ...¹ãÀ ¹ãü,¶ãñ ÌãÊããè ÔããòÀ ...•ããÃ ‡ ãŠãñ
ããìã²ãì|ã ...•ããÃ ½ãò Â¹ãã¶|ãããÀ|ã ‡ ãŠã °ñ|ãã Öõ ý ƒÔã ‡ ãŠã ,,¹ã¾ããñØã
ããìãíãñÓã Â¹ã Ôãñ ‡ãðŠãã¹ã½ã ,,¹ãØãÆÔãò ½ãò ãã‡ãŠ¾ãã •ãã ÀÖã Öõ ý
†ñÔãñ ããìã²ãì|ã ÔãñÊã ‡ãŠãñ ãã¹ãÔãÔãñ ÔããòÀ ...•ããÃ Ôãñ ããìã²ãì|ã
...•ããÃ ¹ãÆã¹|ã Öãñ|ããè Öõ, ÔããñÊãÀ ÔãñÊã ‡ãŠÖìãñ Öõ ý

ÍãìÓ ‡ ãŠ ÔãñÊã (Dry cell):- (ÀãÔãã¾ããã¶ã ‡ ãŠ ...•ããÃ ‡ ãŠã
Â¹ãã¶|ãÀãã)

ÍãìÓ ‡ ãŠ ÔãñÊã ¹ãÀã ãã‡ãŠÔã ¹ãÆ ‡ ãŠãÀ ‡ãŠãè ...•ããÃ ‡ãŠã Â¹ãã¶|ãÀãã
ããìã²ãì|ã ...•ããÃ ½ãò Öãñ|ãã Öõ ?

ÍãìÓ ‡ ãŠ ÔãñÊã ½ãò ...•ããÃ ÀãÔãã¾ããã¶ã ‡ ãŠ ...•ããÃ ‡ ãñŠ Â¹ã ½ãò
ÔããããPã|ã Öãñ|ããè Öõ ý ÔãñÊã ‡ãñŠ °ñ¶ããò ƒãÆìããò (ƒÊãñ‡ã<Êãñ|ãò)
‡ ãŠãñ |ããÀ Ôãñ •ããñü,¶ãñ ¹ãÀ ÔããããPã|ã ÀãÔãã¾ããã¶ã ‡ ãŠ ...•ããÃ
ããìã²ãì|ã ...•ããÃ ½ãò Â¹ãã¶|ãããÀ|ã Öãñ|ããè Öõ ý

heeJej hueevš :- ¹ããìãÀ ¹Êãã¶ ¹ãÀã ããìã²ãì|ã ...•ããÃ ‡ãŠã Â¹ãã¶|ãÀãã
ãã‡ãŠ¶ã ããìãããƒã¾ããò Ôãñ ãã‡ãŠ¾ãã •ãã|ãã Öõ ?

¹ããìãÀ ¹Êãã¶|ãÔã ½ãò •ãÊã ããìã²ãì|ã Ôãã¾ãã¹ã, leã¹ã ããìã²ãì|ã Ôãã¾ãã¹ã
|ã©ãã ¶ãããã¹ã ‡ ãŠãè¾ãã ããìã²ãì|ã Ôãã¾ãã¹ã ¹ãÀã ããìã²ãì|ã ...•ããÃ ‡ãŠã
,,¹ãã¶ã ãã‡ãŠ¾ãã •ãã|ãã Öõý

•ãÊã ããìã²ãì|ã Ôãã¾ãã¹ã ½ãò |ãñ¹ããè Ôãñ °ãÖìãñ Öì† •ãÊã ‡ãŠãè Øããã|ã¹ã
...•ããÃ (¾ãããã¹ã‡ãŠ ...•ããÃ) ‡ãŠã Â¹ãã¶|ãÀãã ããìã²ãì|ã ...•ããÃ ‡ãñŠ Â¹ã
½ãò Öãñ|ãã Öõý

leã¹ã ããìã²ãì|ã Ôãã¾ãã¹ã ½ãò ...Ó½ããè¾ãã ...•ããÃ ‡ãŠãñ Øããã|ã¹ã ...•ããÃ
(¾ãããã¹ã‡ãŠ ...•ããÃ) ½ãò ¹ãããÀìããã|ãÃ|ã ‡ãŠã‡ãñŠ ããìã²ãì|ã ...•ããÃ ‡ãñŠ
Â¹ã ½ãò Â¹ãã¶|ãÀãã Öãñ|ãã Öõý ¶ãããã¹ã‡ãŠãè¾ãã ããìã²ãì|ã Ôãã¾ãã¹ã ½ãò
¶ãããã¹ã ‡ãŠãè¾ãã ...•ããÃ ‡ãŠãñ ããìã²ãì|ã ...•ããÃ ½ãò Â¹ãã¶|ãããÀ|ã
ãã‡ãŠ¾ãã •ãã|ãã Öõ ý

ããìã²ãì|ã PããÊã‡ãŠ |ã©ãã ããìã²ãì|ã Àãñƒããè ¹ã¹ã©ãÃ :-

ããìã²ãì|ã PããÊã‡ãŠ |ã©ãã ããìã²ãì|ã Àãñƒããè ¹ã¹ã©ãÃ ‡ã<¾ãã Öõã ?

āāīā²āī|ā fāāĀā †āŠāñ ††āŠ Ōāāāā Ōāñ āĠŌāĀñ Ōāāāā |ā†āŠ Ēāñ •āāāāñ
 †āñŠ āāĒā† †ñŌāñ 'āāāāā Ōāñ āāāā |āāĀ †āŠāē ,āāīāī³⁄₄ā†āŠ|āā Ōāñ|āāē
 Ōō āā•āŌā¹⁄₂āō āāīā²āī|ā fāāĀā ŌāīŌā¹⁄₂ā|āā Ōāñ 'āĒīāāāāŌ|ā Ōāñ Ōā†āñŠý
 |āāú°āñ, ,Ykqehfu;e †āñŠ āāāā |āāĀ fŌā †āŠā³⁄₄āĀ †āñŠ āāĒā† ,āāāfā†āŠ
 „¹ā³⁄₄āāñŌāāē Ōāñ|āñ Ōō ý fĠŌō āāīā²āī|ā PāāĒā†āŠ 'āāāāĀ †āŠŌ|āñ Ōōý
 fĠā†āñŠ ,āāā|āāĀ†ā|ā Pāā|āē, ĒāāñŌā, ŌāĒñ'āŠāf, 'āāĀā |āāā ,ā¹⁄₂Ēā
 ,āāāā¹⁄₄āē āāīā²āī|ā PāāĒā†āŠ 'āāāāĀ Ōō ,āāŌāĀā ŌāōŌā, āāā³⁄₄āāā
 ŌāōŌā |āāā 'āāĀñ †āŠāē ĪāāŌ'ā †āŠā ¹⁄₄āē PāāĒā†āŠāō †āñŠ Ā'ā ¹⁄₂āō
 'āĒ³⁄₄āāñŌā Ōāñ|āā Ōōý

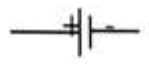
Ā°āĀ, ŌāīĒāā †āŠ'āū|ā, ŌāīĒāāē Ēā †āŠū|āē, †āŠāūPā ,āāāā¹ †ñŌāñ
 'āāāāĀ Ōō āā•āāāŌāñ āāīā²āī|ā fāāĀā 'āĒīāāāāŌ|ā āāāē Ōāñ|āāē Ōōý
 „ĠŌō āāīā²āī|āĀāñāē 'āāāāĀ †āŠŌ|āñ Ōō ý Deeheves efheŪeer
 keā#ee ces efkeāĈāŪee keāueehe 7.8 efkeāŪee nw~

Ī³⁄₄āāīāŌāāāĀ†āŠ Ā'ā Ōāñ āāīā²āī|ā fāāĀā †āñŠ 'āĒīāāŌ Ōñ|āī 'āĒ³⁄₄āī|ā†ā|ā
 |āāĀ Ā°āĀ †āñŠ ,āāīāĀā Ōāñ □†āñŠ ĀŌ|āñ Ōō ,āāāā ,Ġā†āñŠ ...¹āĀ
 āāīā²āī|ā Āāñāē 'āāāāĀ †āŠā Ēāñ'ā ĒāŌāā ĀŌ|āā Ōōý ,āāf † •āāāō
 āā†āŠ āāīā²āī|ā 'āāāĀ'āā †ā³⁄₄āā Ōō ?

āāīā²āī|ā 'āāāĀ'āā (Electric circuit) :-

āāīā²āī|ā 'āāāĀ'āā āāīāāā¹⁄₄āāā 'āĒāŠāĀ †āñŠ Īāō²āī|ā „¹ā†āŠĀāāō †Īāā
 ³⁄₄āāāō †āŠā ††āŠ āāā Ōāā³⁄₄āāñ•āā Ōō ý fŌā¹⁄₂āō āāīā²āī|ā fāāĀā
 'āĒīāāāāŌ|ā †āŠā †āñŠ āāīā²āī|ā ...āāĀ †āŠā „¹ā³⁄₄āāñŌā āāīāāā¹⁄₄āāā
 'āĒāŠāĀ †āñŠ †āŠā³⁄₄āĀ †āŠāāāñ ¹⁄₂āō āā†āŠ³⁄₄āā •āā|āā Ōō ý
 āāīā²āī|ā 'āāāĀ'āā †āŠā ,āāāĀ †ñŌāñ āāīā²āī|ā ¹⁄₂āāŌāĀ Ōāñ Ōō
 āā•āŌā¹⁄₂āō Ōāñ āāīā²āī|ā fāāĀā †āŠā 'āĒīāāŌ Ōāñ Ōā†āñŠý
 āā †āŠŌāē ŌāĒāā āāīā²āī|ā 'āāāĀ'āā ¹⁄₂āō āāā¹⁄₂āāāĒāāāĒā
 „¹ā†āŠĀāāō †āŠā „¹ā³⁄₄āāñŌā Ōāñ|āā Ōō :-

(1) āāīā²āī|ā ŌāñĒā (Electric cell):- ³⁄₄āŌ āāīā²āī|ā ...āāĀ †āŠā Ōāāñ|ā

Ōō ý 'āāāĀ'āā ¹⁄₂āō fŌā†āŠā Ōāā†āñŠ|ā  Ōāñ|āā Ōō ý

(2) Ōāā³⁄₄āāñ•āā |āāĀ (Connecting wire):- fŌā†āñŠ 'āĀā°āō>Āāē / ŌāñĒā
 †āñŠ Ōāāā āāīā²āī|ā ³⁄₄āāā •āāñū|†āŠĀ 'āāāĀ'āā āāāā³⁄₄āā •āā|āā Ōō ý

(3) 'āĒāā|āĀāñā |āāĀ (Resistance wire):- ³⁄₄āŌ āāīā²āī|ā fāāĀā
 'āĒīāāāāŌ|ā Ōāñāāñ āñ|āā Ōō, 'āĀā|āī „Ōā¹⁄₂āō Ā†āŠāīā> |āĒā†āŠĀ āāīā²āī|ā
 fāāĀā †āŠāñ āāā³⁄₄āāāāā|ā †āŠĀ|āā Ōōý 'āāāĀ'āā ¹⁄₂āō „Ōā †āŠā

Ōāā†āñŠ|ā  Ōāñ|āā Ōō ý

(4) ‡ ãĬŠâ•ãĤè(Key):- fÔã ‡ ãŠã 'ãÆ³ãĤñÔã ããÀã ‡ ãŠãñ °ãª, ã©ãĬãã 'ãÆĬãããÖĬã ‡ ãŠãªãñ ‡ ãñŠ ããĤã ‡ ãã ‡ ãŠ³ãã •ãĬãã Öö ý 'ãããÀ¹ã©ã ½ãò fÔã‡ãŠã Ôãã‡ãñŠĬã-(.)-ÖãñĬãã Öö

ãĬĬã²ãĬĬã ããÀã ‡ãñŠ 'ãÆ¹ãĬĬã ‡ã<³ãã Öö ?

ãĬĬã²ãĬĬã ããÀã ‡ãñŠ 'ãÆ¹ãĬĬã ããªĬ½ªãããĤãããĤããã Öö :-

(1) ...Ó½ãĤè³ã 'ãÆ¹ãĬĬã (Heating effect):-

ãĬĬã²ãĬĬã ããÀã ‡ãñŠ ...Ó½ãĤè³ã 'ãÆ¹ãĬĬã ‡ãŠã „,ã³ããñÔã ‡ãŠã ‡ãñŠ „,ãªãñ‡ãŠ „,ã³ããñÔããĤè „,ã‡ãŠã¥ã °ãªãã ‡ãĤã Öö, •ãöÔãñ - ãĬĬã²ãĬĬã °ãĤã, ‡ãŠ¹ãüãò 'ãÀ 'ãÆñÔã ‡ãŠãªãñ ‡ãñŠ ããĤã ‡ãĬã²ãĬĬã fããÔ¹ã³ããü ('ãÆñÔã), ãĬĬã²ãĬĬã „ãããããĤãĤè, 'ããªããĤè ÔãÀ½ã ‡ãŠãªãñ ‡ãŠãĤè ‡ãñŠĬãĤããĤè, ‡ãŠ½ãÀã ÔãÀ½ã ‡ãŠãªãñ ‡ãñŠ ããĤã ‡ãĤè>À,°Ĥããñ,ãÀ>ãñÔ>À, °ãñãã‡ãŠãÔã „ãñĬãªã, °ããĤã ÔãĬĤããªãñ ‡ãŠã ¾ãã¹ã „ããã¹ã ý Ö½ã fªã „,ã‡ãŠã¥ããò ‡ãŠã „,ã³ããñÔã ‡ãŠãĬãñ Öö ý

ãĬĬã²ãĬĬã ããÀã ‡ãñŠ 'ãÆĬããÖ Ôãñ ãã‡ãŠÔããĤè ÞããĤã‡ãŠ ½ãò Gã<cee Glhevve nesves keâer Üãªãã ‡ãŠãñ ãĬĬã²ãĬĬã ããÀã ‡ãŠã ...Ó½ãĤè³ã 'ãÆ¹ãĬĬã ‡ãŠÖĬãñ Öö ý

ãĬĬã²ãĬĬã °ãĤã (Electric Bulb):-

ãĬĬã²ãĬĬã ããÀã ‡ãñŠ ...Ó½ãĤè³ã 'ãÆ¹ãĬĬã ‡ãŠã „,ã³ããñÔã ãĬĬã²ãĬĬã °ãĤã 'ãÀã 'ãÆ ‡ãŠãĬã „,ãªªã ‡ãŠãªãñ ½ãò ãã‡ãŠ³ãã •ãĬãã Öö ý Ôãã½ãªª¾ã °ãĤã ½ãò >ãÔãÔ>ªã ‡ãŠã °ãÖĬã 'ãĬãĤãã ĬãÀ ĤãÔãã ÖãñĬãã Öö, ãã•ãÖãñ ĬãªãĬ (ãã¹ãŠĤãã½ãñªã) ‡ãŠÖĬãñ Öö ý (ããÞã¹ã 9.8) yeuye mes JeeÜeg efvekeâeuekeâj veeFš^espeve/Deeie&ve ieuwme Yej osles nwb ~



•ã°ã °ãÊ°ã †ãñŠ |ã¶|ãì ½ãò ããlã²ãì|ã £ããÀã 'ãÆlããããÖ|ã †ãŠãè •ãã|ããè Öò |ã°ã |ã¶|ãì ØãÀ½ã Öãñ†ãŠÀ Ìãñ|ã |ã¹ã Öãñ •ãã|ãã Öò ý 'ãŠÊãÖlãÀ¹ã 'ãÆ†ãŠãlã „¹ã¶¶ã Öãñ|ãã Öò ý |ã¶|ãì †ãŠã ØãÊã¶ããã†ãŠ 3370°C Öãñ|ãã Öò fÔãããÊã† ¾ãÖ ãã¹ãÜãÊã|ãã ¶ãÖãé Öò ý

(2) Þãì½°ã†ãŠãè¾ã 'ãÆ¹ããlã (Magnetic effect):-

□ ãã%ãŠ¾ãã †ãŠÊãã¹ã 9.4

□ °ãñ 'ãããÀ¶ããããÊã †ãŠã / †ãìŠ¶jÊããè Êãñ †ãŠÀ „Öã½ãò ããlã²ãì|ã £ããÀã 'ãÆlããããÖ|ã †ãŠÀò ý

□ ,ã°ã † †ãŠ †ãìŠ¶jÊããè †ãñŠ ããÖãÀñ †ãŠãñ °ÖãÀãè †ãìŠ¶jÊããè †ãñŠ ããÖãÀñ †ãñŠ 'ããÖã Êãã†ú ý

□ †ã<¾ãã Öãñ|ãã Öò ?

□ °ãñ¶ãò †ãìŠ¶jÊããè †ãñŠ ½ã£¾ã ,ãã †ãŠÓãÃ¶ã ,ã©ãlãã 'ãÆãã|ã†ãŠÓãÃ¶ã Öãñ|ãã Öò ý †ã<¾ããò ?

Þãì½°ã†ãŠãè¾ã 'ãÆ¹ããlã †ãñŠ †ãŠãÀ¶ã ý

ãã†ãŠÖããè ÞããÊã†ãŠ ½ãò £ããÀã 'ãÆlããããÖ|ã †ãŠÀ¶ãñ 'ãÀ ÞããÊã†ãŠ †ãñŠ ÞããÀãò ,ããñÀ Þãì½°ã†ãŠãè¾ã ããñ¹ã

„¹ã¶¶ã Öãñ •ãã|ãã Öò ý fÔã Üã>¶ãã †ãŠãñ ããlã²ãì|ã £ããÀã †ãŠã Þãì½°ã†ãŠãè¾ã 'ãÆ¹ããlã †ãŠÖ|ãñ Öò ý

£ããÀã½ã¹ããè (ØãöÊãlãñ¶ãñ½ããè>À) †ãŠãè †ãŠ¾ãÃ 'ãÆ¶ããÊããè £ããÀã †ãñŠ Þãì½°ã†ãŠãè¾ã 'ãÆ¹ããlã 'ãÀ ,ãã£ããããÀ|ã Öò ý

(3) ÀãÖãã¾ãã¶ã†ãŠ 'ãÆ¹ããlã (Chemical effect) :-

†ãìŠœ ³lãò •ãöÖãñ -¶ã½ã †ãŠ †ãŠã ÜããñÊã, ,ã½Êã ,ããöÀ ãããÀ †ãŠã •ãÊããè¾ã ÜããñÊã ,ãããã¹ ½ãò ããlã²ãì|ã £ããÀã 'ãÆlããããÖ|ã †ãŠÀ¶ãñ 'ãÀ lãñ ããlãÜããã>ã Öãñ •ãã|ãñ Öò ,ããöÀ „¶ã½ãò ÀãÖãã¾ããã¶ã †ãŠ ãã%ãŠ¾ãã Öãñ¶ãñ ÊãØã|ããè Öò ý fÔã Üã>¶ãã †ãŠãñ ããlã²ãì|ã £ããÀã †ãŠãÀãÖãã¾ããã¶ã†ãŠ 'ãÆ¹ããlã †ãŠÖ|ãñ Öò ý

fÔã 'ãÆ¹ããlã †ãñŠ 'ãÀã lãö²ãì|ã ...•ããÃ †ãŠã Â¹ãã¶ãÀ¶ã ÀãÖãã¾ããã¶ã†ãŠ ...•ããÃ ½ãò ãã†ãŠ¾ãã •ãã|ãã Öòý fÔã†ãŠã „¹ã¾ããñØã ,ã¶ãñ †ãŠ †ãŠ¾ããô •ãöÖãñ - ããlã²ãì|ã Êãñ¹ã¶ã, £ãã|ãì,ããò †ãñŠ ãã¶ãÓ †ãŠÓãÃ¶ã |ã©ãã lããñfã¶ã ,ãããã¹ ½ãò ãã †ãŠ¾ãã •ãã|ãã Öò ý lããñÊã½ããè>À †ãŠãè †ãŠ¾ãÃ 'ãÆ¶ããÊããè ããlã²ãì|ã £ããÀã †ãñŠ ÀãÖãã¾ããã¶ã†ãŠ 'ãÆ¹ããlã 'ãÀ ,ãã£ããããÀ|ã Öò ý

¹ã<¾ãl¹ã (Fuse) :-

•ã°ã ãã †ãŠÖããè ããlã²ãì|ã 'ãããÀ¹ã©ã ½ãò „Þã lããñÊã>ãã †ãñŠ †ãŠãÀ¶ã 'ãÆ°ãÊã lããã†ã<ã †ãŠãè ããlã²ãì|ã £ããÀã †ãŠã 'ãÆlããÖ Öãñ|ãã Öò |ããñ „Öã ããlã²ãì|ã 'ãããÀ¹ã©ã ½ãò ÊãØãñ „¹ã †ãŠã¶ã (°ãÊ°ã, 'ããÊãã, ãã¹ãÆŠ¹ã ,ãããã¹)•ãÊã†ãŠÀ ÊãÀã°ã Öãñ •ãã|ãñ Öò ý

‡āš¼āāē-‡āš¼āāē 'āāāÀ'ā©ā ½āò ÊāŌāñ |āāÀāñā ½āò ,āāŌā ÊāŌā •āā¶āñ
 ‡ āšāē Ōā½¼āāīā¶āā ¼āāē Ōāñ|āāē Ōō ý † ñŌāāē āāŌ©āāā|ā ½āò
 „'ā ‡ āšÀŷāāò ‡ āšāñ ĒāÀā°ā Ōāñ¶āñ Ōāñ °āPāā¶āñ ‡ āñš āāÊā† ‡ ā<¾āā
 āā‡āš¾āā •āā|āā Ōō ?

„'ā‡āšÀŷāāò ‡ āšāñ ĒāÀā°ā Ōāñ¶āñ Ōāñ °āPāā¶āñ ‡ āñš āāÊā† 'āÆ|¾āñ‡āš
 āāīā²āī|ā 'āāāÀ'ā©ā ½āò ‡‡āš ceāñ›ñ ‡ āš½ā ŌāÊā¶āā‡āš īāāÊāñ āā½āNā
 fāā|āī ‡ āñš |āāÀ ‡ āñš ›ī‡āšūjā ‡ āšā 'āÆ¾āāñŌā āā‡āš¾āā •āā|āā Ōō ý
 ¾āŌ |āāÀ ‡ āšā ›ī‡āšūjā ‡‡āš āāīā²āī|ā Āāñfāāē ,āāfāāÀ ‡ āñš ‡ āš› ,āā,›
 ½āò ÊāŌāā¾āā •āā|āā Ōō ý fŌā ceāñ›ñ |āāÀ ‡ āšāñ 'ā<¾āī•ā ‡ āšŌ|āñ
 Ōōý Fmes efJeÆgle heefjheLe cesb cesbme keās ßesCeerkeāÇāce cesb
 peesūjā peelee nw ~

•ā°ā 'āāāÀ'ā©ā ½āò īāāñÊ›|āā ‡ āñš ,āāāfā‡āš Ōāñ¶āñ ‡ āñš 'āšÊāŌīāĀ'ā
 'āÆ°āÊā īāāā‡ā<|ā ‡ āšāē āāīā²āī|ā fāāĀā °āŌ|āāē Ōō |āāñ 'ā<¾āī•ā Ōīā¾āā
 ŌāÀ½ā Ōāñ ‡ āšÀ āā'āŪāÊā •āā|āā Ōō, āā•āŌāŌāñ āāīā²āī|ā fāāĀā ‡ āšā
 'āÆīāāŌ Ā ‡ āš •āā|āā Ōō ý Ōāā½āā¶¾ā °āÊ°ā |ā©āā 'āāĒāñ īāāÊāñ
 'āāāÀ'ā©ā ½āò 5 ‡ āā½'ā¾āĀ ‡ āšā 'ā<¾āī•ā ÊāŌāā¾āā •āā|āā Ōō ý Ōāē>Ā,
 āā'āÊš•ā, ‡ āīšÊāĀ ,āāāā° ,āāāfā‡āš fāāĀā ‡ āñš 'āāāÀ'ā©ā ½āò 10-15
 ‡ āā½'ā¾āĀ īāāÊāā ½āāñ›ā 'ā<¾āī•ā |āāÀ ÊāŌāā¾āā •āā|āā Ōō ý 'ā<¾āī•ā
 |āāÀ āā¶ā |ā©āā ŌāāēŌāā ‡ āñš āā½āNā fāā|āī ‡ āšā °ā¶āā Ōāñ|āā Ōō ý
 'ā<¾āī•ā |āāÀ ‡ āšāñ ÊāŌāā¶āā āāīā²āī|ā 'āāāÀ'ā©ā ½āò
 ŌāīĀāāā|½ā‡āš „'āā¾ā Ōō ý

**ŪāĀñÊāī āāīā²āī|ā „'ā ‡ āšÀŷāāò ‡ āñš 'āÆ¾āāñŌā ½āò
 Ōāāīāfāāā¶ā¾āāū †īāā ŌāīĀāāā|½ā‡āš „'āā¾ā :-**

ŪāĀāò ½āò 220 īāāñÊ› ‡ āšāē 'āÆ|¾āāīā|āāē fāāĀā ‡ āšāē ,āā'āīāā|āĀ
 ‡ āšāē •āā|āāē Ōō ý ¾āāā° ,ā¶ā•āā¶āñ ½āò ,ā©āīāā āāīā²āī|ā ‡ āšā¾āĀ
 ‡ āšÀ|āñ Ōā½¾ā āāīā²āī|ā fāāĀā ‡ āñš Ōāāñ|ā ‡ āñš ĒāīÊāñ |āāĀò (¶āŌ¶ā
 |āāĀò) ‡ āšāñ ceī Êāò |āāñ Ō½āò |āñ•ā āāīā²āī|ā ,āāŪāā|ā ÊāŌā|āā Ōō ý
 āāīā²āī|ā ,āāŪāā|ā Ōāñ ‡ āš¼āāē-‡āš¼āāē ½āð¾āī ¼āāē Ōāñ •āā|āāē Ōō ý
 Ō¶āā¶āāŌāāĀ, ¼āāēŌāñ Ō©āā¶āāò ,ā©āīāā °āĀŌāā|ā ‡ āñš āā¶āāò ½āò
 ŪāĀñÊāī āāīā²āī|ā „'ā ‡ āšÀŷāāò ‡ āšāñ Ōāāīāfāā¶āāē 'āīīāĀ ‡ āš ŌāīĒāñ
 Ā°āĀ / Êā‡āšūjāē ‡ āñš Ēāūjāū... 'āŌ¶ā ‡ āšÀ ceī¶āā PāāāāŌ† ý

**‡āīšce ,āāŌĀ •āā¶āò
 āāīā²āī|ā fāāĀā ‡ āñš Ēā|āĀāò Ōāñ °āPāāīā ‡ āñš āāÊā †
 āā¶ā½¶āāāĒāāĒāĒā°āā|āò ,āāīāī¾ā‡āš Ōō :-**

1. ŪāĀāò ½āò ,āPceñ āāīā²āī|ā Āāñfāāē Êāñ'ā īāāÊāñ Ōāā¾āāñ•ā‡āš |āāĀ
 ÊāŌāā† •āā†jý

2. $\tilde{a}\tilde{a}\tilde{l}\tilde{a}^2\tilde{a}\tilde{i}|\tilde{a}$ „ $\tilde{a}$ † $\tilde{a}\tilde{S}\tilde{A}\tilde{\Psi}\tilde{a}$ $\frac{1}{2}\tilde{a}\tilde{a}\tilde{\Pi}\tilde{a}$ † $\tilde{a}\tilde{S}$ $\hat{O}|\tilde{a}\tilde{A}$ ($\tilde{a}\tilde{a}\tilde{f}\tilde{A}0$ † $\hat{O}\tilde{a}0$, $\tilde{a}\tilde{a}\tilde{f}\tilde{A}0$) † $\tilde{a}\tilde{n}\tilde{S}$ $\hat{O}\tilde{a}\tilde{e}$ $\tilde{a}\tilde{a}\tilde{E}^3\tilde{4}\tilde{a}\tilde{a}\tilde{n}\tilde{O}\tilde{a}$ $\frac{1}{2}\tilde{a}\tilde{o}$ $\hat{E}\tilde{a}\tilde{a}\tilde{†}$ • $\tilde{a}\tilde{a}\tilde{†}$ $\acute{y}$
3. $\tilde{U}\tilde{a}\tilde{A}\tilde{a}\tilde{o}$ $\frac{1}{2}\tilde{a}\tilde{o}$ $\tilde{l}\tilde{a}\tilde{a}^3\tilde{4}\tilde{a}\tilde{a}\tilde{a}\tilde{A}\tilde{a}\tilde{O}\tilde{a}$ † $\tilde{a}\tilde{S}\tilde{A}\tilde{a}|\tilde{a}\tilde{n}$ $\hat{O}\tilde{a}\frac{1}{2}\tilde{a}\tilde{a}^3\tilde{4}\tilde{a}$ „ $\tilde{a}\hat{O}\tilde{a}\tilde{a}\tilde{e}\tilde{\Pi}\tilde{a}$ $|\tilde{a}\tilde{a}\tilde{A}$ † $\tilde{a}\tilde{S}\tilde{a}$ $\hat{O}\tilde{a}\frac{1}{2}\tilde{a}\tilde{\Pi}\tilde{f}\tilde{a}$ $\tilde{a}\tilde{d}\hat{O}|\tilde{a}\tilde{a}\tilde{e}$ ($\tilde{a}\tilde{a}\tilde{a}\hat{O}\tilde{a}\tilde{A}\tilde{O}\tilde{a}$) $\hat{O}\tilde{a}\tilde{n}$ „ $\tilde{a}\tilde{l}\tilde{a}\tilde{I}^3\tilde{4}\tilde{a}$ $\tilde{a}\tilde{a}\tilde{†}\tilde{a}\tilde{S}^3\tilde{4}\tilde{a}\tilde{a}$ • $\tilde{a}\tilde{a}\tilde{†}$ $\acute{y}$
4. $\tilde{a}\tilde{a}\tilde{l}\tilde{a}^2\tilde{a}\tilde{i}|\tilde{a}$ † $\tilde{a}\tilde{S}\tilde{a}^3\tilde{4}\tilde{a}\tilde{A}$ † $\tilde{a}\tilde{S}\tilde{A}|\tilde{a}\tilde{n}$ $\hat{O}\tilde{a}\frac{1}{2}\tilde{a}\tilde{a}^3\tilde{4}\tilde{a}$ $\hat{A}^o\tilde{a}\tilde{u}$ † $\tilde{a}\tilde{n}\tilde{S}$ $\hat{a}\hat{O}|\tilde{a}\tilde{a}\tilde{\Pi}\tilde{a}\tilde{n}$ $\tilde{a}\hat{O}\tilde{\Pi}\tilde{a}\tilde{n}$ • $\tilde{a}\tilde{a}\tilde{†}$ $\acute{y}$
5. $\tilde{a}\tilde{a}\tilde{l}\tilde{a}^2\tilde{a}\tilde{i}|\tilde{a}$ $\tilde{a}\tilde{a}\tilde{a}\tilde{A}|\tilde{a}\hat{O}\tilde{a}\tilde{a}\tilde{o}$ $\frac{1}{2}\tilde{a}\tilde{o}$ $\hat{O}\tilde{a}\tilde{i}\tilde{A}\tilde{a}\tilde{a}\tilde{a}$ † $\tilde{a}\tilde{S}\tilde{n}$ $\hat{O}\tilde{a}\tilde{a}\tilde{O}$ † $\tilde{a}\tilde{S}\tilde{a}\tilde{n}\tilde{\Psi}\tilde{a}$ $\hat{O}\tilde{a}\tilde{n}$ $\hat{O}\tilde{a}\tilde{i}\tilde{A}\tilde{a}\tilde{a}\tilde{a}$ $\tilde{a}\tilde{a}\tilde{a}^3\tilde{4}\tilde{a}\tilde{i}\tilde{a}$ † $\tilde{a}\tilde{S}\tilde{a}$ $\tilde{a}\tilde{a}\tilde{E}^3\tilde{4}\tilde{a}\tilde{a}\tilde{n}\tilde{O}\tilde{a}$ „ $\tilde{a}\tilde{l}\tilde{a}\tilde{I}^3\tilde{4}\tilde{a}$ $\tilde{a}\tilde{a}\tilde{†}\tilde{a}\tilde{S}^3\tilde{4}\tilde{a}\tilde{a}$ • $\tilde{a}\tilde{a}\tilde{\Pi}\tilde{a}\tilde{a}$ $\tilde{P}\tilde{a}\tilde{a}\tilde{a}\tilde{a}\tilde{O}$ † $\acute{y}$
6. $\tilde{a}\tilde{a}$ † $\tilde{a}\tilde{S}\hat{O}\tilde{a}\tilde{a}\tilde{e}$ $\tilde{a}\tilde{a}\tilde{E}$ † $\tilde{a}\tilde{S}\tilde{a}\tilde{A}$ † $\tilde{a}\tilde{n}\tilde{S}$ $\hat{C}\tilde{e}\tilde{a}|\tilde{a}\tilde{A}\tilde{n}$ † $\tilde{a}\tilde{S}\tilde{a}\tilde{e}$ „ $\tilde{a}\tilde{a}\tilde{l}\tilde{a}\tilde{a}$ † $\tilde{a}\tilde{S}\tilde{a}$ $\hat{O}\tilde{a}\tilde{n}\tilde{\Pi}\tilde{a}\tilde{n}$ $\tilde{a}\tilde{A}$ $\hat{O}\tilde{a}\tilde{l}\tilde{a}\tilde{A}$ $\tilde{a}\tilde{a}\tilde{E}\hat{O}\tilde{a}\frac{1}{2}\tilde{a}$ $\frac{1}{2}\tilde{a}\tilde{n}\tilde{\Pi}\tilde{O}\tilde{a}$ † $\tilde{a}\tilde{S}\tilde{a}$ $\tilde{a}\tilde{a}\hat{O}\tilde{l}\tilde{a}\tilde{P}\tilde{a}$ „ $\tilde{a}\tilde{a}\tilde{a}\tilde{S}$ † $\tilde{a}\tilde{S}\tilde{A}$ $\hat{a}\tilde{n}\tilde{\Pi}\tilde{a}\tilde{a}$ $\tilde{P}\tilde{a}\tilde{a}\tilde{a}\tilde{a}\tilde{O}$ † $\acute{y}$
7. $\hat{O}\tilde{a}\tilde{a}\tilde{e}\tilde{E}\tilde{a}\tilde{n}$ † $\tilde{a}\tilde{S}\tilde{a}\tilde{u}$ $\tilde{a}\tilde{n}\tilde{a}$ „ $\tilde{a}\hat{O}\tilde{a}\tilde{l}\tilde{a}\tilde{a}$ $\hat{O}\tilde{a}\tilde{a}\tilde{e}\tilde{E}\tilde{a}\tilde{n}$ $\hat{O}\tilde{a}\hat{O}\tilde{a}\tilde{o}$ † $\tilde{a}\tilde{S}\tilde{a}\tilde{e}$ $\hat{O}\tilde{a}\hat{O}\tilde{a}^3\tilde{4}\tilde{a}|\tilde{a}\tilde{a}$ $\hat{O}\tilde{a}\tilde{n}$ $\tilde{a}\tilde{a}\hat{O}\tilde{l}\tilde{a}\tilde{P}\tilde{a}$ † $\tilde{a}\tilde{S}\tilde{a}\tilde{n}$ $\hat{O}\tilde{a}\tilde{l}\tilde{a}\tilde{A}$ $\tilde{\Pi}\tilde{a}\hat{O}\tilde{a}\tilde{e}$ † $\tilde{a}\tilde{S}\tilde{A}\tilde{\Pi}\tilde{a}\tilde{a}$ $\tilde{P}\tilde{a}\tilde{a}\tilde{a}\tilde{a}\tilde{O}$ † $\acute{y}$

Í^aāīāÊāē

$\tilde{a}\tilde{a}^3\tilde{4}\tilde{a}\tilde{i}\tilde{u}$ • $\tilde{a}$ Fuse

$\hat{A}$ $\tilde{a}\tilde{a}\tilde{\Pi}\tilde{a}\tilde{A}\tilde{\Psi}\tilde{a}$ Transformation

$\hat{A}\tilde{n}\tilde{f}\tilde{a}\tilde{a}\tilde{e}$ Insulator

$\tilde{a}\tilde{a}\tilde{l}\tilde{a}^1\tilde{4}\tilde{a}\tilde{l}\tilde{a}\tilde{\Pi}\tilde{a}\tilde{A}$ Potential difference

$\tilde{a}\tilde{a}\tilde{l}\tilde{a}^2\tilde{a}\tilde{i}|\tilde{a}$ $\tilde{l}\tilde{a}\tilde{a}\hat{O}\tilde{†}\tilde{a}\tilde{S}$ $\hat{o}\tilde{a}\tilde{E}\tilde{a}$ Electro-motive force

$\tilde{a}\tilde{a}\tilde{l}\tilde{a}\tilde{a}\tilde{a}\tilde{l}\tilde{a}\hat{O}$ $\tilde{a}\tilde{a}\tilde{E}\tilde{a}\tilde{a}|\tilde{a}\tilde{A}\tilde{n}\tilde{f}\tilde{a}$ Specific Resistance

$\tilde{a}\tilde{a}\tilde{l}\tilde{a}^2\tilde{a}\tilde{i}|\tilde{a}$ $\tilde{P}\tilde{a}\tilde{a}\tilde{E}\tilde{a}\tilde{†}\tilde{a}\tilde{S}$ Electric Conduction

$\hat{O}\tilde{a}\tilde{a}^3\tilde{4}\tilde{a}\tilde{a}\tilde{n}$ • $\tilde{a}\tilde{\Pi}\tilde{a}$ $|\tilde{a}\tilde{a}\tilde{A}$ Connecting-wire

$\hat{O}\tilde{a}\tilde{a}\tilde{P}\tilde{a}\tilde{a}^3\tilde{4}\tilde{a}\tilde{†}\tilde{a}\tilde{S}$ $\hat{O}\tilde{a}\tilde{n}\tilde{E}\tilde{a}$ Accumulator

„ $\tilde{a}\tilde{a}\tilde{l}\tilde{a}\tilde{n}\tilde{a}\tilde{a}\tilde{l}\tilde{a}|\tilde{a}$ Charged

„ $\tilde{P}\tilde{a}$ $\tilde{l}\tilde{a}\tilde{n}\tilde{E}$ › $|\tilde{a}\tilde{a}$ High voltage

„ $\hat{O}\frac{1}{2}\tilde{a}\tilde{a}\tilde{e}^3\tilde{4}\tilde{a}$ $\tilde{a}\tilde{a}\tilde{E}\frac{1}{4}\tilde{a}\tilde{a}\tilde{l}\tilde{a}$ Heating effect

$\tilde{P}\tilde{a}\tilde{i}\frac{1}{2}\tilde{a}\tilde{†}\tilde{a}\tilde{S}\tilde{a}\tilde{e}^3\tilde{4}\tilde{a}$ $\tilde{a}\tilde{a}\tilde{E}\frac{1}{4}\tilde{a}\tilde{a}\tilde{l}\tilde{a}$ Magnetic effect

• $\tilde{a}\tilde{a}\tilde{a}\tilde{\Pi}\tilde{a}$ • $\tilde{a}$ Generator

$\tilde{a}\tilde{a}^o\hat{O}$ › $\tilde{f}\tilde{a}\tilde{a}\tilde{A}\tilde{a}$ Direct current

$\tilde{f}\tilde{a}\tilde{a}\tilde{A}\tilde{a}$ $\frac{1}{2}\tilde{a}\tilde{a}\tilde{a}\tilde{a}\tilde{e}$ Galvanometer

$\tilde{a}\tilde{a}\tilde{E}\frac{1}{4}\tilde{a}\tilde{a}\tilde{l}\tilde{a}|\tilde{a}\tilde{a}\tilde{e}$ $\tilde{f}\tilde{a}\tilde{a}\tilde{A}\tilde{a}$ Alternating current

$\tilde{a}\tilde{a}\tilde{a}\tilde{A}$ $\tilde{a}\hat{O}\tilde{a}$ Circuit

$\tilde{a}\tilde{a}\tilde{E}\tilde{a}\tilde{a}|\tilde{a}\tilde{A}\tilde{n}\tilde{f}\tilde{a}$ $|\tilde{a}\tilde{a}\tilde{A}$ Resistance wire

„ $\tilde{a}\frac{1}{4}^3\tilde{4}\tilde{a}\tilde{a}\hat{O}\tilde{a}$ $\tilde{a}\tilde{a}\tilde{E}\tilde{I}\tilde{\Pi}\tilde{a}$

1. $\tilde{a}\tilde{a}\tilde{\Pi}\tilde{a}\frac{1}{2}\tilde{\Pi}\tilde{a}\tilde{a}\tilde{a}\tilde{E}\tilde{a}\tilde{a}\tilde{a}\tilde{C}\tilde{e}\tilde{a}$ $\tilde{a}\tilde{a}\tilde{E}\tilde{I}\tilde{\Pi}\tilde{a}\tilde{a}\tilde{o}$ $\frac{1}{2}\tilde{a}\tilde{o}$ $\hat{O}\tilde{a}\hat{O}\tilde{a}\tilde{e}$ $\tilde{a}\tilde{a}\tilde{l}\tilde{a}$ † $\tilde{a}\tilde{S}\hat{E}\tilde{a}$ $\tilde{e}\tilde{a}\tilde{u}$ › † $\tilde{a}\tilde{S}\tilde{A}$ „ $\tilde{a}\frac{1}{4}^3\tilde{4}\tilde{a}\tilde{a}\hat{O}\tilde{a}$ $\tilde{a}\tilde{i}\tilde{l}\tilde{a}\tilde{a}\hat{O}|\tilde{a}\tilde{†}\tilde{a}\tilde{S}\tilde{a}$ $\frac{1}{2}\tilde{a}\tilde{o}$ $\tilde{a}\tilde{a}\tilde{E}\tilde{a}\tilde{a}\tilde{a}\tilde{C}\tilde{e}\tilde{a}\tilde{†}$ -
 († $\tilde{a}\tilde{S}$) $\tilde{a}\tilde{a}\tilde{l}\tilde{a}^2\tilde{a}\tilde{i}|\tilde{a}$ $\tilde{f}\tilde{a}\tilde{a}\tilde{A}\tilde{a}$ † $\tilde{a}\tilde{S}\tilde{a}$ $\frac{1}{2}\tilde{a}\tilde{a}\tilde{a}\tilde{†}\tilde{a}\tilde{S}$ $\hat{O}\tilde{a}\tilde{n}|\tilde{a}\tilde{a}$ $\hat{O}\tilde{o}$ -
 (i) † $\tilde{a}\tilde{i}\tilde{S}\hat{E}\tilde{a}\tilde{a}\tilde{u}\frac{1}{2}\tilde{a}$ (ii) $\tilde{l}\tilde{a}\tilde{n}\tilde{E}$ ›
 (iii) † $\tilde{a}\tilde{a}\frac{1}{2}\tilde{a}^3\tilde{4}\tilde{a}\tilde{A}$ (iv) $\hat{O}\tilde{a}\tilde{n}\tilde{†}\tilde{a}\tilde{n}\tilde{S}\tilde{\Psi}$;
 ($\tilde{C}\tilde{e}\tilde{a}$) $\tilde{I}\tilde{a}\tilde{i}\hat{O}$ † $\tilde{a}\tilde{S}$ $\hat{O}\tilde{a}\tilde{n}\tilde{E}\tilde{a}$ $\frac{1}{2}\tilde{a}\tilde{o}$ $\tilde{a}\tilde{a}$ † $\tilde{a}\tilde{S}\hat{O}\tilde{a}$ $\tilde{a}\tilde{a}\tilde{a}\hat{O}\tilde{a}\tilde{A}$ † $\tilde{a}\tilde{S}\tilde{a}\tilde{e}$ $\tilde{e}\tilde{a}\tilde{u}$ † $\tilde{n}\tilde{\Pi}\tilde{a}\tilde{a}\tilde{n}$ † $\tilde{a}\tilde{S}\tilde{a}$ † $\tilde{a}\tilde{S}\tilde{a}^3\tilde{4}\tilde{a}\tilde{A}$ † $\tilde{a}\tilde{S}\tilde{A}|\tilde{a}\tilde{a}\tilde{e}$ $\hat{O}\tilde{o}$ -

(i) †ãŠã°ãÃ¶ã (ii) ããÔãããÊã†ãŠã¶ã
 (iii) •ã¹⁄₂ãóãã¶ã³⁄₄ã¹⁄₂ã (iv) °ãññÃã¶ã
 (Øã) ãã†ãŠÔã ÔãñÊã †ãŠãñ 'ãì¶ã: ,ããìãñããìã|ã ãã†ãŠ³⁄₄ãã •ãã Ôã†ãŠ|ãã Öö
 -

(i) ÔããèÔãã ÔããPãã³⁄₄ã†ãŠ ÔãñÊã (ii) ÌãñÊã>ãè³⁄₄ã ÔãñÊã
 (iii) ÍãìÓ†ãŠ ÔãñÊã (iv) ¦ñãã¶ã³⁄₄ãÊã ÔãñÊã
 (Üã) ÌãñÊ>¹⁄₂ããè>À †ãñŠ 'ãÃã ¹⁄₂ãã¹ãã •ãã|ãã Öö -

(i) ããìã²ãì|ã £ããÃã (ii) °ãñ ãã°ã¶ã¹,ããò †ãñŠ °ããèPã ããìã¹⁄₄ãìãã¶ã|ãÀ
 (iii) ããìã²ãì|ã ...•ããÃ (iv) ,ããìãñÌã

2. ãã¶ã¹⁄₂¶ãããÊããã£ã|ã Ìãã †ã<³⁄₄ããò ¹⁄₂ãò ããª † Øã † Íãªãò Ôãñ 'ãìãã|ãÃ
 ,ã¹ã¶ããè ,ã¹⁄₄³⁄₄ããÔã 'ãìããÔ|ã†ãŠã ¹⁄₂ãò †ãŠãèãã•ã† -

(•ããã¶ã~ã, Meg<keã mesue, ,ããñ¹⁄₂ã, ÌãñÊ>, ÔããñÊãÀ ÔãñÊã)

(†ãŠ) 'ã£ãã|ãÃãñ£ã †ãŠã ¹⁄₂ãã~ã†ãŠ Öãñ|ãã Ööã ý

(£ã) ããìã¹⁄₄ãìãã¶ã|ãÀ †ãŠã ¹⁄₂ãã~ã†ãŠ Öãñ|ãã Öö ý

(Øã) ÔããòÀ ...•ããÃ 'ãÃã ããìã²ãì|ã ...•ããÃ ¹⁄₂ãò 'ãããÀìããã|ãÃ|ã
 Öãñ|ããè Öö ý

(Üã) jemeeÜeefvekeã ...•ããÃ †ãŠãñ 'ãÃã ããìã²ãì|ã ...•ããÃ ¹⁄₂ãò
 'ãããÀìããã|ãÃ|ã ãã†ãŠ³⁄₄ãã •ãã|ãã Öö ý

(Ý) ³⁄₄ããããã~ã †ãŠ ...•ããÃ †ãŠãñ 'ãÃã ããìã²ãì|ã ...•ããÃ ¹⁄₂ãò
 'ãããÀìããã|ãÃ|ã ãã†ãŠ³⁄₄ãã •ãã|ãã Öö ý

3. ãã¶ã¹⁄₂¶ãããÊããã£ã|ã Ìãã †ã<³⁄₄ããò ¹⁄₂ãò ÔãÔãè Ìãã †ã<³⁄₄ã 'ãÀ (□),ããòÀ
 ÔãÊã|ã Ìãã †ã<³⁄₄ã 'ãÀ (★)†ãŠã ããPã¶ãÖ ,ã¹ã¶ããè ,ã¹⁄₄³⁄₄ããÔã 'ãìããÔ|ã†ãŠã
 ¹⁄₂ãò ÊãØããf³⁄₄ãñ-

(†ãŠ) 'ããìãÀ 'Êãã¶ã>áÔã ¹⁄₂ãò ããìã²ãì|ã †ãŠã ,¦ããã¶ã ÔããèÔãã ÔããPãã³⁄₄ã†ãŠ
 ÔãñÊã 'ãÃã ãã†ãŠ³⁄₄ãã •ãã|ãã Öö ý

(£ã) ããìã²ãì|ã 'ãããÀ¹ã©ã ¹⁄₂ãò †ñ¹⁄₂ããè>À †ãŠãñ Ñãñ¥ããè %ã ãŠ¹⁄₂ã ¹⁄₂ãò
 •ããñü¦|ãñ Öö ý

(Øã) ããìã²ãì|ã °ãÊ°ã £ããÃã †ãñŠ Pãì¹⁄₂°ã†ãŠãè³⁄₄ã 'ã£¹⁄₄ããìã 'ãÀ †ãŠã³⁄₄ãÃ
 †ãŠÃ|ãã Öö ý

(Üã) ¦ãú°ãã ããìã²ãì|ã †ãŠã ,¦|ã¹⁄₂ã PããÊã†ãŠ 'ãªã©ãÃ Öö ý

(Ý) pesvesjsšj †ãñŠ 'ãÃã ÀãÔãã³⁄₄ããã¶ã|ã†ãŠ ...•ããÃ †ãŠãñ ããìã²ãì|ã ...•ããÃ
 ¹⁄₂ãò °ãÊãã •ãã|ãã Öö ý

4. ``†ãŠ" ¹⁄₂ãñò ããª † Øã † Ìãã †ã<³⁄₄ããò †ãŠãñ ``£ã" †ãñŠ ÔãÔãè Ìãã †ã<³⁄₄ã
 Ôãñ ãã¹⁄₂ãÊãã¶ã ,ã¹ã¶ããè ,ã¹⁄₄³⁄₄ããÔã 'ãìããÔ|ã†ãŠã ¹⁄₂ãò †ãŠãèãã•ã† -

Ô|ã¹⁄₂¹⁄₄ã ``†ãŠ'

Ô|ã¹⁄₂¹⁄₄ã ``£ã'

$^1\tilde{a}^{<3/4}\tilde{a}\hat{i}\bullet\tilde{a}$ $|\tilde{a}\tilde{a}\grave{\text{A}}$ ‡ $\tilde{a}\check{S}\tilde{a}$ $^1\tilde{a}/\tilde{E}^{3/4}\tilde{a}\tilde{a}\tilde{n}\tilde{O}\tilde{a}$ $\tilde{a}\tilde{a}$ ‡ $\tilde{a}\check{S}^{3/4}\tilde{a}\tilde{a}$ • $\tilde{a}\tilde{a}|\tilde{a}\tilde{a}$ $\ddot{O}\ddot{o}$
 $\hat{O}\tilde{a}\tilde{a}\grave{e}\hat{O}\tilde{a}\tilde{a}$ $\hat{O}\tilde{a}\tilde{a}\tilde{P}\tilde{a}\tilde{a}^{3/4}\tilde{a}\ddagger\tilde{a}\check{S}$ $\hat{O}\tilde{a}\tilde{n}\hat{E}\tilde{a}$ $^1/2\tilde{a}\ddot{o}$
 $,\tilde{a}\tilde{a}|\tilde{a}\tilde{n}\hat{I}\tilde{a}\P\tilde{a}$ $\tilde{a}\tilde{a}$ ‡ $\tilde{a}\check{S}^{3/4}\tilde{a}\tilde{a}$ • $\tilde{a}\tilde{a}|\tilde{a}\tilde{a}$ $\ddot{O}\ddot{o}$
 $\tilde{a}\tilde{a}|\tilde{a}^2\tilde{a}i|\tilde{a}$ $^o\tilde{a}\hat{E}^o\tilde{a}$ $^1/2\tilde{a}\ddot{o}$
 $^1/2\tilde{a}\tilde{n}\P\hat{O}\tilde{a}$ ‡ $\tilde{a}\check{S}\tilde{a}$ $^1\tilde{a}/\tilde{E}^{3/4}\tilde{a}\tilde{a}\tilde{n}\tilde{O}\tilde{a}$ $\ddot{O}\tilde{a}\tilde{n}|\tilde{a}\tilde{a}$ $\ddot{O}\ddot{o}$
 $\tilde{a}\tilde{a}^o\hat{O}\rangle\tilde{a}\tilde{a}\tilde{A}\tilde{a}$
 $\rangle\hat{a}\tilde{O}\tilde{a}\hat{O}\rangle\P\tilde{a}$ $\tilde{a}\tilde{a}|\tilde{a}i$ ‡ $\tilde{a}\tilde{n}\check{S}$ $^o\tilde{a}\P\tilde{a}\tilde{n}$ $|\tilde{a}\P|\tilde{a}i$ ‡ $\tilde{a}\check{S}\tilde{a}$ $^1\tilde{a}/\tilde{E}^{3/4}\tilde{a}\tilde{a}\tilde{n}\tilde{O}\tilde{a}$ $\ddot{O}\tilde{a}\tilde{n}|\tilde{a}\tilde{a}$ $\ddot{O}\ddot{o}$
 $\tilde{a}\tilde{a}|\tilde{a}^2\tilde{a}i|\tilde{a}$ $^1\tilde{a}\tilde{a}\tilde{a}\tilde{A}^1\tilde{a}\hat{O}\tilde{a}$ $^1/2\tilde{a}\tilde{n}\ddot{o}$ „ $^1\tilde{a}\ddagger\tilde{a}\check{S}\tilde{A}\forall\tilde{a}\tilde{a}\ddot{o}$ ‡ $\tilde{a}\check{S}\tilde{a}\grave{e}$ $\hat{O}\tilde{a}i\tilde{A}\tilde{a}\tilde{a}\tilde{a}$
 $\ddagger\tilde{a}\tilde{n}\check{S}$ $\tilde{a}\tilde{a}\hat{E}\tilde{a}\ddagger$
 $\hat{O}\tilde{a}\tilde{n}\hat{E}\tilde{a}$ $\hat{O}\tilde{a}\tilde{n}$ $^1\tilde{a}/\tilde{E}\tilde{a}^1|\tilde{a}$ $\tilde{a}\tilde{a}\tilde{A}\tilde{a}$ $\ddot{O}\tilde{a}\tilde{n}|\tilde{a}\tilde{a}\grave{e}$ $\ddot{O}\ddot{o}$
 $^1\tilde{a}/\tilde{E}^{1/3}\tilde{a}\tilde{a}|\tilde{a}|\tilde{a}\tilde{a}\grave{e}$ $\tilde{a}\tilde{a}\tilde{A}\tilde{a}$ $^1\tilde{a}\tilde{a}\tilde{a}\tilde{A}^1\tilde{a}\hat{O}\tilde{a}$ $^1/2\tilde{a}\ddot{o}$

5. $\hat{O}\tilde{a}\tilde{a}\grave{e}\hat{O}\tilde{a}\tilde{a}$ $\hat{O}\tilde{a}\tilde{a}\tilde{P}\tilde{a}\tilde{a}^{3/4}\tilde{a}\ddagger\tilde{a}\check{S}$ $\hat{O}\tilde{a}\tilde{n}\hat{E}\tilde{a}$ $\hat{I}\tilde{a}i\hat{O}\ddagger\tilde{a}\check{S}$ $\hat{O}\tilde{a}\tilde{n}\hat{E}\tilde{a}$ $\ddagger\tilde{a}\check{S}\tilde{a}\grave{e}$ „ $\tilde{a}^1\tilde{a}\tilde{n}\tilde{a}\tilde{a}\tilde{a}$ ‡ $\tilde{a}^{<3/4}\tilde{a}\tilde{a}\ddot{o}$
 $,\tilde{a}\tilde{P}\tilde{o}\tilde{e}\tilde{a}$ $\ddot{O}\ddot{o}$?

6. $\tilde{a}\tilde{a}|\tilde{a}^1/4\tilde{a}|\tilde{a}\tilde{a}\P\tilde{a}\tilde{A}$ ‡ $\tilde{a}\check{S}\tilde{a}$ ‡ $\tilde{a}^{<3/4}\tilde{a}\tilde{a}$ „ $\tilde{a}\tilde{a}\tilde{a}^1/4\tilde{a}^1\tilde{a}/\tilde{E}\tilde{a}^{3/4}\tilde{a}$ $\ddot{O}\ddot{o}$? $f\hat{O}\tilde{a}\ddagger\tilde{a}\check{S}\tilde{a}$ $^1/2\tilde{a}\tilde{a}\tilde{a}\tilde{a}\ddagger\tilde{a}\check{S}$
 $^o\tilde{a}|\tilde{a}\tilde{a}f^{3/4}\tilde{a}\tilde{n}$ $\acute{y}$

7. $^1\tilde{a}^{<3/4}\tilde{a}\hat{i}\bullet\tilde{a}$ $|\tilde{a}\tilde{a}\grave{\text{A}}$ ‡ $\tilde{a}^{<3/4}\tilde{a}\tilde{a}$ $\ddot{O}\ddot{o}$? $f\hat{O}\tilde{a}\ddagger\tilde{a}\check{S}\tilde{a}$ ‡ $\tilde{a}^{<3/4}\tilde{a}\tilde{a}$ „ $^1\tilde{a}^{3/4}\tilde{a}\tilde{a}\tilde{n}\tilde{O}\tilde{a}$ $\ddot{O}\ddot{o}$ $\acute{y}$

8. $\ddagger\ddagger\ddagger^1/2\tilde{a}\tilde{a}\grave{e}\rangle\tilde{\text{A}}$ „ $\tilde{a}\tilde{a}\ddot{o}\tilde{\text{A}}$ $\hat{I}\tilde{a}\tilde{a}\tilde{n}\hat{E}\rangle^1/2\tilde{a}\tilde{a}\grave{e}\rangle\tilde{\text{A}}$ $^1/2\tilde{a}\ddot{o}$ ‡ $\tilde{a}^{<3/4}\tilde{a}\tilde{a}$ „ $\tilde{a}\hat{a}|\tilde{a}\tilde{\text{A}}$ $\ddot{O}\ddot{o}\hat{a}$?

9. $\ddagger\ddagger\ddagger\tilde{a}\check{S}$ $\tilde{P}\tilde{a}\tilde{a}\hat{E}\tilde{a}\ddagger\tilde{a}\check{S}$ $|\tilde{a}\tilde{a}\grave{\text{A}}$ ‡ $\tilde{a}\check{S}\tilde{a}$ $^1\tilde{a}/\tilde{E}\tilde{a}\tilde{a}|\tilde{a}\tilde{A}\tilde{a}\tilde{n}\tilde{f}\tilde{a}$ 1.5 „ $\tilde{a}\tilde{a}\tilde{n}^1/2\tilde{a}$ $\ddot{O}\ddot{o}$ $\acute{y}$ $|\tilde{a}\tilde{a}\grave{\text{A}}$ ‡ $\tilde{a}\tilde{n}\check{S}$
 $\tilde{a}\tilde{a}\hat{O}\tilde{a}\tilde{A}\tilde{a}\ddot{o}$ ‡ $\tilde{a}\tilde{n}\check{S}$ $^o\tilde{a}\tilde{a}\grave{e}\tilde{P}\tilde{a}$ 1.5 $\hat{I}\tilde{a}\tilde{a}\tilde{n}\hat{E}\rangle$ ‡ $\tilde{a}\check{S}\tilde{a}$ $\tilde{a}\tilde{a}|\tilde{a}^1/4\tilde{a}|\tilde{a}\tilde{a}\P\tilde{a}\tilde{A}$ $\hat{O}\hat{\text{C}}\tilde{a}\tilde{a}\tilde{a}\tilde{a}^1\tilde{a}|\tilde{a}$ $\ddot{O}\ddot{o}$ $\acute{y}$
 $|\tilde{a}\tilde{a}\grave{\text{A}}$ $^1/2\tilde{a}\ddot{o}$ $^o\tilde{a}\hat{O}\P\tilde{a}\tilde{n}$ $\hat{I}\tilde{a}\tilde{a}\hat{E}\tilde{a}\tilde{a}\grave{e}$ $\tilde{a}\tilde{a}|\tilde{a}^2\tilde{a}i|\tilde{a}$ $\tilde{a}\tilde{a}\tilde{A}\tilde{a}$ ‡ $\tilde{a}\check{S}\tilde{a}$ $^1/2\tilde{a}\tilde{a}\P\tilde{a}$ — $\tilde{a}\tilde{a}|\tilde{a}$
 $\ddagger\tilde{a}\check{S}\tilde{a}\grave{e}\tilde{a}\tilde{a}\bullet\tilde{a}\ddagger\acute{y}$

10. $\ddagger\ddagger\ddagger\tilde{a}\check{S}$ $\tilde{P}\tilde{a}\tilde{a}\hat{E}\tilde{a}\ddagger\tilde{a}\check{S}$ $^1/2\tilde{a}\ddot{o}$ 10 ‡ $\tilde{a}i\check{S}\hat{E}\tilde{a}\tilde{a}\tilde{u}^1/2\tilde{a}$ $\tilde{a}\tilde{a}|\tilde{a}^2\tilde{a}i|\tilde{a}$ „ $\tilde{a}\tilde{a}|\tilde{a}\tilde{n}\hat{I}\tilde{a}$ 2 $\hat{O}\tilde{a}\tilde{n}\ddagger\tilde{a}\tilde{a}\check{S}$;
 $|\tilde{a}\ddagger\tilde{a}\check{S}$ $^1\tilde{a}/\tilde{E}|\tilde{a}\tilde{a}\tilde{a}\tilde{a}\hat{O}|\tilde{a}$ $\tilde{a}\tilde{a}\ddagger\tilde{a}\check{S}^{3/4}\tilde{a}\tilde{a}$ • $\tilde{a}\tilde{a}|\tilde{a}\tilde{a}$ $\ddot{O}\ddot{o}$ $\acute{y}$ $\tilde{P}\tilde{a}\tilde{a}\hat{E}\tilde{a}\ddagger\tilde{a}\check{S}$ $^1/2\tilde{a}\ddot{o}$ $^1\tilde{a}/\tilde{E}|\tilde{a}\tilde{a}\tilde{a}\tilde{a}\hat{O}|\tilde{a}$
 $\tilde{a}\tilde{a}\tilde{A}\tilde{a}$ ‡ $\tilde{a}\check{S}\tilde{a}$ $^1/2\tilde{a}\tilde{a}\P\tilde{a}$ — $\tilde{a}\tilde{a}|\tilde{a}$ ‡ $\tilde{a}\check{S}\tilde{a}\grave{e}\tilde{a}\tilde{a}\bullet\tilde{a}\ddagger$?

11. $\tilde{a}\tilde{a}\ddagger\tilde{a}\check{S}\hat{O}\tilde{a}\tilde{a}\grave{e}$ $\tilde{P}\tilde{a}\tilde{a}\hat{E}\tilde{a}\ddagger\tilde{a}\check{S}$ $^1/2\tilde{a}\ddot{o}$ 2 ‡ $^1/2^1\tilde{a}\tilde{a}\grave{e}^{3/4}\tilde{a}\tilde{A}$ ‡ $\tilde{a}\check{S}\tilde{a}\grave{e}$ $\tilde{a}\tilde{a}\tilde{A}\tilde{a}$ 5 $\hat{O}\tilde{a}\tilde{n}\ddagger\tilde{a}\tilde{a}\check{S}$;
 $|\tilde{a}\ddagger\tilde{a}\check{S}$ $^1\tilde{a}/\tilde{E}|\tilde{a}\tilde{a}\tilde{a}\tilde{a}\hat{O}|\tilde{a}$ ‡ $\tilde{a}\check{S}\tilde{A}\P\tilde{a}\tilde{n}$ $^1\tilde{a}\tilde{A}$ 30 • $\tilde{a}i\hat{E}\tilde{a}$...• $\tilde{a}\tilde{a}\tilde{A}$ „ $^1\tilde{a}\P\tilde{a}\tilde{a}$ $\ddot{O}\tilde{a}\tilde{n}|\tilde{a}\tilde{a}\grave{e}$ $\ddot{O}\ddot{o}$
 $|\tilde{a}\tilde{a}\tilde{n}$ $\tilde{P}\tilde{a}\tilde{a}\hat{E}\tilde{a}\ddagger\tilde{a}\check{S}$ ‡ $\tilde{a}\tilde{n}\check{S}$ $\tilde{a}\tilde{a}\hat{O}\tilde{a}\tilde{A}\tilde{a}\ddot{o}$ $^1\tilde{a}\tilde{A}$ $\tilde{a}\tilde{a}|\tilde{a}^1/4\tilde{a}|\tilde{a}\tilde{a}\P\tilde{a}\tilde{A}$ — $\tilde{a}\tilde{a}|\tilde{a}$ ‡ $\tilde{a}\check{S}\tilde{a}\grave{e}\tilde{a}\tilde{a}\bullet\tilde{a}\ddagger$?

12. $^{3/4}\tilde{a}\tilde{a}\tilde{a}\tilde{a}^a$ 5000 ‡ $\tilde{a}i\check{S}\hat{E}\tilde{a}\tilde{a}\tilde{u}^1/2\tilde{a}$ ‡ $\tilde{a}\check{S}\tilde{a}$ $\tilde{a}\tilde{a}|\tilde{a}^2\tilde{a}i|\tilde{a}$ „ $\tilde{a}\tilde{a}|\tilde{a}\tilde{n}\hat{I}\tilde{a}$ $\tilde{a}\tilde{a}\ddagger\tilde{a}\check{S}\hat{O}\tilde{a}\tilde{a}\grave{e}$ $\tilde{P}\tilde{a}\tilde{a}\hat{E}\tilde{a}\ddagger\tilde{a}\check{S}$
 $\hat{O}\tilde{a}\tilde{n}$ $\ddot{O}\tilde{a}\tilde{n}\ddagger\tilde{a}\check{S}\tilde{A}$ 2 $\ddot{U}\tilde{a}\tilde{a}\rangle\tilde{a}$ 30 $\tilde{a}\tilde{a}^1/2\tilde{a}\P\tilde{a}\rangle$ $^1/2\tilde{a}\ddot{o}$ $^1\tilde{a}/\tilde{E}|\tilde{a}\tilde{a}\tilde{a}\tilde{a}\hat{O}|\tilde{a}$ $\ddot{O}\tilde{a}\tilde{n}|\tilde{a}\tilde{a}$ $\ddot{O}\ddot{o}$ $|\tilde{a}\tilde{a}\tilde{n}$
 $\tilde{P}\tilde{a}\tilde{a}\hat{E}\tilde{a}\ddagger\tilde{a}\check{S}$ $\hat{O}\tilde{a}\tilde{n}$ $^1\tilde{a}/\tilde{E}|\tilde{a}\tilde{a}\tilde{a}\tilde{a}\hat{O}|\tilde{a}$ $\tilde{a}\tilde{a}|\tilde{a}^2\tilde{a}i|\tilde{a}$ $\tilde{a}\tilde{a}\tilde{A}\tilde{a}$ ‡ $\tilde{a}\check{S}\tilde{a}\grave{e}$ $\tilde{O}\tilde{a}\forall\tilde{a}\P\tilde{a}\tilde{a}$ ‡ $\tilde{a}\check{S}\tilde{a}\grave{e}\tilde{a}\tilde{a}\bullet\tilde{a}\ddagger\acute{y}$

13. $\ddagger\ddagger\ddagger\tilde{a}\check{S}$ $^o\tilde{a}\ddot{o}\rangle\tilde{\text{A}}\tilde{a}\grave{e}$ $\hat{O}\tilde{a}\tilde{n}$ 24000 ‡ $\tilde{a}i\check{S}\hat{E}\tilde{a}\tilde{a}\tilde{u}^1/2\tilde{a}$ ‡ $\tilde{a}\check{S}\tilde{a}$ „ $\tilde{a}\tilde{a}|\tilde{a}\tilde{n}\hat{I}\tilde{a}$ $\tilde{a}\tilde{a}\hat{E}\tilde{a}^{3/4}\tilde{a}\tilde{a}$ • $\tilde{a}\tilde{a}$
 $\hat{O}\tilde{a}\ddagger\tilde{a}\check{S}|\tilde{a}\tilde{a}$ $\ddot{O}\ddot{o}$ $|\tilde{a}\tilde{a}\tilde{n}$ $^o\tilde{a}|\tilde{a}\tilde{a}$ „ $\tilde{a}\tilde{a}\tilde{n}$ $f\hat{O}\tilde{a}$ $^o\tilde{a}\ddot{o}\rangle\tilde{\text{A}}\tilde{a}\grave{e}$ $^1\tilde{a}\tilde{A}\tilde{a}$ 5 ‡ $\tilde{n}\tilde{a}\tilde{a}^1/2^1\tilde{a}^3/4\tilde{A}$ ‡ $\tilde{a}\check{S}\tilde{a}\grave{e}$
 $\tilde{a}\tilde{a}\tilde{A}\tilde{a}$ $\tilde{a}\tilde{a}\ddagger\tilde{a}\check{S}|\tilde{a}\P\tilde{a}\tilde{n}$ $\hat{O}\tilde{a}^1/2\tilde{a}^3/4\tilde{a}$ $|\tilde{a}\ddagger\tilde{a}\check{S}$ $\hat{E}\tilde{a}\tilde{a}\grave{e}$ • $\tilde{a}\tilde{a}$ $\hat{O}\tilde{a}\ddagger\tilde{a}\check{S}|\tilde{a}\tilde{a}\grave{e}$ $\ddot{O}\ddot{o}$ $\acute{y}$

14. $^{3/4}\tilde{a}\tilde{a}\tilde{a}\tilde{a}^a$ $\tilde{a}\tilde{a}$ ‡ $\tilde{a}\check{S}\hat{O}\tilde{a}\tilde{a}\grave{e}$ $\tilde{P}\tilde{a}\tilde{a}\hat{E}\tilde{a}\ddagger\tilde{a}\check{S}$ ‡ $\tilde{a}\check{S}$ ‡ $\tilde{a}\tilde{n}\check{S}$ $\tilde{a}\tilde{a}\hat{O}\tilde{a}\tilde{A}\tilde{a}\ddot{o}$ $^1\tilde{a}\tilde{A}$ 25 $\hat{I}\tilde{a}\tilde{a}\tilde{n}\hat{E}\rangle$
 $\tilde{a}\tilde{a}|\tilde{a}^1/4\tilde{a}|\tilde{a}\tilde{a}\P\tilde{a}\tilde{A}$ $\hat{E}\tilde{a}\tilde{O}\tilde{a}\tilde{a}\P\tilde{a}\tilde{n}$ $\hat{O}\tilde{a}\tilde{n}$ 5 ‡ $\tilde{n}\tilde{a}\tilde{a}^1/2^1\tilde{a}^3/4\tilde{A}$ ‡ $\tilde{a}\check{S}\tilde{a}\grave{e}$ $\tilde{a}\tilde{a}\tilde{A}\tilde{a}$ $^1\tilde{a}/\tilde{E}|\tilde{a}\tilde{a}\tilde{a}\tilde{a}\hat{O}|\tilde{a}$
 $\ddot{O}\tilde{a}\tilde{n}|\tilde{a}\tilde{a}\grave{e}$ $\ddot{O}\ddot{o}$ $|\tilde{a}\tilde{a}\tilde{n}$ $\tilde{P}\tilde{a}\tilde{a}\hat{E}\tilde{a}\ddagger\tilde{a}\check{S}$ ‡ $\tilde{a}\check{S}\tilde{a}$ $^1\tilde{a}/\tilde{E}\tilde{a}\tilde{a}|\tilde{a}\tilde{A}\tilde{a}\tilde{n}\tilde{f}\tilde{a}$ — $\tilde{a}\tilde{a}|\tilde{a}$ ‡ $\tilde{a}\check{S}\tilde{a}\grave{e}\tilde{a}\tilde{a}\bullet\tilde{a}\ddagger\acute{y}$

f‡ãŠãfÃ : 10 ãü•ãÄã'ãŠ ‡ãŠãè ØãªÃ¶ã Êã½°ããè ‡ã<¾ããò ?

,ã¶ãì‡ãîŠÊã¶ã †lãâ •ãõlã äãlã‡ãŠãÔã



**,ã¶ãì‡ãîŠÊã¶ã ý
•ãõlã äãlã‡ãŠãÔã ý**

,ã¶ãì‡ãîŠÊã¶ã

‡ãŠãã 6 ½ãò ,ãã'ã¶ãñ meerKee äã ‡ãŠ Ôã¼ããè •ããèlãfããÄãè ,ã'ã¶ãñ-
,ã'ã¶ãñ äãlãããlãÓ> äã¶ãlããÔã äãñããò ½ãò ÀÖ¶ãñ Ööý ¾ããªª f¶ã ‡ãñŠ
ãã¶ãlããÔã ½ãò 'ãããÀlãlãÃ¶ã Öãñlãã Öò lããñ f¶Öò ‡ãŠããY¶ããf¾ããò ‡ãŠã
Ôãã½ã¶ã ‡ãŠÀ¶ãã 'ãüj|ãã Öò ,ããòÀ 'ãÆããlã ‡ãîŠÊãªlãã†ú Öãñ¶ãñ 'ãÀ
lãñ ¶ãÓ> ¼ããè Öãñ •ããlãñ Öòâ ý •ãõÔãñ - ½ãœÊããè ‡ãŠãñ 'ãã¶ããè ‡ãñŠ
°ããÀÖ äã¶ã‡ãŠãÊãªò lããñ ‡ã<¾ãã Öãñlãã Öò Fmeer heÇkeâej ,ãã½ã ‡ãŠãè
'ããòfã ‡ãŠãñ lããÊããª½ãò Àãñ'ãªò lããñ ‡ã<¾ãã ÖãñØãã? ,ãã'ã¶ãñ
‡ãŠ½ããè Ssmee Yeer ÔããñPãã äã ‡ãŠ •ãÊã ‡ãñŠ °ããÖÀ ,ããlãñ Öãè
½ãœÊããè ‡ã<¾ããò œ'ã>ã¶ãñ ÊãØãlããè Öò, ,ããòÀ ,ãã½ã ‡ãŠãè 'ããòfã
'ãã¶ããè ½ãò ‡ã<¾ããò Ôãüj •ããlããè Öò? lããÓlãlã ½ãò ½ãœÊããè ‡ãŠãñ
•ããèlã¶ã ¾ããªª¶ã ‡ãñŠ äãÊã† ,ããlãlã¾ã ‡ãŠ Ôã¼ããèªlãã†ò •ãÊã ½ãò
'ãÆãlã Öãñ •ããlããè Öò 'ãÀ¶ãlã •ãÊã Ôãñ °ããÖÀ ¶ãÖãé ,ããòÀ lãÖ ½ãÀ
•ããlããè Ööý

fÔããè 'ãÆ ‡ãŠãÀ Öãñ 'ãÆl¾ãñ ‡ãŠ •ããèlãfããÄãè ‡ãŠãñ äã ‡ãŠÔããè
ãã¶ãlããÔã ÔLeeve 'ãÀ ÀÖ¶ãñ ‡ãñŠ äãÊã† „ã¾ãl‡ã<lãªlãã†ú ÔãÖã¾ã‡ãŠ
Öãñlããè Ööý f¶Öãé „ã¾ãl ‡ã<lãªlãã ,ããò 'ãÄã
'ã¾ããÃlãÀ¥ã (JeeleeJeyCe) ‡ãñŠ ,ã¶ãlãÔããÀ •ããèlãfããããÀ¾ããò ½ãò
lãÀãèÀ ‡ãŠãñ ããÊã¶ãñ ‡ãŠãè äã½ãlãã ‡ãŠã äãlã ‡ãŠãÔã Öãñlãã Öò
ãã•ãÔãñ ,ã¶ãl‡ãîŠÊã¶ã (Adaptation) ‡ãŠÖ¶ãñ Öö ý ‡ã<¾ãã ,ãã'ã ,ã'ã¶ãñ
,ããÔã 'ããÔã ‡ãñŠ •ããèlãfããããÀ¾ããò ½ãò ,ã¶ãl‡ãîŠÊã¶ã Ôã½°ã¶ããè
ªlãã ,ããò ‡ãŠãñ 'ãÖPãã¶ã Ôã‡ãŠlãñ Öò ? ,ããf†ªñÇãòý

äãlãlãñÓã 'ã¾ããÃlãÀ¥ã ½ãò •ããèlãfããããÀ¾ããò 'ãÄã

,ã¶ãì‡ãîŠÊã¶ã :-

'ãÆl¾ãñ‡ãŠ •ããèlãfããÄãè ‡ãŠ äãlãlãñÓã 'ãÆ‡ãŠãÀ ‡ãñŠ 'ã¾ããÃlãÀ¥ã
½ãò ÀÖlãs Öò ý ¾ãñ 'ãÆã¾ã: lããè¶ã Öò- •ãÊã, ÔããÊã lãã¾ãlãý

fÔããè ,ãã£ããÀ 'ãÀ •ã¶|ài |ã©ãã 'ãñü| 'ããõ£ãñ •ãÊããè³/ã, Ô©ãÊããè³/ã, ,¹/ã³/ãPãÀ ,ã©ãìãã Ìãã³/ãÌããè³/ã Ôãñ|ãñ Öö ý

ãä%ãŠ³/ãã ‡ãŠÊãã¹ã 10.1

,ã¹ã¶ããè 'àiããÔ|ã ‡ãŠã ½ãò ãã¶ã½¶ããÊããã£ã|ã 'ãÆ ‡ãŠãÀ Ôãñ ,ãÊãØã- ,ãÊãØã |ããããÊã ‡ãŠã- 1 |ã©ãã |ããããÊã ‡ãŠã- 2 °ã¶ãã ‡ãŠã dqN •ã¶|ài Ìã 'ããõ£kksa ½ãò ,ã¶|ài‡ãìŠÊã¶ã Ôã½°ã¶£ããè 'Ìãã,ããò ‡ãŠãñ 'ãÖPãã¶ãñ -

|ããããÊã‡ãŠã - 1 ããìããã¼ã¶¶ã 'ãããÀìãñÌã ½ãò 'ãã³/ãñ •ã¶|ãñ ÌããÊãñ

¹ããõ£ãñ

|ããããÊã‡ãŠã - 2 ããìããã¼ã¶¶ã 'ãããÀìãñÌã ½ãò 'ãã³/ãñ •ã¶|ãñ ÌããÊãñ

•ã¶|ài

क्रम सं०	घन में	मैदान में	पर्वतीय क्षेत्र में	मरुस्थल में	तालाब में	नदी में	समुद्र में

fÔã ‡ãŠã³/ãÃ ½ãò ,ãã¹ã ,ã¹ã¶ãñ ãã½ãããò, ½ãã|ãã-ãã¹ã|ãã ‡Ìãã ØãìÀ•ã¶ããò Ôãñ ¼ããè ããìãPããÀ ããìã½ãìãÃ ‡ãŠãkeã Deewj DeefOekeã •ã¶|ã‡ãŠãããè Êãòý 'àiÔ|ã ‡ãŠãÊã³/ã Ôãñ 'àiÔ|ã ‡ãŠãò Ìã 'ãããã ‡ãŠã,ããò Ôãñ ¼ããè ÔãÖã³/ãã Êãñ Ôã‡ãŠ|ãñ Ööý fÔã |ããããÊã‡ãŠã ‡ãŠãñ ¼ãÀã¶ãñ ½ãò ,ãã¹ã fÔããè f ‡ãŠãfÃ ‡ãñŠ „ãÖÀ¥ããò ‡ãŠãñ ¼ããè Ôããã½½ãããÊã|ã ‡ãŠÀ Ôã‡ãŠ|ãñ Ööý

°ãñ¶ããò |ããããÊã ‡ãŠã,ããò ‡ãñŠ ,ã£³/ã³/ã¶ã Ôãñ ,ãã¹ã¶ãñ meerKee efkeã ããìããã¼ã¶¶ã 'ãÆ ‡ãŠãÀ ‡ãŠãè Ìã¶ãÔ¹ããã|ã³/ããùã ãã¼ã¶¶ã-ãã¼ã¶¶ã Ìãã|ããìãÀ¥ã ½ãò „Øã|ããè Öö ý •ãõÔãñ- ¶ããè½ã, ØãñÖúì |ã©ãã Pã¶ãã ,ããããª Ô©ãÊããè³/ã Ìãã|ããìãÀ¥ã ½ãò, •ãªãã ‡ãŠ ‡ãìŠ½ãìãã¶ããè,ãÊã ‡ãìŠ½¼ããè |ã©ãã ‡ãŠ½ãÊã ,ããããª •ãÊããè³/ã Ìãã|ããìãÀ¥ã ½ãò „Øã|ãñ Öö ý fÔããè 'ãÆ ‡ãŠãÀ ÌãñÀ, ããÖÀ¶ã, Ìã¶ã ½ãò |ããñ ½ããããÊã³/ããù •ãÊã ½ãò ãã¶|ãããÔã ‡ãŠÀããè Ööý ‡ã«³/ãã ¶ããØã¹ãŠ¶ããè ‡ãŠãñ •ãÊããè³/ã Ìãã|ããìãÀ¥ã |ã©ãã ‡ãìŠ½ãìãã¶ããè ‡ãŠãñ Ô©ãÊããè³/ã Ìãã|ããìãÀ¥ã ½ãò „Øãã³/ãã •ãã Ôã‡ãŠ|ãñ Öö ? Ö½ã fÔããè f‡ãŠãfÃ ½ãò ,ããØãñ •ã¶|ãñÔãñ ãã‡ãŠ •ã¶|ài,ããò ½ãò ,ã©ãìãã 'ããõ£ããò ½ãò •ãÊã ½ãò ,ã©ãìãã Ô©ãÊã 'ãÀ ÀÖ¶ãñ ‡ãñŠ ããÊã ‡ãŠãõ¶ã Ôãñ ,ã¶|ài‡ãìŠããÊã|ã Êããã¥ã 'ãã³/ãñ •ã¶|ãñ Ööý

,ãã ‡ãõŠãã|ã, ,ãã ‡ãŠãÀ, ÀãØã-À¹ã, ÔããÀPã¶ãã |ã©ãã ,ããìããÔã Ôã½°ã¶£ããè Êããã¥ããò ½ãò ‡ñÔãã 'ãããÀìã|ãÃ¶ã, •ããñ Ôã•ããèìã

‡āŠāñ āāīāīāñÓā 'ā³⁄₄āāĀīāĀŸā ½āō Ōā'āŠĒā|āā'āīāĀ ‡āŠ •āāēāāīā|ā
 ĀÖŲāñ ½āō ŌāŌā³⁄₄ā‡āŠ Ōāñ|āā Ōō, ,āŲāī‡āīŠĒāŲā ‡āŠŌĒāā|āā Ōōý

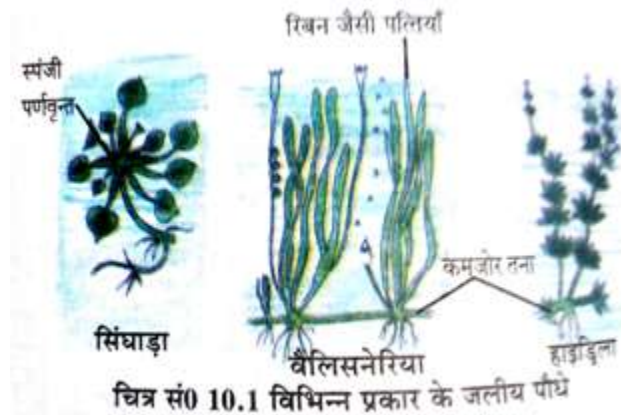
pevleDegesb leLee heewOeesb cesb peueerŲe, mLeueerŲe leLee
 JeeŲegJeerŲe Devegkeâtueve keâer efJeMes<eleeSbb efvecveJeled
 nwb

•āĒāāē³⁄₄ā ,āŲāī‡āīŠĒāŲā -
 āā%āŠ³⁄₄āā ‡āŠĒāā'ā 10.2

,ā'āŲāñ ŌāŌā |āŌāā 'āōĀ ‡āŠāñ ĒāŌāā|āāĀ ‡‡āŠ ŲāŸ>ñ |ā‡āŠ 'āāŲāāē ½āō
 |¹āāñ ‡ ĀĒāō ý ŌāŌā |āŌāā 'āōĀ ‡āŠāē |āPāā (Pā¹⁄₂āū|āē) ½āō ‡ā³⁄₄āā
 ‡āŠāñfĀ 'āāāĀīā|āĀŲā āāĒāāfĀ ˆñ|āā Ōō ? ‡ā³⁄₄āā fŌāāē |āĀŌ •āĒāāē³⁄₄ā
 •āŲāī ½āñū‡ ‡āŠ, ½āēĒāāē |āŌāā •āĒāāē³⁄₄ā 'āāōfāā •āĒā ‡ āīŠ¹⁄₂¹⁄₄āāē,
 āāŌāāŲāāū|ā ,āāāā ½āō ¼āāē Ōāñ|āā Ōō ?

Ö½āāĀñ ŌāŌā |āŌāā 'āōĀ ‡āŠāē |āPāā āāŌā ‡ āīSū| •āā|āāē Ōō
 ‡ā³⁄₄āāōāā ‡āŠ Ö½āāĀā •āāēīāŲā 'āāŲāāē ½āō ĀŌŲāñ ‡āñŠ āāĒā ‡
 ,āŲāī ‡ āīŠāāĒā|ā ŲāŌāē Ōō 'āĀŲāī •āĒāāē³⁄₄ā •āāēīāfāāāāĀ³⁄₄āāō •āōŌāñ
 -½āñū‡ ‡āŠ, ½āēĒāāē •āĒā ‡ āīŠ¹⁄₂¹⁄₄āāē, āāŌāāŲāāū|ā ,āāāā ½āō ‡ñŌāā
 ŲāŌāē Ōāñ|āā Ōō ý ,āā'āŲāñ ‡āŠāā 6 ‡āŠāē f‡āŠāfĀ •āāēīā•āŌā|ā ½āō
 ,āŲāī‡āīŠĒāŲā ‡āñŠ ˆāāĀñ ½āō •āāŲā‡āŠāĀāē 'āĒā'ā ‡āŠāē Ōōý ‡ā³⁄₄āā
 āāŲāŌ ‡āŠŌāĀ 'āĒā'ā Ōāñ|āñ Ōōā ? ,āŲāī ‡āīŠĒāŲā •āāēīāfāāāāĀ³⁄₄āāō
 ‡āñŠ ĪāĀāēĀ ½āō ĀPāŲāā|½ā‡āŠ āāīāīāñŌā|āā,āāō ‡āñŠ ‡āŠāĀŸā Ōāñ|āā
 Ōōý •āōŌāñ - •āĒāāē³⁄₄ā Īāā|āāīāĀŸā ½āō ĀŌŲāñ ‡āñŠ āāĒā ‡ ĪāĀāēĀ
 ‡āŠāñ ŌāīĀāā ‡āŠāē ,āāīāī³⁄₄ā ‡āŠ|āā Ōāñ|āāē Ōōý•āĒāāē³⁄₄ā •āŲāī
 ½āēĒāāē ‡āñŠ ĪāĀāēĀ 'āĀ •āĒāĀāñfāāē ĪāĒ‡āŠ 'āā³⁄₄āñ •āā|āñ Ōō,fŲā¹⁄₂āō
 ĪāŌāŲā ‡āñŠ āāĒā ‡ āāīāīāñŌā ĀPāŲāā ‡ ú •āōŌāñ •āĒā ‡ āĒĒāñ¹⁄₂ā
 (efieume)Ōāñ|āñ Ōō , |āōĀŲāñ ‡āñŠ āāĒā ‡ fŲā ‡āŠā ĪāĀāēĀ fāāĀā
 ĀñāāĒā|ā |āŌāā Pā'ā>ñ 'āĒā Ōāñ|āñ Ōōý ‡ā³⁄₄āā 'āĒā āā ‡āŠŌāāē
 ŌŌāĒāāē³⁄₄ā •āŲāī ½āō Ōāñ|āā Ōō? ŌāĀŲā ‡āŠā ,ā¹⁄₄āāīā Ōāñ|āā Ōō |āŌāā
 ,āāūĒāāō 'āĀ āāŲā¹⁄₂āñŌā ‡āŠ 'āĒā Ōāñ|āāē Ōō ý ³⁄₄āñ Ōā¹⁄₄āāē ĒāāāŸā
 ½āēĒāāē ‡āŠñ •āĒā ½āō |āōĀŲāñ, ¼āāñ•āŲā ‡āŠāē |āĒāīā |āŌāā ĪāŌāŲā
 ‡āñŠ 'āĒāā|ā ,āŲāī ‡āīŠĒāŲā Ōōý fŌāāē 'āĒ ‡āŠāĀ ,ā³⁄₄ā •āĒāāē³⁄₄ā
 •āŲāī,āāō ½āō ¼āāē ,āŲāñ ‡āŠ āāīāīāñŌā|āā ‡ ú 'āā³⁄₄āāē •āā|āāē Ōō
 āā•āŲā‡āñŠ ‡āŠāĀŸā Ōāē Īāñ •āĒā ½āō āāŲāīāāŌā ‡āŠĀ 'āā|āñ Ōōý
 •āŲāī,āāō ‡āŠāē |āĀŌ •āĒāāē³⁄₄ā 'āāōfāāō ½āō ¼āāē ,āŲāī‡āīŠĒāŲā Ōāñ|āā
 Ōōý fŲā 'āāōfāāō ‡āŠā ĪāĀāēĀ ‡āŠāñ¹⁄₂āĒā |āŌāā ‡āŠ¹⁄₂ā•āāñĀ Ōāñ|āā Ōō
 ý ‡ā³⁄₄āāōāā ‡āŠ fŲā 'āā¹⁄₂āāō ‡āñŠ ĪāĀāēĀ ‡āñŠ Ōā¹⁄₄āāē ¼āāŌāāō ½āō
 ½āōḡ Gā|ā‡āŠ ,āāāfā‡āŠ|āā ½āō Ōāñ|āā Ōō ,āāōĀ ‡āŠāŌŸāē³⁄₄ā ...|ā‡āŠ

,ã|¾ã¶ã Ôãîà½ã ½ãããã ½ãò Öãñ|ãã Öö ý 'ããã|ã¾ããú 'ã|ãÊããè, ‡ãŠ>ãè-
 'ãŠ>ãè ,ã©ãîãã |ãðÀ¶ãñ ‡ãŠãè ,ãîãÖ©ãã ½ãò Öãñ|ããè Ööý 'ããã|ã¾ããò ½ãò
 'ãÆã¾ã: À¶ãÆãò ‡ãŠã ,ã¼ããîã Öãñ|ãã Ööý f¶ã 'ããðããò ½ãò •ãü| |ã¶ã
 ,ãÊ¹ã ããîã‡ãŠããÖã|ã Öãñ|ãã Öö ý |ã¶ãã, 'ã¥ãÀîãð¶ã |ã©ãã 'ããã|ã¾ããò ½ãò
 ,ãããã‡ã‡ãŠ îãã¾ãî‡ãŠãñ" k Öãñ|ãã Öö ,ã|ã: peuerÙe heewOes Ô¹ãâ•ããè îã
 ÖÊ ‡ãñŠ Öãñ •ãã|ãã Ööãý •ãðÖãñ -ãÊã ‡ãîŠ½¼ããèý •ãÊããè¾ã 'ããðããò
 ‡ãñŠ Ôã¼ããè ¼ããðããò 'ãÀ •ãÊãÀãñããè ½ããñ½ã ¾ãã ,ãPã½ãÃ (Cuticle)
 ‡ãŠãè 'ã|ãÃ 'ãã¾ããè •ãã|ããè Öö •ããñ f¶ã‡ãŠãñ 'ãã¶ããè ½ãò Ôãü|¶ãñ Ôãñ
 °ãPãã|ããè Öö ý f¶Öãè Êããã¥ããò ‡ãñŠ ‡ãŠãÀ¥ã •ãÊããè¾ã 'ããðãñ
 •ãÊããè¾ã îãã|ããîãÀ¥ã ½ãò Ôã¹ãŠÊã|ãã 'ãîîãÃ ‡ãŠ •ããèîã¶ã ¾ãã¹ã¶ã
 ‡ãŠÀ¶ãñ ½ãò Ôãã½ã Öãñ|ãã Öö ý •ãðÖãñ-ããÖããÜããü|ã,
 îãðããÊãÖã¶ãñããÀ¾ãã, Öãfãã|ÊÊãã |ã©ãã ‡ãîŠ½ãîãã¶ããè ,ããããª (ããPãª
 10.1)ý



Ô©ãÊããè¾ã ,ã¶ãî‡ãîŠÊã¶ã -

Ô©ãÊããè¾ã •ã¶ãî •ãðÖãñ ãã°ãÊÊããè, Øãã¾ã |ã©ãã Ô©ãÊããè¾ã 'ãã¹ã
 •ãðÖãñ ¶ããè½ã, ,ã½ã:ª ,ããããª ½ãò ¼ããè îãã|ããîãÀ¥ã ‡ãñŠ ,ã¶ãîÔããÀ
 ,ã¶ãî‡ãîŠÊã¶ã Öãñ|ãã Öö ý

Ô©ãÊããè¾ã •ã¶ãî •ãðÖãñ ãã°ãÊÊããè, Øãã¾ã ½ãò 'ãÆPãÊã¶ã ‡ãñŠ ããÊã†
 PããÀ 'ããª Öãñ|ãã Öö meebme uesves nsleg ããîã ‡ãŠããÖã|ã îãÖã¶ã |ã¶ã
 Öãñ|ãã Ööý ¶ããè½ã leLee ,ã½ã:ª Ô©ãÊããè¾ã îãðãã Ööý ,ãããã‡ã‡ãŠ •ãÊã
 ½ãò ¾ããñ ÔãîÊã •ãã|ãã Ööý f¶ã ‡ãŠã |ã¶ãã ½ã•ããî|ã îã 'ããã|ã¾ããú
 Pã½ã‡ãŠãèÊããè ,ããðÀ 'ãðŠÊããè ÖîfÃ Öãñ|ããè Öö, f¶ã½ãò À¶ããò 'ãÀ
 ØãðÖããè¾ã ,ããª¶ã 'ãÆª¶ã Öãñ|ãã Ööý •ãü| |ã¶ã ,ãããã‡ã ‡ãŠ
 ããîã‡ãŠããÖã|ã Öãñ|ãã Ööý

,ãã¹ã ‡ãŠãñ ÀãããðãÖã¶ã (½ãÁÔ©ãÊã) ‡ãñŠ °ããÀñ ½ãò •ãã¶ã ‡ãŠãÀãè
 ÖãñØããèý ½ãÁÔ©ãÊã ¼ããè Ô©ãÊããè¾ã îãã|ããîãÀ¥ã ‡ãŠã Öãè ‡ãŠ Á¹ã
 Ööý ‡ã¾ãã ,ãã¹ã ½ãÁÔ©ãÊã ½ãò 'ãã¾ãñ •ãã¶ãñ îããÊãñ ãã ‡ãŠÔããè
 'ããðãñ ,ã©ãîãã •ã¶ãî ‡ãñŠ ¶ãã½ã °ãã Ôã‡ãŠ|ãã Öö ?

•ãõÔãã ää ‡ äŠ ,ää'ä •ää¶|ã|ãñ Öö ää ‡ äŠ ½ãÁÔ©ãÊã ½ãò ÀÖ¶|ãñ ÌããÊãñ
 •ã¶|ãì,ããò ‡ äŠãñ ääÌãÍãñÓã ‡ äŠããÝ¶|ãã^{f³/4}ããò ‡ äŠã Ôãã½ã¶|ãã ‡ äŠÀ¶|ãã
 'äü|ãã Öö - pewmes 'ää¶|ããè ‡ äŠãè ‡ äŠ½ããè, |ãñ•ã ðãí'ã |ã©ãã ØãÀ½ã
 °ããÊãí 'ãÀ ÞãÊã¶|ãã, ‡ äŠãú»ñªãÀ † Ìãã ÍãíÓ ‡ äŠ 'ãñü| 'ããõðããò ‡ äñŠ
 °ããèÞã peerefJeleÀÖ¶|ãã Deeefoy
 „¹ã³/4ãÃì ‡ ä<|ã ‡ äŠããÝ¶|ãã^{f³/4}ããò ‡ äñŠ meceeOeeve nsleg cejâmLeueerÙe
 pevlegDeesb cesb peue mebÙeÙe, Kegjojer lJeÙee, DeefOekeâ yeeue,
 uecyes hewj leLee ieodosoej leueJes jsefiemleeve cesb oew][ves keâs
 efueÙes Devegkeâtefuele nesles nwbý •ãõÔãñ -...ú» (ääÞãã 10.2)ý



ääÞãã Ôããã0 10.2 ½ãÁÔ©ãÊããè³/4ã •ã¶|ãì

- ã¶|ãì,ããò ‡ äñŠ Ôã½ãã¶|ã ½ãÁÔ©ãÊã ½ãò „Øã¶|ãñ ÌããÊãñ 'ãñü|-'ããõðããò
 ‡ äŠãñ ¼ããè ‡ äŠããÝ¶|ãã^{f³/4}ããò ‡ äŠã Ôãã½ã¶|ãã ‡ äŠÀ¶|ãã 'äü|ãã Öö ¾ãñ
 ¼ããè 'ää¶|ããè ‡ äŠãè ‡ äŠ½ããè, Ôãí³/4ãÃ ‡ äŠã |ãñ•ã 'ãÆ ‡ äŠãÍã |ã©ãã äª¶|ã
 ‡ äñŠ Ôã½ã³/4ã „Þã |ãã¹ã½ãã¶|ã ‡ äŠãñ çãñÊã|ãñ Öö1
 Fmeer heÇkeâej ½ãÁÔ©ãÊããè³/4ã 'ãã¹ããò ½ãò Devegkeâtueve
 nsleg äã¶|ã½¶|ãããÊãããÆã|ã efJeMes<eleeSb nesleer nwb -
- |ã¶|ãã ½ãããÔãÊã, Þã'ã>ã, ÖÀã † Ìãã Ô'ãã•ããè Öãñ •ãã|ãã Öö •ãñ
 ¼ããñ•ã¶|ã °ã¶|ãã¶|ãñ ‡ äñŠ Ôãã©ã •ãÊã ÔããããÞã|ã ‡ äŠÀ¶|ãñ ‡ äŠã ‡ äŠã³/4ãÃ
 ‡ äŠÀ|ãã Ööý •ãõÔãñ - ¶|ããØã¹ãŠ¶|ããè
 - •äü|ãã |ã¶|ãã ,ã|³/4ãããããããã ‡ äŠ 'ãõŠÊãã Òì,ãã ,ããòÀ ØãÖÀã^fÃ ½ãò •ãã|ãã Öö ý
 - ÌããÓ'ããñ|Ôã•ãÃ¶|ã ‡ äŠãè äã %o äŠ³/4ãã ‡ äŠ½ã ‡ äŠÀ¶|ãñ ‡ äñŠ äãÊã †
 'ããã|ã³/4ããú, ½ãããÔãÊã ¾ãã ‡ äŠãú»ãò ¾ãã ÍãÊ ‡ äŠãò ‡ äñŠ Á¹ã ½ãò
 'ãã³/4ããè •ãã|ããè Ööý •ãõÔãñ - ¶|ããØã¹ãŠ¶|ããè, Üããè ‡ ä<ÌããÀ, Ôã|ããÌãÀ
 |ã©ãã ¼ãü|¼ãÝ|ãã ,ããããª (ääÞãã 10.3)ý
 - 'ããã|ã³/4ããò ½ãò À¶|ããÆ Øã:áãò ½ãò ðããÔãñ ÀÖ|ãñ Öö ^fÔãÔãñ
 ÌããÓ'ããñ|Ôã•ãÃ¶|ã ‡ äŠ½ã Ôãñ|ãã Öö •ãõÔãñ - ‡ äŠ¶|ãñÀ ý

ÀñããĈẽã|ã Öññ|ãã Ööý ‡ã<³⁄₄ãã ,ãã¹ã •ãã¶ã|ãñ Öôâ efkeâ f¶ã‡ãñŠ ,ãŒãÆ¹ããª
 Öæè 'ããĈẽãðò ½ãð Â¹ãã¶ãããÀ|ã Öññ|ãñ Öö •ããñ „ü|¶ãñ ½ãð ÔãÖã³⁄₄ã ‡ãŠ
 Ööý f¶ã ‡ãŠãè ,ãããÖ©ã³⁄₄ããú ĈẽãñĈẽãÊããè † Îãã Îãã³⁄₄ãî Ôãñ ¼ãÃãè
 Öññ|ããè Öö ãã•ãÖãÖññ f¶ã ‡ãŠã ÎãÃãèÀ ÖÊ ‡ãŠã Öññ •ãã|ãã Ööý
 'ãñŠ¹ãŠü|ãð Ôãñ •ãîü|ñ Îãã³⁄₄ãî ‡ãŠãñ" k ½ãð ÖÎãã ¼ãÃ •ãã|ããè Öö •ããñ
 „ü|¶ãñ Ôã¹ã³⁄₄ã ÎãÃãèÀ ‡ãŠãñ ÖÊ ‡ãŠã ÀĈẽã|ãñ Ööý fÔã |ãÃÖ ‡ãŠã
 ããÎãÎãñÓã Â¹ãã¶ãÀ¥ã ‡ãñŠÎãÊã 'ããããã³⁄₄ããð ½ãð Öññ|ãã Öö •ãöÖññ -
 |ããñ|ãã, ‡ãŠªãî|ãÃ |ã©ãã ŒããðÀð³⁄₄ãã ,ãããªª ý
 Fmemes Ô¹ãÓ> Öññ Œã³⁄₄ãã ÖññŒãã ãã ‡ãŠ ‡ãŠãè>ãð ,ããðÀ 'ããããã³⁄₄ããð
 ½ãð „ü|¶ãñ ‡ãñŠ ããÊã† ããÎãÎãñÓã ,ã¶ãî‡ãîŠÊã¶ã Öññ|ãã Öö ý
 ,ãã¹ã¶ãñ |ã³⁄₄ã¶ããÖããñÀ ‡ãñŠ °ããÃñ ½ãð Ôãî¶ãã ÖññŒããý ³⁄₄ãñ ÊããĈẽãð
 ÎãŒãÃ 'ãÖÊãñ 'ãð©Îããè 'ãÃ 'ãã³⁄₄ãñ •ãã|ãñ ©ãñ 'ãÃ¶ãî ,ãã•ã ¶ãŒãè Ööý
 †ñÔãñ ner ‡ãŠfÃ •ããèÎããð ‡ãŠãè 'ãÆ•ãããã|ã³⁄₄ããú ããÎãÊãî¹|ã Öññ Þãî‡ãŠãè
 Ööý ‡ãñŠÎãÊã † ñÔãã Öæè ¶ãŒãè Öö °ãããÊ ‡ãŠ ‡ãŠfÃ ¶ãfÃ
 'ãÆ•ãããã|ã³⁄₄ããð ‡ãŠã „ª¼ãÎã ¼ããè Öî,ãã Ööý ³⁄₄ãñ 'ãÆ½ãã¥ã Ö¹ãð
 •ããèÎãã¹½ããð ‡ãñŠ 'ãÃ ãã½ãÊã|ãñ Ööý •ããèÎãã¹½ã ‡ã<³⁄₄ãã Öö ? ,ã¹ã¶ãñ
 ããÎããã ‡ãŠ Ôãñ ÞãÞããÃ ‡ãŠÀð Îã fÔããè f‡ãŠãfÃ ½ãð fÔã‡ãŠãè ,ããðÀ
 •ãã¶ã ‡ãŠãÃãè 'ãÆã¹|ã ‡ãŠÀöý ããÎãÊãî¹|ããè ‡ãŠÀ¥ã † Îãã „ª¼ãÎã
 'ãÆãã%ãŠ³⁄₄ãã ½ãð Îãã|ããÎãÀ¥ã ½ãð Öññ¶ãñ ÎããÊãñ 'ãããÀÎã|ãÃ¶ã |ã©ãã
 „Ôã‡ãñŠ ããÊã† ,ã¶ãî‡ãîŠÊã¶ã ‡ãŠã ããÎãÎãñÓã ½ãÖî|ã Öö ,ããf† fÔã‡ãŠãñ
 Ö½ã •ãðÎã ããÎã‡ãŠãÔã ‡ãñŠ Â¹ã ½ãð •ãã¶ãñý

•ãðÎã ããÎã‡ãŠãÔã

‡ãŠãÊãã¶ãÀ ½ãð •ããèÎããð ‡ãŠãè ÀÞã¶ãã |ã©ãã ‡ãŠã³⁄₄ãÃ¹ãÆ¥ããÊããè
 ½ãð %ããŠã½ã ‡ãŠ 'ãããÀÎã|ãÃ¶ããð 'ãÃã •ããèÎããð ‡ãŠãè „¹ããã|ã
 ‡ãŠãñ Öæè •ãðÎã ããÎã‡ãŠãÔã ‡ãŠÖî|ãñ Ööý

‡ã<³⁄₄ãã •ãðÎã ããÎã‡ãŠãÔã ‡ãŠã Öññ¶ãã 'ãÆ½ããã¥ã|ã Öö?

•ãðÎã ããÎã‡ãŠãÔã ‡ãŠãè 'ãÆ½ãããã¥ã‡ãŠ|ãã ‡ãñŠ Ôããª¹⁄₄ãÃ ½ãð ãã•ã¶ã
 ªãñ Îãð—ãããã¶ã ‡ãŠãð ‡ãñŠ ¶ãã¹⁄₂ã °ãÖîÞãããÞãÃ|ã Öö Îãñ
 Öö Êö½ãã‡ãŠ |ã©ãã ;ãããÎãÃ¶ã ý
 •ãðÎã ããÎã‡ãŠãÔã ‡ãñŠ Ôã½ª¶ã ½ãð ÔãªÔãñ 'ãÖÊãñ 'ãÆŠããÔã ªñÎã
 ½ãð Ôã¶ãá 1744 ½ãð •ã¶¹⁄₂ãñ •ããèÎã Îãð—ãããã¶ã ‡ãŠ Êãð½ãã ‡ãŠ ¶ãñ
 ,ã¹ã¶ãñ ããÎãÞããÀ ÀĈẽãñ ©ãñý „¶ã ‡ãŠã
 ããÔã®ãã|ã Êãð½ãã‡ãŠÎããª ‡ãŠÖÊãã|ãã Ööý

Êö½ãã‡ãŠÎããª (Lamarckism) :-

fÔã ããÔãª¶ã ‡ãŠã ,ããfããÀ ããª¶ã¹ Öö ãã‡ãŠ Îãã|ããÎãÀ¥ã ‡ãŠñ 'ãÆ¼ããÎã
 ³⁄₄ãã ,ããŒããð ‡ãñŠ „¹ã³⁄₄ããñŒã † Îãã ,ã¶ãî¹ãÆ³⁄₄ããñŒã ‡ãŠñ 'ãÆ¼ããÎã Ôãñ
 •ããèÎããð ‡ãŠãè ÀÞã¶ãã ,ããðÀ ‡ãŠã³⁄₄ãÃ 'ãÆ¼ããããÎã|ã Öññ|ãñ Öö

छोटी गर्दन

पूर्वज जिराफ

लम्बी गर्दन

आधुनिक जिराफ

चित्र सं० 10.4 लैमार्क के अनुसार जिराफ के पूर्वजों में लम्बी गर्दन का क्रमिक विकास

□ Ôā¶āā 1924 ½āō ‡ āōS½āÀÀ ¶āā½ā ‡ āS İāō—āāāā¶ā ‡ āS ¶āñ ‡ āSÖā āā ‡ āS āāœ¹ā ‡ āSāāĒā³⁄₄āāō ‡ āñS İāĀāēĀ ½āō āāİāāā¹⁄₄ā¶ā ¶āā¹ā , ¶ā½āāē † İāā ¹āĒ ‡ āSāİā ‡ āñS ‡ āSĀĀā °āĒĒāñ Òì † Ēāāāā , ¶ā ‡ āSāē Ôā¶āā¶āāō ½āō ¹āĒāāİāĀİā Ôāñ|āñ Öōāý Ēāō½āā¶āĀS ‡ āñS , ā¶āİÔāĀ Ôāā¹āāō ‡ āSā İāĀāēĀ ÜāāÔā ¹āİSÔā ½āō |āñ•āāē Ôāñ °āōü:¶āñ , āāōĀ āā°āĒā ½āō ÜāİÔā¶āñ ‡ āñS āāĒā † Ēā½°āā Òì, āā , āāōĀ , ¶ā ‡ āSāē ›āúØāñ Ēāİ¹ā Öāñ Øā³⁄₄āāēý † ñÔāāē ¹āāĀāāÔ©āāāİā ½āō •āāēİāāō ½āō ¹āāĀÔ¹āāĀ ‡ āS |ā©āā İāā|āāİāĀāāē³⁄₄ā , ā¶āİ ‡ āİSĒā¶ā ‡ āñS ÔāāÓ, Ôāñ , ā¹ā¶āñ-, ā¹ā¶āñ •āāēİā¶ā ‡ āñS āāĒā † ÔāāÜāÔāĀ Öāñ|āā ĀÖ|āā Öō , āāōĀ İāñ Ôāē •āāēİā •āāēāāİāĀ ĀÖ ¹āā|āñ Öō •āāñ Ôā¹āSĒā Öāñ|āñ Öōý

GheÙeg&keäle Ôã¼ääè ‡ äŠ©ā¶ā Ô'āÓ> ‡ äŠÀ|āñ Öö āā‡ äŠ İāā|āāİāÀ¥ā
‡ āñŠ 'āÆ¼āāİā Ôāñ ,āāÔāāò ‡ äŠāè ‡ äŠ'½ā , 'ā¾āāñāāØāİāā Öāè ,¶ā‡ āñŠ

,ããØããò ‡ ãŠãè ããlãÊãlãã¹|ã ‡ ãŠÀŸã ‡ ãŠã ‡ ãŠãÀŸã Ööý •ã¹⁄₂ãÃ¶ã lãõ—
ãããã¶ã‡ ãŠ °ããè•ã¹⁄₂ãã¶ã ¶ãñ fÔã‡ ãŠã ÊãŸ¶ã ,ã¹ã¶ãñ 'ãÆ³⁄₄ããñØããò ‡ ãñŠ
,ãã£ããÀ 'ãÀ ãã ‡ ãŠ³⁄₄ããý „¶Öãò¶ãñ ÊãØã¹⁄₄ãØã 22 'ããèããü³⁄₄ããò |ã ‡ ãŠ
¶ãlã•ãã|ã ÞãlÖãò ‡ ãŠãè 'ãlúœ ‡ ãŠã>ãè ãã¹ãŠÀ ¹⁄₄ããè ¶ãfÃ Ôã¶ãã¶ããò ¹⁄₂ãò
'ãlúœ ‡ ãŠã Ôã¹⁄₂ãã¹|ã Öãñ¶ãã |ããñ ¹lÀ Êã¹⁄₂°ããfÃ |ã‡ ãŠ ¶ãÖãé Üã>ãéý ,ã°ã
'ãÆl¶ã ³⁄₄ãÖ „Ýlee nw ãã‡ ãŠ-

‡ ã<³⁄₄ãã „'ãããã•ãÃ|ã ÊãããŸããò ‡ ãŠãè lããlããØããã|ã Öãñ|ããè Öö ? ,ããf³⁄₄ãñ
•ãã¶ãñ ¹lÔãÀñ lãõ—ãããã¶ã‡ ãŠ |ãããlãÃ¶ã ¶ãñ ‡ ã<³⁄₄ãã ‡ ãŠÖã ?

¡ãããlãÃ¶ãlããª (Darwinism) :-

ÞããÊÔãÃ Àã°ã•Ã ¡ãããlãÃ¶ã ¶ãñ ,ã¹ã¶ãñ ØãÖ¶ã ÔãlãñÃããŸããñã |ã©ãã
„Ôã‡ ãŠñ ,ãã£ããÀ 'ãÀ ãã¶ã‡ ãŠãÊãñ ãã¶ãÓ‡ ãŠÓããñÃ ‡ ãŠñ ,ãã£ããÀ 'ãÀ
•ããñ 'ãããÀ ‡ ãŠÊ¹ã¶ãã °ãé „Ôãñ |ãããlãÃ¶ãlããª ‡ ãŠÖã •ãã|ãã
Ööý [eefJe&veJeeo keâs DeeOeejYetle efme®evle efvecveJele nwb -

(i) •ããèlããò ¹⁄₂ãò ,ããã£ã‡ ãŠ Ôãñ ,ããã£ã‡ ãŠ Ôã¶ãã¶ã „¹ã¶ã‡ ãŠã¶ãñ ‡ ãŠãè
ãã¹⁄₂ã|ãã

(ii) •ããèlã¶ã ÔããÜãÓãÃ ý

(iii)ããlããã¹⁄₄ã¶ã|ãã†ú |ã©ãã ,ãã¶ãlããããlã‡ ãŠ|ãã ý

(iv)lãã|ããlãÀŸã ‡ ãñŠ 'ãÆãã|ã ,ã¶ãlããlãÊã¶ã ý

(v) ¶ã³⁄₄ããè •ãããã|ã³⁄₄ããò ‡ ãŠãè „¹ããã|ã ý

'ãÆ¹⁄₄ãñ ‡ ãŠ •ããèlã-ãããã|ã ‡ ãñŠ Ôã°Ô³⁄₄ããò ¹⁄₂ãò lããlã ‡ ãŠãñ ÞãÊãã¶ãñ
‡ ãñŠ ããÊã ‡ ,ã¹⁄₄ããã£ã ‡ ãŠ Ôãã|ãã¶ã „¹ã¶ã‡ ãŠã¶ãñ ‡ ãŠãè ãã¹⁄₂ã|ãã
Öãñ|ããè ÖöýÔãã|ããã|ã³⁄₄ããü lãã|ããlãÀŸã ¹⁄₂ãñã „¹ãÊã°£ã
¹⁄₄ããñ•ã¶ã, DeelããÔã ‡ lãã ,ã¶³⁄₄ãã ,ããlãl³⁄₄ã ‡ ãŠ|ãã,ããñã ‡ ãñŠ ããÊã ‡
ÔããÜãÓãÃ ‡ ãŠã|ããè ÀÖ|ããè Ööý fÔã ÔããÜãÓãÃ ¹⁄₂ãò
lãã|ããlãÀŸããè³⁄₄ã ¹lãã,ããò ‡ ãñŠ ,ã¶ãlãÔããÀ „¹ã³⁄₄ããñØããè •ããèlã ‡ ãŠã
'ãÆ ‡ ãðŠãã|ã Þã³⁄₄ã¶ã ‡ ãŠã|ããè Ööý fÔã ‡ ãŠãñ 'ãÆã ‡ ãðŠãã|ã ‡ ãŠ
Þã³⁄₄ã¶ãlããª ‡ ãŠÖ|ãñ Ööý fÔã 'ãÆ ‡ ãŠãÀ ¡ãããlãÃ¶ãlããª ‡ ãŠãñ
'ãÆã‡ ãðŠãã|ã‡ ãŠ Þã³⁄₄ã¶ãlããª ¹⁄₄ããè ‡ ãŠÖ|ãñ Ööý

,ã°ã 'ãÆl¶ã ³⁄₄ãÖ Öö ãã‡ ãŠ ãã•ãÃã¹ãŠ ‡ ãñŠ ,ãØãÊãñ 'ãõÀ ‡ lãã ØãªÃ¶ã
‡ ãŠã ããlã‡ ãŠãÔã ‡ ãðŠÔãñ Öì,ãã ? ,ããf† •ãã¶ãñ |ãããlãÃ¶ã ¶ãñ fÔã‡ ãñŠ
ããlãÓã³⁄₄ã ¹⁄₂ãò ‡ ã<³⁄₄ãã ‡ ãŠÖã Öö ?

|ãããlãÃ¶ã ¶ãñ °ã|ãã³⁄₄ãã ãã‡ ãŠ ãã•ãÃã¹ãŠ ‡ ãñŠ 'ãlãÃ•ããò ‡ ãŠãè ØãªÃ¶ã lã
,ãØãÊãñ 'ãõÀ ãã¹⁄₄ã¶ã 'ãÆ‡ ãŠãÀ ‡ ãñŠ ©ãñ ý •ããèlã¶ã ÔããÜãÓãÃ |ã©ãã
ãã¹⁄₄ã¶ã|ãã ‡ ãñŠ ‡ ãŠãÀŸã 'ãÆã ‡ ãðŠãã|ã ‡ ãŠ lãÀŸã Öì,ãã ãã•ãÔãÔãñ
Êã¹⁄₂°ããè ØãªÃ¶ã lã Êã¹⁄₂°ãñ 'ãõÀãò lããÊãñ ãã•ãÃã¹ãŠ ¹⁄₄ãÊããè 'ãÆ‡ ãŠãÀ
ÀÖ¶ãñ ¹⁄₂ãò Ôããã¹⁄₂ã ©ãñ ý 'ãÆã ‡ ãðŠãã|ã ‡ ãŠ lãÀŸã fÔã 'ãÆ‡ ãŠãÀ
'ããèããü³⁄₄ããò Ôãñ Öãñ|ãã ÞãÊãã Øã³⁄₄ãã ãã•ãÔãÔãñ œãñ>ãè ØãªÃ¶ã

ÍlāĒĒāñ 'āīlāĀ•āāò Ôāñ Êā½°āāè Øā^aĀĴā ‡āñŠ āā•āĀā'āŠ °āĴā Øā¾āñ ,āāòĀ
 œāñ>āè Øā^aĀĴā ÍlāĒĒāñ 'āīlāĀ•ā fāāèĀñ-fāāèĀñ Êāī'ā Ôāñ|āñ
 Øā¾āñý 'āĒĒā ‡āðŠāā|ā ‡āŠ Þā¾āĴā Ôā°lā ÞāĒā|āā ÀÖ|āā Öō ,āāòĀ
 Ö•āāĀāò-ĒāāĒāāò ÍāÓāāò °āā^a ĴāfĀ Íā 'āīĀāĴāāè 'āāèāāü¾āāò ‡āñŠ
 Ôā^aÔ¾āāò ½āò f|āĴāā ,āĴāĀ Ôāñ •āā|āā Öō āā ‡āŠ ĴāfĀ
 'āāèāāü¾āāü ĴāfĀ •āāā|ā¾āāü °āĴā •āā|āāè Öōý ĴāfĀ •āāèlā
 •āāā|ā¾āāò ‡āŠā „ā¾ālā Öāè •āōlā āālā‡āŠāÔā Öōý

•āōlā āālā‡āŠāÔā ‡āñŠ 'āĒ½āāŸā :-

Deeheves meerKee āā‡āŠ •āāèlā-•āāā|ā¾āāò ½āò °āÖlā fāāè½āāè Øāāā|ā
 Ôāñ āālā‡āŠāÔā Ôāñ|āā ,āā ÀÖā Öō ý •āāèlā āālā—āāĴā ‡āñŠ āālāāā¾āĴā
 āāñ•āāò ‡āñŠ ,āf¾ā¾āĴā Ôāñ āā¾āĴā-āā¾āĴā 'āĒ‡āŠāĀ ‡āñŠ •āāèlāāò
 ½āò Ôā½°āĴā āāĒāāĴāñ ‡āñŠ ,āĴāñ‡āŠ 'āĒ½āāŸā ,ā°ā |ā‡āŠ —āā|ā Öl†
 Öōý ,āāf¾āñ ‡āīŠœ ‡āñŠ Ôā½°āĴā ½āò •āāĴā‡āŠāĀè 'āĒĒ|ā ‡āŠĀòý

**(1) ÍāāĀāèāāĀ ‡āŠ ÔāāĀÞāĴāā |ā©āā āā% āŠ¾āā,āāò Ôāñ
 'āĒ½āāŸā :-**

āālāāā¾āĴā 'āĒ‡āŠāĀ ‡āñŠ •āāèlāāò ‡āŠāè ÍāāĀāèāāĀ ‡āŠ ÔāāĀÞāĴāā
 ‡āŠāè Ôā½āāĴāā fÔā °āā|ā ‡āŠāè °āāñ|ā‡āŠ Öō āā‡āŠ ¾āÖ •āāèlā ‡āŠ
 °lÔāĀñ Ôāñ Ôā½°āāĴā|ā Öō ý •āōlā āālā ‡āŠāÔā ‡āŠāè 'āīāāÓ> ½āò
 •āāèlāāò ‡āŠāè ÔāāĀÞāĴāā,āāò ½āò fĴā Ôā½āāĴā|āā,āāò ‡āŠā
 ½āÖlā'āīŸāĀ ¾āāñØā^aĴā ÀÖā Öō ý ¾āÖ Ôā½āāĴā|āā†ú āāñ 'āĒ‡āŠāĀ
 ‡āŠāè Ôāñ|āāè Öō -

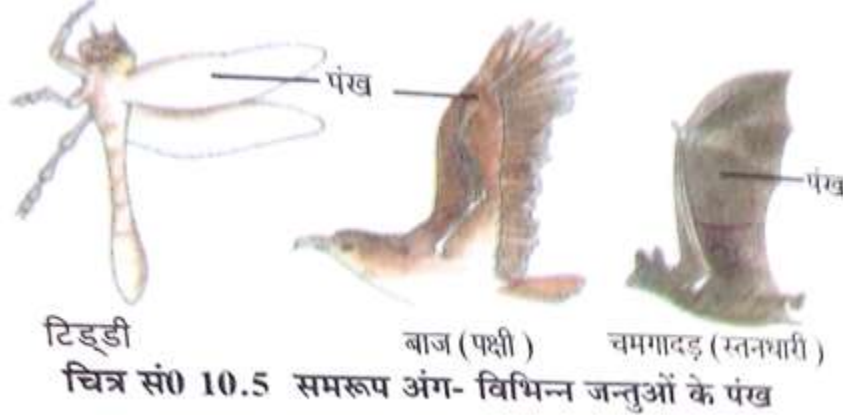
(‡āŠ) Ôā½āĀ'ā ¾āā Ôā½ālāðāā||ā ĀÞāĴāā†ú ý

(Ēā) Ôā½ā•āā|ā ĀÞāĴāā†ú ý

(‡āŠ) Ôā½āĀ'ā ¾āā Ôā½ālāðāā||ā ĀÞāĴāā†ú :-

,āĒāØā-,āĒāØā •āāèlāāò ‡āñŠ †ñÔāñ ,āāØā •āāñ ‡āŠ Öāè 'āĒ‡āŠāĀ
 ‡āŠā ‡āŠā¾āĀ ‡āŠĀĴāñ ‡āñŠ āāĒā† ‡āŠ •āōÔāñ āāĒāā¾āāè °ñ|āñ Ôōā
 āā ‡āŠĴāī „Ĵā ‡āŠāè „|āāā||ā ½āò ,āĴāĀ Ôāñ|āā Öō, Ôā½āĀ'ā ¾āā
 Ôā½ālāðāā||ā ,āāØā ‡āŠÖĒāā|āñ Öō ý āāÞāā 10.5 ‡āŠāñ °ñĒāñā fĴā
 •āĴāī,āāò ½āò ‡ā¾āā Ôā½āāĴā|āā Öō ? ,āā'ā ,ā'āĴāñ ,āĴāī¾ālā ‡āŠñ
 ,āāfāāĀ 'āĀ °ā|āā¾āñā āā ‡āŠ āā ‡āŠĴā -āā ‡āŠĴā •āĴāī,āāò ½āñ 'āāĒā
 Ôāñ|āñ Öōý ,āā'āĴāñ °ñĒāā ÔāñØāā āā ‡āŠ ‡āŠāè, 'āāāāè ,āāòĀ
 Þā½āØāāü ‡āñŠ 'āāĒā „üĴāñ ‡āŠā ‡āŠā¾āĀ ‡āŠĀ|āñ Öōý ‡ā¾āā ¾āāñ
 ‡āŠ Öāè ÍāØāĀ ‡āŠñ 'āĒāŸāāè Öō ? ‡ā¾āā fĴā ‡āñŠ 'āāĒā
 ½āāōāāĒā‡āŠ Ā'ā Ôāñ Ôā½āāĴā Öōā ? ¾āñ ,āāØā ½āāōāāĒā‡āŠ Ā'ā Ôāñ
 Ôā½āāĴā ĴāÖāè Öō 'āĀĴāī ‡āŠā¾āĀ ,āāòĀ ÔāāĀÞāĴāā ½āò Ôā½āāĴā
 Öōý ‡āŠā¾āĀ ½āò Ôā½āāĴā|āā ‡ā¾āā fĴā ‡āŠĀñĀ ‡āŠāè ,āāòĀ

,ã ‡ ãŠÍãñÂ ‡ ãŠãè 'ãÆããã¥ã³⁄ããò ½ãò ãã¶ãããÍPã|ã Ôã½°ã¶ã ¶ãÖãé
 'ÍããÃããè Öò ? ããÍãPããÂ ‡ãŠÃòý ‡ã³⁄ãã ãã¶ãÖ‡ãŠÖãÃ 'ãÆã¹ã Öì³⁄ãñ ?



Ìãñ ,ããÖã ãã•ã¶ã‡ãŠãè „,¹ããã¶ã †Ìãâ ½ãîÊã ÀPã¶ãã Ôã½ãã¶ã Öãñããè Öò
 ãã ‡ãŠ¶ãì „¶ã ‡ãñŠ ‡ãŠã³⁄ããò ½ãò ,ã¶ãÀ Öãñãã Öò „¶Öò Ôã½ã•ããã
 ,ããÖã ‡ãŠÖãñ Öòý •ãöÖãñ -½ãñ‡ãŠ ‡ãŠãè ,ãÖãÊããè >ãúÖã, 'ããããè ‡ãñŠ
 'ããÊã, Pã½ãÖãããü; ‡ãñŠ 'ããÊã |ã©ãã ½ã¶ãìÖ³⁄ã ‡ãñŠ Öã©ã f¶ã ‡ãŠãè
 ,ãããããÀ¹⁄ãìã ÀPã¶ãã †Ìãâ ,ãããÖ©ã³⁄ããú Ôã½ãã¶ã Öò (ããPãã 10.6)
 ‡ã³⁄ãã f¶ã ‡ãñŠ ‡ãŠã³⁄ãÃ ‡ãŠ •ãöÖãñ Öòâ ? ,ãã¹ã •ã¶ãìãñ Öò ãã‡ãŠ
 ³⁄ãÖ ,ãÊãÖã-,ãÊãÖã ‡ãŠã³⁄ããò ‡ãñŠ ããÊã† ,ã¶ãì‡ãìŠããÊãã Öãñãñ Öò ý
 f¶ã ,ããÖããò ‡ãŠãè „,¹ããã¶ã Ìã ÀPã¶ãã ½ãò Ôã½ãã¶ãã Ôãñ 'ãÆ½ãããã¥ãã
 Öãñãã Öò ãã‡ãŠ ³⁄ãñ Ôã¹⁄ããè •ã¶ãì ‡ãŠ Öãè 'ãÆ‡ãŠãÀ ‡ãñŠ 'ãìãã•ããò
 Öãñ ããìã‡ãŠããÖãã Öì† Öòý



½ãññ‡ãŠ (,½ã³⁄ãPãÀ) 'ããããè

Pã½ãÖãããü; (Öã¶ãããããè) ½ã¶ãìÖ³⁄ã (Öã¶ãããããè)

ããPãã Öããò 10.6 Ôã½ã•ããã ,ããÖã- ããìããã¹⁄ã¶ã ‡ãŠÍãñÂãã‡ãŠ³⁄ããò ‡ãñŠ ,ãÖãÆ¹ãã

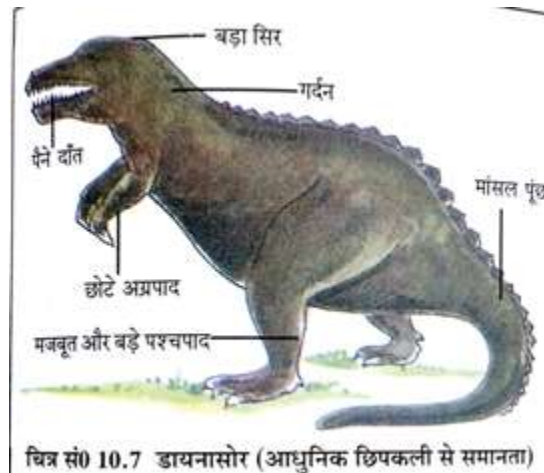
2. •ããèìãã¹⁄ã Öãñ 'ãÆ½ããã¥ã :-

†ñÖãñ ,ã¶ãñ ‡ãŠ •ããèìã Öò •ããñ ‡ãŠ¹⁄ããè Ö•ããÃãò ÊããÊããò ÌãÓãÃ
 'ãÖÊãñ 'ãö©Ìããè 'ãÀ •ããèããìãã ©ãñ Êãããã‡ãŠ¶ã ,ã°ã ¶ãÖãé 'ãã³⁄ãñ •ãããñ
 Öò ý †ñÖãñ ããìãÊãì¹ã 'ãÆãããã¥ã³⁄ããò / Ìã¶ãÔ¹ãããã³⁄ããò ‡ãñŠ ,ãìãìãñÓã
 ³⁄ãã ããPãÜ¶ã Pã>ããããò ½ãò °ãñ Öì† ãã½ãÊããñ Öò ý f¶ã ,ãìãìãñÓããò /
 ããPãÜ¶ããò ‡ãŠãñ •ããèìãã¹⁄ã ‡ãŠÖãñ Öòý •ããèìãã¹⁄ããò ‡ãŠã
 ,ãã³⁄ãã³⁄ã¶ã •ããèìãã¹⁄ã ããìã—ãã¶ã ‡ãŠÖÊãããã Öò ý ããìã—ãã¶ã ‡ãŠãè
 ³⁄ãÖ ÌããÊãã ,ã¶ãñ ‡ãŠ •ããèìããò ‡ãñŠ ããìã ‡ãŠãÖã ‡ãŠã % ãŠ½ãìããÀ

°¾ããÒÀã °ã|ãã|ããè Òõ •ããñ •ãõÌã ããÌã ‡ãŠãÒã Òãñ¶ãñ ‡ãŠã Ôããè£ãã †Ìãã
ÝãñÒã 'ãÆ½ãã¥ã Òõây

ãã•ã¶ã •ã¶ãì,ããò |ã©ãã 'ããõ£ããò ‡ãñŠ •ããèÌããÌ½ã ,ã½ããè |ã‡ãŠ 'ãÆã½ã Òì†
Òõ „¶ã ‡ãñŠ ,ã£¾ã¾ã¶ã Òãñ 'ã|ãã ÞãÊã|ãã Òõ ãã ‡ãŠ Ìãñ ,ãã‡ãŠãÀ †Ìãã
ÒìãÀ½ã ½ãò ,ãã£ãìãã¶ã ‡ãŠ 'ãÆããã¥ã¾ããò |ã©ãã Ìã¶ãÒ'ããã|ã¾ããò Òãñ
ãã½ã¶ã Òõ ý Ôã°ãÒãñ 'ãÆãÞããè¶ã Þã>ã>ã¶ããò Òãñ ãã½ãÊãñ ÔãÀÊã|ã½ã
'ãÆããã¥ã¾ããò (,ã‡ãŠÌãñÀ ‡ãŠãè •ã¶ãì) |ã©ãã Ìã¶ãÒ'ããã|ã¾ããò (ÌãòÌããÊã,
‡ãŠÌã ‡ãŠ) ‡ãñŠ •ããèÌããÌ½ã |ã©ãã £¶ã ‡ãñŠ °ãã° °ã¶ããè Þã>ã>ã¶ããò ½ãò
‡ãŠÌãñÀ ‡ãŠãè •ã¶ãì ½ãöããÊã¾ããú, ½ãñ‡ ‡ãŠ ‡ãñŠ •ããèÌããÌ½ã ,ããòÀ
£¶ã ‡ãñŠ °ãã° ‡ãŠãè Þã>ã>ã¶ããò ½ãò ÔãÀãèÒãð'ã •ãòÒãñ-ããö'ã ‡ãŠÊããè,
‡ãŠœì † , ½ãÒãÀ½ãÞœ |ã©ãã ;ã¾ã¶ããÒããñÀ (Dinosaurs) ‡ãñŠ
•ããèÌããÌ½ã ‡ãñŠ |ãìÊã¶ãã½ã ‡ãŠ ,ã£¾ã¾ã¶ã Òãñ ¾ãÒ Ò'ãÒ>
'ãÆ½ããã¥ã|ã Òãñ|ãã Òõ ãã ‡ãŠ •ãòÌã ããÌã ‡ãŠãÒã %ãããã½ã ‡ãŠ
'ãããÀÌã|ã¶ã Òãñ ‡ãŠãÊãã¶ãÀ ½ãò Òì,ãã Òõý ,ã°ã ,ãã'ã •ã¶ã Þãì ‡ãñŠ
ÒãòÒãñ •ããèÌããÌ½ã ‡ã¾ãã Òõ ?

ããÌãÌãÒã

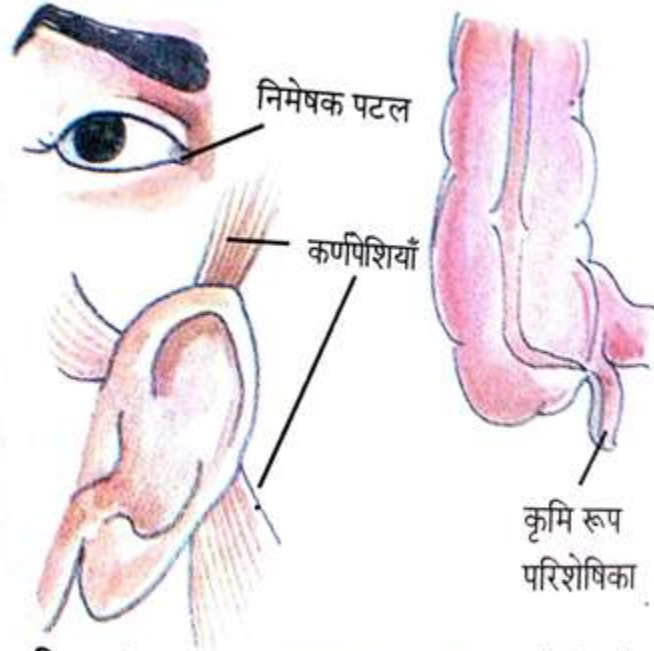


चित्र सं० 10.7 डायनासोर (आधुनिक छिपकली से समानता)

ã¾ã¶ããÒãñÀ Ìã|ã½ã¶ã ½ãò ããö'ã‡ãŠããÊã¾ããò Òãñ Òã½°ãã¶ã|ã Òõây ¾ãÒ ÊãÒã½ãÒã 13
‡ãŠããñ; Òãñ 6.5 ‡ãŠããñ; ÌãÒãÀ 'ãìÌã |ã‡ãŠ ÀÒñý ã¾ã¶ããÒãñÀ ,ãÒã½ããããè 'ãÆãããè
©ãñ ,ãÒã½ããããè 'ãÆããã¥ã¾ããò ‡ãñŠ ÌãÀãèÀ ‡ãŠã |ãã'ã%ãŠ½ã „¶ã ‡ãñŠ ÞããÀãò ,ããñÀ ‡ãñŠ
Ìãã|ããÌã¥ã ‡ãñŠ ‡ãŠã'ãŠãè Òã½ã¶ã ©ãã ý ÒãÀ½ã Ìãã|ããÌã¥ã ½ãò ¾ãÒ Òããã|ãããèÊã †Ìãã Ý¶;
½ãò ¾ãÒ £ããè½ããè Òããã|ã ÌããÊãñ Òãñ •ãã|ãñ ©ãñý ¾ãÒ ,ã¾ããã£ã‡ãŠ |ãã'ã †Ìãã Ý¶; ½ãò ¶ãÒãè
ÀÒ Òã ‡ãŠ|ãñ ©ãñý †ñÒãã Ìãò—ãããã¶ã ‡ãŠãò ‡ãŠã ,ã¶ãì½ã¶ã Òõ ãã ‡ãŠ ã¾ã¶ããÒãñÀ „Òã
Òã½ã¾ã |ã ‡ãŠ ÀÒñ •ã°ã |ã ‡ãŠ ãã ‡ãŠ |ãã'ã%ãŠ½ã ½ã¶ã †Ìãã ÒãÀ½ã ©ãã |ã©ãã ½ããñ•ã¶ã
'ãÆÞãìÀ ½ãããã ½ãò „Ìãã°£ã ©ãã ý ½ããñ•ã¶ã ½ãò ‡ãŠ½ããè ,ãã Òã¾ããè |ããñ £¶ã ‡ãŠãè
Òãã£ããããã ½ãò •ãòÒãñ-ããòÒãñ ½ããòÒã½ã Ý¶ã Òì,ãã ÌãÒ ããñãããããÒã ¾ãÒ •ããèããÌã|ã
ÀÒ Òã ‡ãŠ|ãñ ©ãñ, |ãñ•ããè Òãñ ‡ãŠ½ã Òãñ Òã¾ããè ý ÊãÒã½ãÒã 6.5 ‡ãŠããñ; ÌãÒãÀ 'ãìÌã
©ãÊã ,ããòÀ ½ããòÒã½ã ½ãò Òì† 'ãããÀÌã|ã¶ããò ‡ãŠãñ ã¾ã¶ããÒãñÀ °ããÀÌã ¶ãÒãè ‡ãŠã
Òã‡ãñŠ ,ããòÀ ,ã¶ã|ã: Êãì'ã Òãñ Òã¾ãñ ©ãñý •ãòÒãñ ãã'Ìããñ|ãñ‡ãŠÒãý

3. ,ãìÌãÌãÒããè ,ããÒããò Òãñ 'ãÆ½ãã¥ã :-

•ã||ài,ããò ‡ãñŠ ÍãÀãèÀ ½ãò ‡àiSœ †ñÔãñ ,ãâØã ¼ããè 'ãã¾ãñ •ãã|ãñ Öö
ãã•ã||ã‡ãŠã Íã|ãÃ½ãã||ã ,ãÌãÔ©ãã ½ãò ‡ãŠãñfÃ „'ã¾ããñØã ||ãÔãé Öãñ|ãã
Ööây ¾ãñ ‡ãŠã¾ãÃããÌãÔãè||ã |ã©ãã ,ã||ããÌãÍ¾ã‡ãŠ Öãñ|ãñ Ööý ‡ã<¾ãã
,ãã'ã ,ã'ã||ãñ ÍãÀãèÀ ½ãò f||ã‡ãŠãè „'ãããÔ©ããã|ã ‡ãŠãñ •ãã||ã|ãñ Öö ?
f||Öãé ,ãâØããò ‡ãŠãñ ,ãÌãÍãñÔããè ,ãâØã ‡ãŠÖ|ãñ Öö ããPãã
10.8ý Ö½ããÀñ ‡ãŠã||ã ‡ãŠãè 'ããããÍã¾ããú ,ãÌãÍãñÔããè ,ãâØã ‡ãñŠ Â'ã
½ãò Öãñ|ããè Ööý ‡ã<¾ãã ,ãã'ã ‡ãñŠ °ããÛã ‡ãŠãÃ ‡ãŠãè 'ããããÍã¾ããú
Öã©ããè, Üããñüñ, °ã||À Øãã¾ã, ‡ãìS||ãñ ,ãããã Ô|ã||ããããÀ¾ããò ‡ãñŠ
‡ãŠã||ã ‡ãŠãè ¼ããúãã|ã ‡ãŠã¾ãÃ ‡ãŠã Êãñ|ããè Öö ? Ö½ããÀñ °ããÛã
‡ãŠãÃ ‡ãŠãè 'ããããÍã¾ããú ããÌã‡ãŠãÔã ‡ãñŠ %ããŠ½ã ½ãò ,ãPãÊã Öãñ
Øã¾ããè Ööý ,ãã'ã||ãñ °ãããã ½ãò ,ã'ã||ããè ,ããúCããò ‡ãñŠ ¼ããè|ããè
‡ãŠãñ||ããò 'ãÀ £¾ãã||ã ãã¾ãã ÖãñØãây ÊããÊã ÀãØã ‡ãŠãè ,ãããÃ
Pã||ã‡ãŠã ããããÊããè „Ôã ãã||ã½ãñÔã‡ãŠ 'ã>Êã ‡ãŠã ,ãÌãÍãñÔããè ,ãâØã
Öö •ããñ ½ãñü ‡ãŠ, 'ãããã¾ããò, ãã°ãÊããè, CãÀØããñÌã ,ãããã ½ãò
'ãã¾ããè •ãã|ããè Ööý |ããñ|ãñ ‡ãŠãñ ,ãã'ã||ãñ •ãÃ ãñCãã ÖãñØãã •ãã ÍãÖ
Ôããñ|ãã Öö |ããñ 'ãÌããè ,ããúCãã ãã||ã½ãñÔã‡ãŠ 'ã>Êã Öãñ ‡ãŠ Êãñ|ãã Öö
Ö½ããÀãè ,ããúCããã ...'ãããè 'ãÊã‡ãŠ Öãñ ‡ãŠ Êããè •ãã|ããè Öö ,ããõÀ
ãã||ã½ãñÔã‡ãŠ 'ã>Êã ,ãÌãÍãñÔããè ,ãâØã ‡ãñŠ Â'ã ½ãò ,ããã ¼ããè 'ãã¾ããè
•ãã|ããè Ööý fÔã 'ãÆ ‡ãŠãÀ ‡ãŠ Ôã½ãìÖ ‡ãñŠ •ã||ài,ããò ‡ãñŠ
,ãÌãÍãñÔããè ,ãâØããò ‡ãŠã °ÔãÀñ Ôã½ãìÖ ‡ãñŠ •ã||ài,ããò ½ãò
ÔããããÌã ‡ãŠããÔã|ã |ã©ãã ãã %ãã¾ããããèÊã Öãñ||ãã •ãõÌã ããÌã ‡ãŠãÔã
‡ãŠãè 'ãããÓ ‡ãŠã|ãã Ööý



चित्र सं0 10.8 मनुष्य के कुछ अवशेषी अंग

Íā[°]āīāÊāāè

•āāèīāāī¹/₂ā Fossil
 £āāÀā ÀñāāĈāīā Stream lined
 ĪāāĪāāŌāāāīā (,āāīāīāāāāīā†āŠīāā) Inheritance
 Īāā³/₄āī†āŠāñīā Air sac
 Ōā¹/₂āīāāīāāè Homothermous
 ,āāāŌā / Ōīāīāè Bone
 ,āŌā¹/₂āīāāīāāè Poikilothermous
 āāīā³/₄āīā āāīāāè Warm blooded
 ,āāīāīāāāāīā†āŠāè Heredity
 „,āāāā•āĀīā ÊāāāŸā Acquired characters

,ā¹/₄³/₄āāŌā ¹āĈīīā

1. āāīā¹/₂īāāāÊāāāĈāīā † āñŠ ŌāŌāè āāīā † āŠĒ¹ā Pāīīā † āŠĀ ,ā¹āīāāè
 ,ā¹/₄³/₄āāŌā ¹āīāāŌīā†āŠīā ¹/₂āō āāÊāāāĈā† -

(†āŠ) •āÊāāè³/₄ā ĪāāīāīāĀŸā ¹/₂āō ¹āā³/₄āñ •āāīāñ ĪāāÊāā ¹āāō£āā Ōō -

(i) ¹/₂ā>Ā (ii) ,āāÊāī (iii) āāŌāāŪāāūīā (iv) ¹/₂ā†ā<†āŠā

(Ĉā) ``¹āĈā † āōŠāāīā † āŠ Pā³/₄āīāīāā[°] āā † āŠŌā Īāō—āāāāīā † āŠ īāñ
¹āĈāāīāīāāāāīā āā†āŠ³/₄āā Ōāā ?

(i) ĵāāīāĀīā (ii) ŌāĈñŌāĀ •āāūīā ¹/₂āñŸīĒā (iii) •āŌāāèīā Pāīīā³ °āāñŌā
 (iv) Êāō¹/₂āā†āŠ

2. āāīā¹/₂īāāāÊāāāĈāīā † āŠŌāīāāō † āñŠ Ōāā¹/₂āīāñ ŌāŌāè (√) ,āŌāīāā
 ŌāĒāīā (×) † āŠā āāPāīŌ ,ā¹āīāāè ,ā¹/₄³/₄āāŌā ¹āīāāŌīā † āŠā ¹/₂āō
 āāÊāāāĈā† -

(†āŠ) •āāèīāāō † āŠā āāīā†āŠāŌā ,āPāāīā†āŠ Ōāñ Ōā³/₄āā ý ()

(Ĉā) ¹āāāāè † āŠāè Ōīāīāè ĈāāñĈāĒāāè ĪāŌāā Īāā³/₄āī Ōāñ ¹/₄āĀāè Ōāñīāāè
 Ōō ý ()

(Ōā) ¹/₂āĀŌāĈāĒāè³/₄ā ¹āāō£āñ † āŠāñ¹/₂āĒā ĪāŌāā † āŠ¹/₂ā•āāñĀ Īāīāñ
 ĪāāĒāñ Ōāñīāñ Ōō ý ()

3. āāĀ † ā<īā Ōāāāīāāō † āŠāè ¹āīāāīāĀ ,ā¹āīāāè ,ā¹/₄³/₄āāŌā ¹āīāāŌīā † āŠā
¹/₂āō † āŠāèāā•ā† -

(†āŠ) •āāèīāāō ¹/₂āō Ōāñīāñ ĪāāÊāā Ōāè •āōīā āāīā † āŠāŌā
 † āŠŌĒāāīāā Ōō ý

(Ĉā) •āāèīāāī¹/₂ā āāīā—āāīā ¹/₂āō † āŠā ,ā£³/₄ā³/₄āīā āā†āŠ³/₄āā
 •āāīāā Ōōā ý

(Ōā) īāāŌā¹āŠīāāè † †āŠ ĪāāīāīāĀŸā † āŠā ¹āāō£āā Ōō ý

4. Ōīā¹/₂¹/₄ā † āŠ' † āŠāñ Ōīā¹/₂¹/₄ā `Ĉā' Ōāñ āā¹/₂āĒāāīā ,ā¹āīāāè ,ā¹/₄³/₄āāŌā
¹āīāāŌīā†āŠā ¹/₂āō † āŠāèāā•ā† -

Ōīā¹/₂¹/₄ā † āŠ'

Ōīā¹/₂¹/₄ā `Ĉā'

$\frac{1}{2}\pi$ ¹ãàããè
$$\dagger \quad \tilde{n}^1 \tilde{a} \tilde{n} \tilde{a} \tilde{a} \quad \ddagger \quad \tilde{a} \langle \hat{O} \tilde{a}$$

(keâ=efcejâhe heefjMesef<ekeâ)

5. $\frac{1}{2}\tilde{a}^a\tilde{A} \quad \tilde{a}\tilde{a} \ddagger \tilde{a}\check{S}\tilde{O}\tilde{a} \quad \tilde{l}\tilde{a}\tilde{a}\tilde{l}\tilde{a}\tilde{A}\tilde{Y}\tilde{a} \quad \frac{1}{2}\tilde{a}\tilde{o} \quad \text{,}\tilde{O}\tilde{a}\tilde{T}\tilde{a}\tilde{n} \quad \tilde{l}\tilde{a}\tilde{a}\tilde{E}\tilde{a}\tilde{a} \quad \text{'}\tilde{a}\tilde{a}\tilde{o}\tilde{f}\tilde{a}\tilde{a} \quad \tilde{O}\tilde{o} \quad \text{,}\tilde{a}\tilde{a}\tilde{o}\tilde{A} \quad \ddagger\tilde{a}\prec\frac{3}{4}\tilde{a}\tilde{a}\tilde{o} \text{ ?}$

6. •ãÊä -Ô©ãÊäPàÀ ªãñ ºãääã³/4ãäò ‡ãñŠ ¶ãä¹/₂ã äãÊäãäŒã³/4ãñ ?

7. Ôã¹/₂ã•ãã|ã ,ãâÔã ‡ãŠãñ „,ãÖÀ¥ã ÔãããÖ|ã Ô¹ãÓ› ‡ãŠãëãã•ã† ý

8. `•aaēlāāf'½a' •ōōlā āālā ‡ āŠāŌā ‡ āŠāñ 'āÆ½āāāā¥ā|ā ‡ āŠĀ|āñ Ōōāý
āā>¹¹ā¥āāē ‡ āŠāēāā•ā† ý

9. `āāi ‡ āiŒāā' āā ‡ āŒŌān ‡ āŒŌān Ōō ? ½āÁŌāĒāāē³¼ā •āāēlāāò
‡ānŒ `āāi ‡ āiŒāā' ‡ āŒān Ōāāāān'ā ½āò Ō'āŌ' ‡ āŒāēāā•ā† ý

10. ¡ããã!ãÃ¶!ã!ããª ¢ãŠãè Ì³⁄₄ããƐ³⁄₄ãã ¢ãŠãèãã•ã†ý

11. •âÊãë³⁄₄ã ,ã¶ãî‡ãîŜÊã¶ã ½ãò ¹ãĈã ‡ãŜãè ¼ãîãã¹⁄₂ã‡ãŜã °ã|ããƒ†ý

12. ¹āāāāā³/₄āāò ¹/₂āō „üj¶āñ ‡ āñŠ āāÊā † „ā¶āi ‡ āiŠÊā¶ā āā ‡ āŠ¶ā
āāiāiāñÓāiāā,āāò ‡āñŠ ‡āŠāÀ¥ā Ōāñ,āā Ōō ?

13. $\frac{1}{2}\tilde{a}\tilde{a}i\acute{O}^3\tilde{a}\tilde{a}\tilde{S}$, $\tilde{a}\tilde{a}\tilde{a}\tilde{a}\tilde{a}\tilde{a}\tilde{a}\tilde{a}\tilde{e}$, $\tilde{a}\tilde{a}\tilde{O}\tilde{a}\tilde{a}\tilde{o}$ † $\tilde{a}\tilde{a}\tilde{S}$ † $\tilde{a}\tilde{a}\tilde{P}\tilde{a}\tilde{a}$ † $\tilde{a}\tilde{a}\tilde{f}$ † ?

[back](#)

fṫāŠāfÃ : 11

•āāèlāḡā ṫāŠāè 'āÆāä%āŠ³/₄āā†ú



•āāèlāḡā ṫāŠāè ,āāāāÀ¹/₄āī'ā āä%āŠ³/₄āā†â ý
ṫāiŠœ •āāèlāāāāÀ³/₄āāò 'āÀā ,ā'āḡāā ¹/₄āāñ•āḡā āāḡā•āāèlā ,āāōÀ
Ôāü;ḡāñ lāāÊāñ •āōlā 'ā'ā©āāô Ôāñ ³/₄āā 'iÔāÀñ •āāèlāāāāÀ³/₄āāò
Ôāñ 'āÆā'ā ṫāŠÀḡāā ý

ÎāÔāḡā 'āÀā •āāèlāḡā ṫāñŠ āāÊā† ,āālāí³/₄ā ṫāŠ ...•āāÃ ṫāŠāè
'āÆāā'ā ý

ÎāÀāèÀ ¹/₂āò 'ā'ā©āāô ṫāŠā 'āāāÀlāÖḡā ý

•āāèlāāāāÀ³/₄āāò ¹/₂āò lā•³/₄āÃ 'ā'ā©āāô ṫāŠā āāḡāÔṫāŠāÔāḡā ý

ÎāāÀāèāāÀ ṫāŠ 'āÆāä % āŠ³/₄āā,āāò ṫāŠā āāḡā³/₄āḡā'āā† lāā
Ôā¹/₂āḡālā³/₄āḡā ý

„Ppā NāñŲāāè ṫāñŠ •āḡāī,āāò ¹/₂āò 'āñāālā³/₄āāò lā Ôāā;á³/₄āāò ṫāŠāè
Ôā¹/₂āāāḡālā Ôāāā'ā ý

'āÆ•āḡāḡā ý

•āāèlāāāāÀ³/₄āāò ¹/₂āò lāðāā®†lāā āālāṫāŠāÔā ý

ÎāāÀāèāāÀ ṫāŠ ,ā'āâÔā'āā (āālā ṫāŠĖāāâÔā'āā), ḡāñ'āÔāèḡā'āā,
°āÔāā'āḡā, ,āāāḡā³/₄āāāḡā'ā lāāÀāèāāÀ ṫāŠ lāðāā® ,āāāā'
'ā³/₄āāÀlāÀŲā ¹/₂āò 'āÆ¹/₄āālāāè •āāèlāḡā Ôñ'āi ÁṫāŠālā› ý

•āāèlāḡā ṫāŠāè ,āāāāÀ¹/₄āī'ā āä%āŠ³/₄āā†ú :-

•āōÔāā āā ṫāŠ ,āā'ā āā'āœÊāāè ṫāŠāāā,āāò ¹/₂āò •āāḡā Pāi ṫāñŠ Ôö
āā ṫāŠ 'āð©lāāè 'āÀ ÀÖḡāñ lāāÊāñ Ôā¹/₂āÔ'ā •āāèlāāāāÀ³/₄āāò ¹/₂āò
•āāèāālā'ā ÀÖḡāñ ṫāñŠ āāÊā† ṫāiŠœ ¹/₂āīÊā¹/₄āī'ā āä%āŠ³/₄āā†ú Ôā¹/₂āāḡā
Ā'ā Ôāñ Ôāñlāāè ÀÖlāāè Ôö ý ³/₄āñ āä%āŠ³/₄āā†ú •āāèlāḡā ṫāñŠ āāÊā†
,āālāí³/₄ā ṫāŠ Ôöý fḡā ,āāāāÀ¹/₄āī'ā āä%āŠ³/₄āā,āāò ṫāŠāñ •āōāālā ṫāŠ
'āÆāä % āŠ³/₄āā†ú ³/₄āā •āāèlāḡā ṫāŠāè 'āÆāä % āŠ³/₄āā†ú ṫāŠÔlāñ
Ôöý ³/₄āñ 'āÆāä % āŠ³/₄āā†ú Ôö - 'āāñÔāŲā, ÎāÔāḡā, „iÔā•āÃḡā,

¹ãääÀÔääPãÀ¥ã (¹ãääÀlãÖ¶ã) **ãä¶ã³ãâ¨ã¥ã** |ã©ãã **Ôã½ã¶lã³ã¶ã**,
lãðãã® |ã©ãã **¹ãÆ•ã¶ã¶ãý**

Ôã¼ããè •ãæèlãfããããÀ³ããò ½ãò ¾ãñ ¹ãÆãã%ãS³ãã†ú ½ããðããÊã‡ãS Â¹ã
Ôãñ Ôã½ãã¶ã Öãñ|ããè Öö ¹ãÀ¶ãlãl ãã¼ã¶¶ã-ãã¼ã¶¶ã ¹ãÆ ‡ãSãÀ Ôãñ
Ôã½¹ã¶¶ã Öãñ|ããè Öö ý ¾ãñ •ãæèlããò ‡ãSãè ÔããÀPã¶ãã |ã©ãã ,ããlããÔã
¹ãÀ ãã¶ã¼ãÀÀ ‡ãSÀ|ããè Öö ý

□ **¹ãñÔã¥ã** ‡ãñS ¹ãÀã ¼ããñ•ã¶ã ‡ãñS ¹ããñÔã ‡ãS |ãlã •ãæèlããò ‡ãñS
lãÀãèÀ ‡ãSãñ ¹ãÆã¹ã Öãñ|ãñ Öö ý ¹ããñÔã¥ã ‡ãñS ããÊã †
Ôã¼ããè •ãæèlãfããããÀ³ããò ¹ãÀ ¼ããñ•ã¶ã ØãÆÖ¥ã ãã ‡ãS³ãã •ããlãã
Ööý Öãñ ¹ãñü-¹ããðfãñ ¹ãÆ‡ãSãlã ÔããlÊãñÔã¥ã ‡ãSãè ãã%ãS³ãã ¹ãÀã
,ã¹ã¶ã ¼ããñ•ã¶ã Ôlã³ãã ã¶ããlãñ Öö •ãñ ¹ããðfãñ Öãñ ¶ãÖãè Öãñ|ãñ Öö
lãñ Ôãñ|ãñ-ØãÊãlãñ ‡ãSããÀãã¶ã ‡ãS ¹ãã©ããò ¹ãÀ „Øãlãñ Öö ,ããðÀ
,ã¹ã¶ã ¹ããñÔã¥ã ¹ãÆã¹ã ‡ãSÀ|ãñ Ööý ¹ããðfããò ‡ãSãè ¼ããúããlã •ã¶ãlã
,ã¹ã¶ã ¼ããñ•ã¶ã Ôlã³ãã ¶ãÖãè ã¶ããlãñ Ööý ¹ããðfããò ¹ãÀã lãð³ããÀ
¼ããñ•ã¶ã ãã‡ãSÔããè ¶ã ãã‡ãSÔããè ÔlãÀ¹ã ½ãò ØãÆÖ¥ã ‡ãSÀ|ãñ Ööý

□ **lãÔã¶ã** ‡ãñS ¹ãðÀã¶ã ããÊã † Øã³ãñ ,ããù ‡ã<Ôããè•ã¶ã ¹ãÀ ¼ããñ•ã¶ã
‡ãSã ,ããù ‡ã<Ôããè ‡ãSã¥ã Öãñ|ãã Öö ãã•ãÔãÔãñ ¼ããñ•ã¶ã ½ãò ããfããè
ÀãÔãã¼ãã¶ãlã‡ãS ...ããÃ ½ãl ‡ã<lã Öãñ|ããè Öö ,ããðÀ •ãæèlãfããããè ‡ãñS
lãÀãèÀ ‡ãSãè ,ã¶³ãã •ãðããlã‡ãS ãã%ãS³ãã†â Ôã½¹ã¶¶ã Öãñ|ããè ÀÖlããè
Ööý Ôã¼ããè •ãæèlãfããããè lãÔã¶ã ‡ãSÀ|ãñ Öö ý

□ **„lãÔãã¶ã** ¹ãÀã lãÀãèÀ ½ãò ã¶ãñ ,ã¹ãããlãÓ> ¹ãã©ãÃ •ãðÔãñ
‡ãSãã¶ã¶ãlãfÃ ,ããù ‡ã<Ôããfj,ã½ããñãã¶ã³ãã lã ¾ãlããÀ³ãã ,ããããã •ããñ
•ãæèlãfããããÀ³ããò ‡ãñS ããÊã † Ôããã¶ã ‡ãSãÀ ‡ãS Öãñ|ãñ Öö f¶ã ‡ãSã
lãÀãèÀ Ôãñ ãã¶ãÓ‡ãSãÔã¶ã Öãñ|ãã Ööý

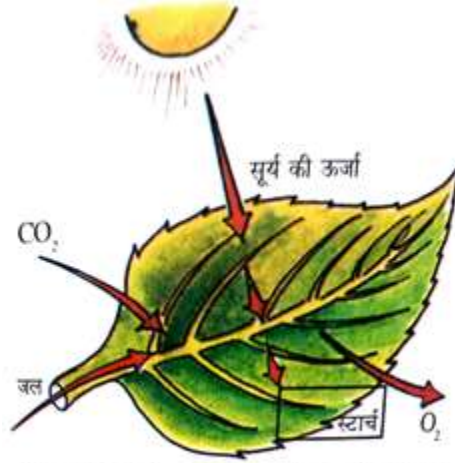
□ **¹ãääÀÔääPãÀ¥ã** ‡ãñS ¹ãÀã ¹ããñÔã ‡ãS |ãlã |ã©ãã ,ããù ‡ã<Ôããè•ã¶ã
lãÀãèÀ ‡ãñS ããlããã¼ã¶¶ã ¼ããØããò lã‡ãS À‡ã<lã ‡ãñS Ôãã©ã ¹ãÖlúPãlãñ
Ööý À‡ã<lã lãÀãèÀ ½ãò ã¶ãñ „lãÔããè ¹ãã©ãÃ ‡ãSã ¼ããè ifjÔããPãÀ¥ã
‡ãSÀ|ãñ Öö ý

□ **ãä¶ã³ãâ¨ã¥ã** |ã©ãã **Ôã½ã¶lã³ã¶ã** ¼ããè •ãæèlãfããããè ‡ãSãè
•ãðããlã ‡ãS ¹ãÆãã%ãS³ãã Ööý Ôã¼ããè •ãæèlãfããããè lããlããlãÀ¥ã ½ãò
Öãñ|ãñ lããÊãñ „ããè¹ã¶ããò ‡ãñS ¹ãÆããlã Ôããlãñ¶ãlããèÊã Öãñ|ãñ Ööý
œl¶ãñ ¹ãÀ ‡ãñS Pãl† ‡ãSã lãÀãèÀ ‡ãSãñ ããÔã‡ãSãñü¶ãã, œl fÃ-½ãl fÃ
‡ãSãè ¹ãããlã³ããò ‡ãSã çãl ‡ãS •ã¶ãã, Øã½ãÃ lãÔlãl œl¶ãñ Öãè Ôã©ã
‡ãSã Ö> •ã¶ãã ,ãããã †ñÔããè •ãðããlã‡ãS ãã%ãS³ãã,ããò ‡ãñS „ãÖÀ¥ã
Ööý

□ **lãðãã®** |ã©ãã **¹ãÆ•ã¶ã¶ã** ¹ãÀã Ôã¼ããè •ãæèlã •ã¶½ã Êãñ|ãñ Öö,
lãðãã® ‡ãSÀ|ãñ Öö |ã©ãã ½ãðl³ãl ‡ãSãñ ¹ãÆã¹ã Öãñ|ãñ Ööý

•ãæèlãfããããÀ³⁄ããò ½ãò 'ãÆ•ã¶ã¶ã ãã¼ã¶¶ã-ãã¼ã¶¶ã 'ãÆ ‡ ãŠãÀ Ôãn
 Ôãn|ãã Ööý ‡ ãiŠœ •ã¶|ãì (‡ ãŚlãñÁ ‡ ãSãè 'ãÆãããæ)|ã©ãã 'ããðfããò
 ½ãò ÊãöããÖã ‡ ãŠ ããlããããfã Ôãn 'ãÆ•ã¶ã¶ã Öãn|ãã Öö |ããñ ‡ ãiŠœ
 ½ãò ,ãÊãöããÖã‡ãŠ ããlããããfã Ôãn ,ãããfã‡ãŠ|ãÀ 'ããðfãñ ‡ ãŠããã³⁄ã‡ãŠ
 'ãÆ•ã¶ã¶ã ããlããããfã Ôãn 'ãÆ•ã¶ã¶ã ‡ ãSÀ ‡ ãñŠ ,ã¹ã¶ããè lããlãlãðãã®
 ‡ãSÀ|ãñ Ööý¹ãÆ|³⁄ãñ‡ãŠ •ãæèããlã|ã lãÔ|ãì ¼ãÆlãã ‡ãñŠ Á¹ã ½ãò •ãæèlã¶ã
 'ãÆãÀ½¹⁄ã ‡ ãSÀ|ããè Öö ,ããòÀ fããèÀñ-fããèÀñ ,ãã ‡ ãŠãÀ ½ãò lãðãã®
 ‡ ãSÀ 'ãÆãöüœ °ã¶|ããè Ööý ¾ãÖ lãðãã® ‡ ãŠãñããlã ‡ ãŠã,ããò ‡ ãñŠ
 ããlã¹⁄ãã•ã¶ã ‡ãñŠ 'ãSÊãÔlãÁ¹ã Ôãn|ããè Ööý
 ,ããf³⁄ãñ f¶ã ,ããfããÀ ¼ãlã 'ãÆãã%ãŠ³⁄ãã,ããò ‡ãñŠ ããlãÔã³⁄ã ½ãò ,ããòÀ
 ããlãÔ|ããÀ Ôãn •ã¶|ãñý
 ,ãã¹ã¶ãñ •ã¶|ãã ãã ‡ ãŠ lãÀãèÀ ½ãò ããlããã¼ã¶¶ã •ãðããlã ‡ ãŠ
 ãã%ãŠ³⁄ãã,ããò ‡ ãŠãñ ÔããPããããÊã|ã ‡ãSÀ¶ãñ ‡ãñŠ ããÊã† ...ããÃ ‡ãSãè
 ,ããlãlã¹⁄ã‡ãŠ|ãã Öãn|ããè Öö ý ¾ãÖ ...ããÃ ¼ããñ•ã¶ã Ôãn 'ãÆã¹|ã Öãn|ããè
 Öö Ôã½ãÔ|ã •ãæèlãfããããÀ³⁄ããò ‡ãñŠ ããÊã† ...ããÃ ‡ãSã Öãñ|ã ¼ããñ•ã¶ã
 |ããñ Öö 'ãÀ¶|ãì lãÔã¶ã 'ãÆãã%ãŠ³⁄ãã ‡ãñŠ 'ãÀã Öãè ¼ããñ•ã¶ã ½ãò
 °ããfããè ÀãÔãã³⁄ããã¶ã‡ãŠ ...ããÃ ½ãì‡ã¶ã Öãn|ããè Ööý ,ã°ã 'ãÆlã¶ã ¾ãÖ
 Ôãã½ã¶ãñ ,ãã|ãã Öö ãã ‡ ãŠ ,ããããÆãÀ ¼ããñ•¾ã 'ãªã©ããò ½ãò ...ããÃ
 ‡ ãðSÔãn °ããfã|ããè Öö? ¾ãÖ ‡ ãŠ •ããã»Êã ÀãÔãã³⁄ããã¶ã ‡ ãŠ
 'ãÆãã%ãŠ³⁄ãã Ööý ãã•ãÔã‡ãñŠ ããlãÔã³⁄ã ½ãò ããlãÔ|ããÀ Ôãn ,ãã¹ã ,Pã
 ‡ãSããã,ããò ½ãò •ã¶|ãñãÔãñý ,ãã¹ã ¾ãÖ •ã¶|ã|ãñ Öö ãã ‡ãŠ ÔÀñ 'ãñü;
 'ããðfãñ Öãè ÔããòÀ ...ããÃ ‡ãSãñ 'ãÆ ‡ãSãlã ÔããlÊãñÔããã ãã%ãŠ³⁄ãã
 ‡ãñŠ 'ãÀã ¼ããñ•ã¶ã ‡ãñŠ Á¹ã ½ãò ããÔãÀ ‡ãSÀ|ãñ Öö |ã©ãã ¾ãÖ ...
 •ããÃ •ã¶|ãì,ããò |ã ‡ãS 'ãÆlããããÔ|ã Öãn|ããè Ööý ,ããããÆãÀ ¾ãñ 'ãñü;
 'ããðfãñ ‡ãðSÔãn ¼ããñ•ã¶ã °ã¶ãã|ãñ Öö ,ããòÀ ‡ãðSÔãn Ôlã³⁄ãã 'ãÆã¹|ã
 ¼ããè ‡ãSÀ|ãñ Ööã ,ããf³⁄ãñ •ã¶|ãñ-

**ÔÀñ 'ããðfããò ãÀã ,ã¹ã¶ã ¼ããñ•ã¶ã Ôlã³⁄ãã |ãð³⁄ããÀ
 ‡ãSÀ¶ãã -**



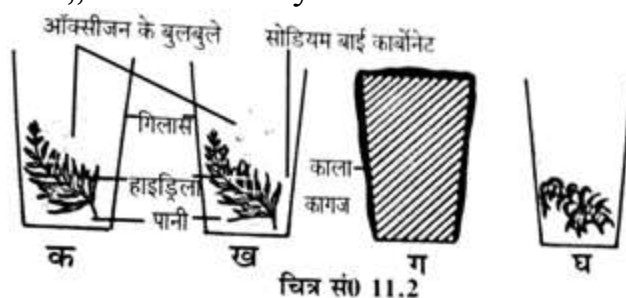
चित्र सं० 11.1 हरी पत्तियों द्वारा सौर ऊर्जा का प्रयोग

,ãäåäãä†ãš|ãÀ 'ãäöfãñ ÖÀñ Öãñ|ãñ Öö ý 'ãäöfãäò †ãñŠ ÖÀñ ¼ãäÖã †ãšãè
 †ãšãñããíã †ãšã,ãäò ½äò ÖããÀ|ã Êãíã †ãš 'ãä¾ãñ •ãñ|ãñ Öö ý ÖããÀ|ã
 Êãíã †ãš ½äò 'ãäãÖããÀ½ã (†ãÊããñÀãñãã'ãšÊã)¶ãã½ã †ãš ÖÀñ ÀãÖã
 †ãšã 'ãã©ãÃ Öãñ|ãã Ööý Ôã½ãÔ|ã ÖÀñ 'ãñüj-'ãäöfãñ fÔãäè
 'ãäãÖããÀ½ã †ãñŠ 'ãÀã Ôã¾ãÃ †ãšãè ÔãäòÀ ...ããÃ ÖãÆÖä †ãšÀ|ãñ
 Öö ý ÖÀãè 'ããã|ã¾ãäü Ôã¾ãÃ †ãšãè ÔãäòÀ ...ããÃ |ã©ãã
 'ãäãÖããÀ½ã †ãšãè „ãããÔããã|ã ½äò Íãã¾ãí½ãäãÊã Ôãñ †ãšã°ã¶ã
 |ãfÃ,ãäü †ãÔããfj |ã©ãã ¼ãíãã½ã Ôãñ •ãÊã 'ãÆã|ã †ãšÀ ¼ããñ•ã¶ã
 °ã¶ã¶ãñ (†ãšã°ããóÔãfjÊñ) †ãšãè äã%ãš¾ãã Ôã½ã'ã¶ã †ãšÀ|ãäè Öö
 äã•ãÔãñ 'ãÆ †ãšãíã ÔããíÊãñÔãäã †ãšÖ|ãñ Öö (ããäã 11.1)ý fÔã
 äã%ãš¾ãã †ãñŠ 'ãšÊãÔãÀã'ã ÔãÀÊã †ãšã°ããóÔãfjÊñ (ÔÊãí †ãšãñ•ã
 †ãñŠ Æã ½äò) |ã©ãã ,ãäü †ãÔããè•ã¶ã ÖãòÔã °ã¶ã|ãäè Ööý ¼ããñ•ã¶ã
 'ãäã|ã¾ãäò ½äò äã¶ã †ãñŠ Ôã½ã¾ã ÔãäãÃ (½ãäã) †ãñŠ Æã ½äò
 † †ãšããã|ã Öãñ|ãã ÀÖ|ãã Öö ý äã¶ã †ãñŠ Ôã½ã¾ã 'ãäöfãäò 'ãÀã
 |ãò¾ããÀ äã†ãš¾ãã Öã¾ãã ¼ããñ•ã¶ã ,ã¾ããããã†ãš ½ãããã ½äò Öãñ|ãã Öö
 äã•ãÔã†ãñŠ †ãšãÀäã -

- 'ãäöfãäò ½äò Öãñ|ãñ ÍããÊãäè Ôã½ãÔ|ã •ãäãíã†ãš äã%ãš¾ãã,ãäò †ãñŠ
 äãÊã† ...ããÃ 'ãÆã|ã Öãñ|ãäè ÀÖ|ãäè Öö ý
 - 'ã¾ãÃ|ã ¼ããñ•ã¶ã |ã¶ãñ,ãäü,ãäè, •ãüj, 'ãšÊã, 'ãíšÊã ½äò ÔããÖãÆããÖ|ã
 Öãñ •ãñ|ãã Öö •ãñ Íãã†ãšãÖãÀäè •ãäèíããããÀ¾ãäò †ãñŠ äãÊã† ¼ãäè
 „ãÊã°ãã Öãñ|ãã Ööý
- ,ãã ,ããã •ã¶ã Öã¾ãñ Öö äã †ãš ÖÀñ 'ãñüj- 'ãäöfãñ ,ãã¶ãã 'ããñÔãäã
 Ôã¾ãã †ãšÀ|ãñ Ööý fÔãäèããÊã† Ôããããããã(Àãããã) †ãšÖÊãã|ãñ Öö
 |ã©ãã ,ã¶¾ãã •ãäèíãããããÀ¾ãäò †ãñŠ ¼ããñ•ã¶ã †ãñŠ 'ãÆã©ãã½ã †ãš
 „ãã ¼ãäè Ööãý Ôã½ãÔ|ã Íãã†ãšãÖãÀäè •ã¶ãíã,ãäò †ãšãñ 'ãäöfããñã 'ãÀã
 |ãò¾ããÀ ¼ããñ•ã¶ã Ôãñ ...ããÃ 'ãÆã|ã Öãñ|ãäè Ööý •ãñ •ã¶ãíã

ãä%ãš¾ãã ‡ãŒÊãã¹ã 11.1

ãâÖ©äää'ā ‡ āŠ |ā©āā Ēā -ÍāāĒēā •āÊā ½ăö į°ăăē ÀŌñ, Ôăî³₄ăĂ ‡ āŠă
¹ă³₄ăăĂ¹|ă ¹ăĒ‡ăŠăÍă „,ăÊă°£ă Ōăñ ý



ãäÔ©ãää'ā Ūā - Ôäi³/₄āÃ ‡ãŠā 'āÆ‡ãŠā'ā 'āÆā'ā Ōāñ 'āÀ¶āi •ãÊā ¶āÖäé
 ý ÞāāÀāò „'ā ‡ãŠÅ¥ā ÊāØā¹/₄Øā ,ääfää Ūāā~ā ‡āñŠ āāÊā †fÔāāē
 'āÆ‡ãŠāÀ œāñüj ^aò ý ,ääfāñ Ūā¥~ñ ‡āñŠ ^oāā^a āā¶āÀäèàā¥ā ‡ãŠÀ¶āñ 'āÀ
 ‡ã³/₄āā ^añÆā'āñ Öö ?

ããøãÊããÔã Ąã ‡ ãñŠ •ãÊã ½ãò ©ããñü|ã Ôãã Ôããñãã|¾ã½ã °ããfÃ
‡ ãŠã°ããõ¶|ãñ> ãã½ãÊãã¾ãò ý ‡ ã<¾ãã ãñĄã|ãñ Öö ? ØãõÔã ‡ ãñŠ
°ãìÊã°ãìÊãñ ,ããõÀ |ãæèìãÆ|ãã Ôãñ ãã¶ã ‡ ãŠÊã ÀÖñ Öö ý ¾ãñ ‡ ã<¾ãã
¹ãÆ½ãããã¥ã|ã ‡ãŠÀ|ãñ Öö ?

ãaOãÊããÔã Øã ‡ ãŠã ‡ ãŠãÊãã ‡ ãŠãØã•ã † ‡ ãŠ |ãÀ¹ãŠ ©ããñüjã Ôãã
Öã‡ãŠÃ |ãì¹¶ã ãã¶ãÀãèãã¥ã ‡ãŠÃò ? ‡ã<³⁄₄ãã ºñÇã|ãñ Öò ? ØãõÔã ‡ãñŠ
ºãìÊãºãìÊãñ ¶ãÖãé ãã¶ã‡ãŠÊã ÆÖñ Ööý

ãaOãÊããÔã Ûã ½ãñã ¹ããõ£ãñ ‡ãŠãè ÍããÇãã ‡ãŠãè ‡ã<³⁄₄ãã ããÖ©ããã|ã Öò ?
½ãì¹Àçãã ÆÖã Öò ý
,ãã¹ã¶ãñ ºñÇãã -

□ **¹ãÆ©ã¹⁄₂ã ããÖ©ããã|ã (‡ãŠ)** ½ãò ¹ããõ£ãñ ‡ãŠãñ Ôãñ³⁄₄ãÃ ‡ãŠã
¹ãÆ ‡ãŠãÍã, •ãÊã |ã©ãã ‡ãŠºãÃ¶ã |ãfÃ ,ããù ‡ã<Ôããf| (•ãÊã ½ãò
ÛãìããÊã|ã) ¹ãÆã¹ã Öãñ¶ãñ ‡ãŠãè ããÖ©ããã|ã ½ãò ¹ãÆ ‡ãŠãÍã
ÔããìÊãñÔã¥ã (¹⁄₄ããñ•ã¶ã ãã¶ã¹⁄₂ããÃ¥ã) Öãñ ÆÖã Öò ý

□ **ºÔãÀãè ããÖ©ããã|ã (Çã)** ½ãò ,ããã|ãããÀ ‡ã<|ã ‡ãŠºãÃ¶ã |ãfÃ
,ããù ‡ã<Ôããf| (Ôããñãã|³⁄₄ã¹⁄₂ã ºããfÃ ‡ãŠºããõ¶ãñ Öãñ) ¹ãÆã¹ã Öãñ¶ãñ
Öãñ ¹ãÆ ‡ãŠãÍã ÔããìÊãñÔã¥ã ‡ãŠãè Øããã|ã |ããèÌãÆ Öãñ Øã³⁄₄ããè Öò
‡ã<³⁄₄ããòãã‡ãŠ „Öãñ ,ããã£ã‡ãŠ ‡ãŠºãÃ¶ã |ãfÃ ,ããù‡ã<Ôããf| „¹ãÊãº£ã Öò
ý

□ **|ããèÔãÀãè ããÖ©ããã|ã (Øã)** ½ãò ¹ãÆ ‡ãŠãÍã ¶ãÖãé ãã¹⁄₂ãÊã ÆÖã Öò
,ã|ã: ¹ãÆ‡ãŠãÍã ÔããìÊãñÔã¥ã ¶ãÖãé Öãñ ÆÖã Öò ý

□ **¹ããõ©ããè ããÖ©ããã|ã(Ûã)** ½ãò •ãÊã ‡ãñŠ ,ã¹⁄₄ããÌã ½ãò ¹ãÆ ‡ãŠãÍã
ÔããìÊãñÔã¥ã ¶ã Öãñ¶ãñ ‡ãŠñ ‡ãŠãÀ¥ã ¹ããõ£ãã ½ãì¹Àçãã¶ãñ ÊãØã|ãã Ööý
fÔã ¹ãÆ³⁄₄ããñÔã Öãñ ‡ã<³⁄₄ãã ãã¶ãÓ‡ãŠÓãÃ ãã¶ã‡ãŠÊã|ãã Öò ?

,ãã¹ã¶ãñ •ã¶ãã ãã ‡ãŠ **¹ãÆ ‡ãŠãÍã ÔããìÊãñÔã¥ã ‡ãŠãè ãã%ãŠ³⁄₄ãã
•ãÊã, ‡ãŠºãÃ¶ã |ãfÃ ,ããù‡ã<Ôããf| |ã©ãã Ôãñ³⁄₄ãÃ ‡ãñŠ ¹ãÆ ‡ãŠãÍã
‡ãŠãè „¹ãããÖ©ããã|ã ½ãò Öãñ|ããè Öò f¶ã¹⁄₂ãò Öãñ ãã‡ãŠÔããè †‡ãŠ
‡ãŠãè ¹⁄₄ããè ,ã¶ãì¹ãããÖ©ããã|ã ½ãò ¹ãÆ ‡ãŠãÍã ÔããìÊãñÔã¥ã
ãã%ãŠ³⁄₄ãã ¶ãÖãé Öãñ Ôã‡ãŠ|ããè Öò ý**

¹ãÆ‡ãŠãÍã ÔããìÊãñÔã¥ã ãã%ãŠ³⁄₄ãã ½ãò ÖÀãè ¹ããã|ã³⁄₄ããù ØÊãî‡ãŠãñ•ã
ºã¶ãã|ããè Öò •ããñ ½ã¥| ‡ãñŠ Æ¹ã ½ãò ÔããããPã|ã Öãñ|ãè Ööý fÔã
ãã%ãŠ³⁄₄ãã ½ãò ºã¶ã¶ãñ ÌããÊãã ºÔãÀã •ãõÌã „¹ããª ,ããù ‡ã<Ôããè•ã¶ã Öò
ãã•ãÔã‡ãŠãè ,ããã|ãããÀ ‡ã<|ã ½ããããã ØãõÔã ‡ãñŠ Æ¹ã ½ãò ¹ããã|ã³⁄₄ããããñ
¹ãÀ ããÖ©ã|ã Æ¶ãÆãò Öãñ ãã¶ã ½ãò ºããÖÀ ãã¶ã‡ãŠÊã|ããè ÆÖ|ããè Ööý
fÔããè ãã%ãŠ³⁄₄ãã ¹ãÀ |ãõ³⁄₄ããÀ ¹⁄₄ããñ•³⁄₄ã ¹ãªã©ãÃ |ã©ãã ,ããù‡ã<Ôããè•ã¶ã
Ôã¹⁄₂ãÔ|ã •ããèÌã£ããããÀ³⁄₄ããò ‡ãñŠ ããÊã† ¹⁄₄ããñ•ã¶ã ,ããõÀ ÔãããÔã Êãñ¶ãñ
‡ãñŠ ããÊã† ,ããù‡ã<Ôããè•ã¶ã ºñ|ãã Ööý

Öãñ ¹ãñü;-¹ããõ£ãñ ¹⁄₄ããñ•ã¶ã ‡ãñŠ ¹ãÆã©ããã¹⁄₂ã‡ãŠ „¹ããª‡ãŠ |ã©ãã
Ôìã¹ããñÔããè Ööý ¹ãÆ|³⁄₄ããã ³⁄₄ãã ¹ãÀãñãã Æ¹ã Öãñ f¶Öãé Öãñ
Íãã ‡ãŠãÔãÀãè, ½ãããÔããÔãÀãè ,ã©ãÌãã ÔãÌããÆÖãÀãè •ã¶ãì
¹ãÀ¹ããñããÔã|ã Öãñ|ãñ Öò ý

‡āiŠœ •āāèlāfāāāÀ³āāò 'āÀā ,ā'ā¶āā ¼āāñ•ā¶ā ¶ÔāÀāò Ôāñ
 'āÆā¹ā ‡āŠÀ¶āā-

□ 'āÀ'āāñÔāāè •āāèlā ‡āñŠ Â'ā ½āò -

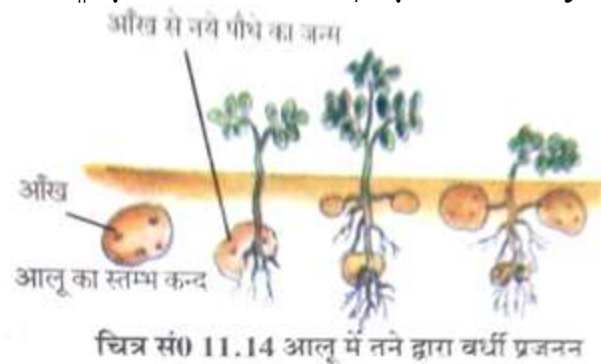
•āōÔāā āā ‡ āŠ ,āā'ā¶āñ ¶ñĒāā āā ‡ āŠ Ôā¼āāè ÖÀñ 'āñü; 'āāōfāñ
 Ôlā'āāñÔāāè Öāñ|āñ Öö ,ā|ā: lāñ ,ā'ā¶āā ¼āāñ•ā¶ā Ôlā³āā °ā¶āā|āñ Ööý
 'āÀ¶āi •āāèlā •āØā|ā ‡ āñŠ ,ā¶¼ā Ôā¼āāè •āāèlāāò ½āò ³¼āÖ āā½ā|āā
 ¶āÔāé Öāñ|āāè Ööý ,ā|ā: lāñ 'āāñÔāā¶ā ‡ āñŠ āāÊā † 'āñü; 'āāōfāāò 'āÀ
 āā¶ā¼āÀ Öāñ|āñ Öö f¶Öò 'āÀ'āāñÔāāè ‡ āŠÖ|āñ Ööý Ôā½āÔ|ā
 Íāā ‡ āŠāÔāÀāè •ā¶āi,āāò ‡ āŠs ¼āāñ•ā¶ā keāe meÇesle 'āñü; 'āāōfāò
 Öāñ|āñ Öö 'āÀ¶āi ½āāÔāāÔāÀāè •ā¶āi f¶ā Íāā ‡ āŠāÔāÀāè •ā¶āi,āāò
 ‡ āñŠ āāÍā ‡ āŠā Ôāñ ,ā'ā¶āā ¼āāñ•ā¶ā 'āÆā¹ā ‡ āŠÀ|āñ Ööý 'āāúPā
 Íāā ‡ āŠāÔāÀāè |ā©āā 'āāúPā ½āāÔāāÔāÀāè •ā¶āi,āāò ‡ āñŠ ¶āā½ā
 ,ā'ā¶āāè ,||āÀ 'āiāāÔ|ā‡āŠā ½āò āāÊāāāĒā†ý



चित्र सं० 11.3अमरबेल

‡ āiŠœ † ñÔāāè lā¶āÔ'āāā|ā³āāú Öö āā•ā¶ā½āò 'āāÀ ÖāāÀ½ā ¶āÔāé
 'āā³āā •āā|āā Ööý ,ā'ā¶āñ āāÍāāè‡āŠ Ôāñ fÔā 'āÀ PāPāāĀ ‡ āŠÀöý ³¼āñ
 lā¶āÔ'āāā|ā³āāú ,ā'ā¶āā 'āāñÔāā¶ā ½āò|ā •āāèlāāò Ôāñ 'āÆā¹ā ‡ āŠÀ|āñ Öö
 ,ā|ā: f¶Ôñā ½āò|ā•āāèlāāè ‡ āŠÖ|āñ Ööý fÔā Nāñāāè ‡ āñŠ •āāèlā
 ‡ āŠlā‡āŠ, •āāèlāā¶āi f¹¼āāāāā Ööý ‡ ā<³āā ,āā'ā¶āñ Ôāñü; ÆāÊāñ |ā©āā
 ½āò|ā •āāèlāāò ‡ āñŠ ... 'āÀ ‡ āŠlā‡āŠ ‡ āŠāñ ,Øā|āñ Ôi† ¶ñĒāā Öö? ‡āiŠœ
 † ñÔāñ ¼āāè •āāèlāfāāÀāè Ööā •āāñ •āāèāālā|ā 'āāōfāāò |ā©āā •ā¶āi,āāò
 ‡ āñŠ ÍāÀāèÀ ½āò āā¶ālāāÔā ‡ āŠÀ|āñ Öö |ā©āā ,¶āÔāñ ,ā'ā¶āā ¼āāñ•ā¶ā
 'āÆā¹ā ‡ āŠÀ|āñ Ööý f¶ā ‡ āŠāñ 'āÀ•āāèlāāè ‡ āŠÖ|āñ Ööý āā'āōÊāñ
 ,āf³¼āā³¼ā ½āò 'āūñ Ôi† ¶āñ 'āÀ•āāèlāāè 'āāōfāāò ‡ āñŠ ¶āā½ā

$\text{ãÊãããÊã†ý} \text{ ‡ã}^{3/4}\text{ãã} , \text{ãã}^1\text{ã} \text{ ¶ãñ} , \text{ã}^{1/2}\text{ã} \text{ ºãñÊã ‡ãñŠ}^1\text{ããõ£ããò ‡ãŠãñ}^{\text{ãñÊãã}} \text{ Öò}$
 $(\text{ããPã}^{\text{ã}} 11.3)? \text{ }^{3/4}\text{ãÖ} , \text{ã}^1\text{ã} \text{ ¶ãã} \text{ }^{1/4}\text{ããñ} \cdot \text{ã} \text{ ¶ã} \text{ ãã ‡ãŠÖã}^1\text{ããñÖã} \text{ ‡ãŠ}^1\text{ããõ£ãñ} \text{ Öãñ}$
 $^1\text{ãÊã}^1\text{ã} \text{ ‡ãŠÀ}^1\text{ãã} \text{ Öò} ? , \text{ãã}^1\text{ã} \text{ ‡ãŠãñ} \text{ }^{3/4}\text{ãÖ} \cdot \text{ãã} \text{ ¶ã} \text{ ‡ãŠÀ} , \text{ãã}^1\text{Pã}^{3/4}\text{ã} \text{ ÖãñÖãã}$
 $\text{ãã ‡ãŠ} \text{ ‡ãìŠœ} \text{ ‡ãŠãè}^{1/4}\text{ããããè} \text{ }^{3/4}\text{ãã} \text{ ‡ãŠãè} \cdot \text{ãÖãÄãè}^1\text{ããõ£ãñ} \text{ Öãñ|ãñ} \text{ Ööý} \cdot \text{ããñ}$
 $\text{ ‡ãŠãèü|ñ} \text{ }^{1/2}\text{ã} \text{ ‡ãŠãñü|ãñã} \text{ ‡ãŠãñ} \text{ }^{1/4}\text{ããñ} \cdot \text{ã} \text{ ¶ã} \text{ ‡ãñŠ} \text{ Ä}^1\text{ã} \text{ }^{1/2}\text{ãò} \text{ ÖãÊÖã} \text{ ‡ãŠÀ}^1\text{ãñ}$
 $\text{Ööã} (\text{ããPã}^{\text{ã}} 11.4) \text{ ý} \text{ f} \text{ ¶ã} \text{ ‡ãñŠ} \text{ ºããÄñ} \text{ }^{1/2}\text{ãò} , \text{ãã}^1\text{ã} , \text{ãÖãÊããè} \text{ ‡ãŠããã} , \text{ããò} \text{ }^{1/2}\text{ãò}$
 $\text{ããìãÖ|ãð|ã} \text{ Ä}^1\text{ã} \text{ Öãñ} \cdot \text{ãã} \text{ ¶ã} \text{ ‡ãŠãÄãè}^1\text{ãÊã}^1\text{ã} \text{ ‡ãŠÀ}^1\text{ã} \text{ ‡ãŠÀ}^1\text{ã} \text{ Öãñý}$



□ $\text{,ã}^1\text{ã}^{1/2}\text{ãã} \cdot \text{ã} \text{ ¶ã} \text{ ‡ãñŠ} \text{ Ä}^1\text{ã} \text{ }^{1/2}\text{ãò} -$

$\cdot \text{ããèìã£ãããã}^{3/4}\text{ããò} \text{ ‡ãŠãè} \text{ }^{1/2}\text{ãð}^{3/4}\text{ài} \text{ Öãñ¶ãñ}^1\text{ãÄ} \text{ ‡ã}^{3/4}\text{ãã}^1\text{ãÊ} \text{ ‡ãðŠãã|ã} \text{ }^{1/2}\text{ãò}$
 $\text{f} \text{ ¶ã} \text{ ‡ãñŠ} \text{ ºñÄ} \text{ ºã¶ã|ãñ} \cdot \text{ãã|ãñ} \text{ Öò} ? \text{ ¶ãÖãé} , \text{†ñÖãã} \text{ ¶ãÖãé} \text{ Ööý} \text{ }^{1/2}\text{ãð}^1\text{ã}$
 $\cdot \text{ããèìã£ãããã}^{3/4}\text{ããò} \text{ ‡ãŠã} \text{ }^{1/4}\text{ããñ} \cdot \text{ã} \text{ ¶ã} \text{ Ööý} \text{ ‡ãŠìã} \text{ ‡ãŠ} , \text{ããèìãããã} \text{ ‡ãñŠ} , \text{ãÊããìãã} \text{ ããÖã®} , \text{ºãã} \cdot \text{ã} , \text{ãããã}^{\text{ã}} \text{ f} \text{ ¶ã} \text{ }^{1/2}\text{ãð}^1\text{ã}$
 $\text{ìãÄãèÄ} \text{ ‡ãŠãñ} \text{ Êãã|ãñ} \text{ Ööã} \text{ f} \text{ ¶Öò} , \text{ã}^1\text{ãÜã} \text{ ‡ãŠ} \text{ |ã©ãã} , \text{ã}^1\text{ã}^{1/2}\text{ãã} \cdot \text{ã} \text{ ¶ã} \text{ ‡ãŠÖã}$
 $\cdot \text{ãã|ãã} \text{ Ööý}$

$^{3/4}\text{ããã}^{\text{ã}} , \text{ãã}^1\text{ã} \text{ Öìã}^{3/4}\text{ãã} \text{ Êãã}^{3/4}\text{ãñ} \cdot \text{ãã} \text{ ¶ãñ} \text{ ìããÊãñ} \text{ }^{1/4}\text{ããñ} \cdot \text{ã} \text{ }^1\text{ãã} \text{ ©ããò} \text{ ‡ãŠãè}$
 $\text{ÖãìPããè} \text{ ºã¶ãã}^{3/4}\text{ãò} \text{ |ããñ}^{\text{ãñÊãòÖãñ}} \text{ ãã} \text{ ‡ãŠ} , \text{ãã}^1\text{ã} \text{ }^{1/4}\text{ããè} , \text{ã}^1\text{ã} \text{ ¶ãñ} \text{ }^{1/4}\text{ããñ} \cdot \text{ã} \text{ ¶ã} \text{ ‡ãñŠ}$
 $\text{ããÊã†}^1\text{ããõ£ããò} , \text{ããòÄ} \cdot \text{ã} \text{ ¶ãì , } \text{ããò}^1\text{ãÄ} \text{ ãã¶ã}^{1/4}\text{ãÄ} \text{ ‡ãŠÀ}^1\text{ãñ} \text{ Ööý}$

$\text{ããìããã}^{1/4}\text{ã¶ã} \quad \cdot \text{ã} \text{ ¶ãì , } \text{ããò} \text{ }^{1/2}\text{ãò} \quad ^1\text{ããñÖãã} \quad ^1\text{ãÊã}^1\text{ã}$
 $\text{ ‡ãŠÀ}^1\text{ãñ} \text{ }^{1/4}\text{vUrxzZg.k}^{1/2} \text{ ‡ãŠãè} \text{ ãã}^{1/4}\text{ã¶ã} \text{ - } \text{ãã}^{1/4}\text{ã¶ã}$
 $\text{ããìããã£ã}^{3/4}\text{ããü} -$

$\cdot \text{ã} \text{ ¶ãì , } \text{ã} \text{ ¶ãñ} \text{ ‡ãŠ} , \text{ }^1\text{ãã}^{3/4}\text{ããò} \text{ Öãñ} \text{ }^{1/4}\text{ããñ} \cdot \text{ã} \text{ ¶ã} \text{ ÖãÊÖã} \text{ ‡ãŠÀ}^1\text{ãñ} \text{ Ööý} , \text{ãã} \text{ f}^{3/4}\text{ãñ}$
 $^{\text{ãñÊãò}} \text{ ããìããã}^{1/4}\text{ã¶ã} \cdot \text{ã} \text{ ¶ãì , } \text{ããò} \text{ Öãñ} , \text{Pã} \text{ ÖìãÄ} \text{ |ã} \text{ ‡ãŠ} \text{ ‡ãñŠ} \cdot \text{ã} \text{ ¶ãì , } \text{ããò} \text{ }^{1/2}\text{ãò}$
 $^{1/4}\text{ããñ} \cdot \text{ã} \text{ ¶ã} \text{ ãã} \text{ ‡ãŠ¶ã} \text{ ããìããã£ã}^{3/4}\text{ããò} \text{ }^1\text{ãÄ} \text{ }^1\text{ãÊã}^1\text{ã} \text{ ãã} \text{ ‡ãŠ}^{3/4}\text{ãã} \cdot \text{ãã|ãã} \text{ Ööý}$

$\text{ãã}^{\text{ºã}} \text{ ºãŠ}^{3/4}\text{ãã} \text{ ‡ãŠÊãã}^1\text{ã} 11.2$

$^1\text{ããÄìãñìã} \text{ ‡ãñŠ} \cdot \text{ã} \text{ ¶ãì , } \text{ããò} \text{ }^1\text{ãÄ} \text{ ããÊã†} \cdot \text{ãã} \text{ ÄÖñ} \text{ }^{1/4}\text{ããñ} \cdot \text{ã} \text{ ¶ã} \text{ ‡ãŠãñ} \text{ }^1\text{ãÊã}^1\text{ã}$
 $\text{ ‡ãŠÀ}^1\text{ãñ} \text{ ‡ãŠãè} \text{ ããìããã£ã}^{3/4}\text{ããò} \text{ ‡ãŠã} , \text{ãìãÊããñ} \text{ ‡ãŠ¶ã} \text{ ‡ãŠÀ}^1\text{ã} \text{ ý} \text{ ‡ãñŠPãì , } \text{ãã} ,$
 $\text{Pããé}^{\text{ãè}} , \text{ }^{1/2}\text{ã} \text{ ‡ãÊããè} , \text{ããœ}^1\text{ã} \text{ ‡ãŠÊããè} , \text{ }^{1/2}\text{ãñ} \text{ ‡ãŠ} , \text{ÖããòÄ}^{3/4}\text{ãã} , \text{ãããã}^{\text{ã}}$
 $\text{ãã} \text{ ‡ãŠÖã}^1\text{ãÊ} \text{ ‡ãŠãÄ} \text{ }^{1/4}\text{ããñ} \cdot \text{ã} \text{ ¶ã} \text{ }^1\text{ãÊã}^1\text{ã} \text{ ‡ãŠÀ}^1\text{ãñ} \text{ Öò} ? \text{ ‡ã}^{3/4}\text{ãã} \text{ f} \text{ ¶ã} \text{ ‡ãñŠ}$

ÍàÀãèÀ ½ãò fÔã † ãŠã³⁄ãÃ † ãñŠ ããÊã † ãàlãlãñÓã ,ããØã Öãñ|ãñ Öö
 ý ½ãñ□ † ãŠ † ãŠãè •ãã¹⁄ã ãã'ÍããããÊã|ã Öãñ|ããè Öö (ããPãã 11.5)ý
 ½ã † ã<Êããè, ½ãfãl½ã † ã<Êããè, ãã|ã|ãÊããè ,ããããª † ãŠãè>ãò † ãñŠ
 ½ãlÊãããØã ãàlãlãñÓã ¹ãÆ † ãŠãÀ † ãñŠ Öãñ|ãñ Öö ý ãã>á|ñ † ãñŠ
 ½ãlÊãããØã ¹ãð¶ãñ |ã©ãã ½ãfãl½ã†ã<Êããè, ãã|ã|ãÊããè ,ããããª ½ãò Êã¹⁄²ããè
 Ôãúü;¶ãl½ãã ÔããÀPã¶ãã ¼ããñ•ã¶ã ØãÆÖ¥ã † ãŠÀ¶ãñ ½ãò ÔãÖã³⁄ã†ãŠ
 Öãñ|ããè Ööý ÔãÀãèÔãð¹ã lãØãÃ † ãñŠ •ã¶ãl,ããò † ãñŠ ¹ãú|ã ½ãl;ñ |ã©ãã
 ¶ãl†ãŠãèÊãñ Öãñ|ãñ Ööý f¶ã Ôã¹⁄ããè •ã¶ãl,ããò ½ãò Pãªã¶ãñ lããÊãñ ¹ãú|ã
 ¶ãÖãé ¹ãã³⁄ãñ •ãã|ãñ Ööý ,ãã: ¾ãñ Ôã¹⁄ããè ¼ããñ•ã¶ã † ãŠãñ ¹ãlÀã
 ãã¶ãØãÊã Êãñ|ãñ Öö ý Ôã¶ãfããããÀ³⁄ããò † ãñŠ ¹ãã|ã † ãŠã>¶ãñ, ¹ãŠãü;¶ãñ
 |ã©ãã Pãªã¶ãñ † ãñŠ ,ã¶ãl¹ã Öãñ|ãñ Ööý ¹ãããã³⁄ããñò ½ãò ¹ãú|ããò † ãñŠ
 Ô©ãã¶ã ¹ãÀ ããlããã¹⁄ã¶ã ,ãã†ãðŠãã|ã³⁄ããò † ãŠãè PããòPã Öãñ|ããè Öö •ããñ
 ¹ã¶ãã PãlØã¶ãñ, ããlã † ãŠãÀ ¹ã † ãŠü;¶ãñ ,ããòÀ ¹ãŠãü;¶ãñ † ãñŠ † ãŠã¹⁄ã
 ,ãã|ããè Ööý † ãlŠœ ¹ããããè •ãðÔãñ ¹ãã•ã, PããèÊã † ãñŠ ¹ãã•ãñ ¹ãð¶ãñ, ¹ãü;ñ
 ,ããòÀ ½ã•ããlã Öãñ|ãñ Ööý Öã©ããè ,ã¹ãããè Êã¹⁄²ããè Ôãlúü; Ôãñ
 † ãðŠÔãñ ¼ããñ•ã¶ã ¹ãÆã¹ã † ãŠÀ|ãã Öö ? † ã<³⁄ãã ¼ããñ•ã¶ã ¹ãÆã¹ã
 † ãŠÀ¶ãñ † ãñŠ ããÊã † †ñÔããè ãàlãÓãñlã ÀPã¶ããÜebs Ôã¹⁄ããè •ã¶ãl,ããò
 ½ãò ¹ãã³⁄ããè •ãã|ããè Öö ?



ããPãã Ôãã0 11.5 ½ãñü□†ãŠ ¹ãÀã †ãŠãè> ¼ããã¥ã

,ã¹⁄ããèªã ½ãò †ãlŠ>¹ããª (¹ããª¹⁄ã) |ã©ãã Öãf;Êã ½ãò ÔãlãlãÃ†ãŠ ¼ããñ•ã¶ã
 ØãÆÖ¥ã †ãŠÀ¶ãñ ½ãò ÔãÖã³⁄ã†ãŠ Öãñ|ãñ Öö (ããPãã Ôãã0 11.6 a, b)ý

(a) ,ã¹⁄ããèªã ½ãò ¹ããª¹⁄ã ¹ãÀã ¼ããñ•ã¶ã ØãÆÖ¥ã
 ¹ããª¹⁄ã



Ôãlãlã†ãŠ

(b) Öãf;Êã ½ãò Ôãlãlã†ãŠãò ¹ãÀã ¼ããñ•ã¶ã ØãÆÖ¥ã

ããPãã Ôãã 0 11.6 (,ã¹⁄ããèªã |ã©ãã Öãf;Êã ½ãò ¼ããñ•ã¶ã ØãÆÖ¥ã)

•ã¶ãl,ã¹ã¶ãã ¼ããñ•ã¶ã ãã•ãÔã ¼ããè ãàlãããfã Ôãñ ØãÆÖ¥ã †ãŠÀò •ãª
 |ã†ãŠ ¼ããñ•ã¶ã †ãŠã ¹ããPã¶ã ¶ãÖãé Öãñ|ãã lãÀãèÀ †ãŠã ¹ããñÔã¥ã ¶ãÖãé

Öāñ Öā†āŠ|āā Ööý ,āā^{f3/4}āñ •āā¶āñ 'āāPā¶ā ‡ā^{<3/4}āā Öö ?

**1/4āāñ•ā¶ā ‡ āñŠ •āāā>Ēā † İāā ,āÜāİĒā¶āİāāēĒā ,āYāİ,āāō ‡ āŠāñ
ÔāĀĒā † İāā ÜāİĒā¶āİāāēĒā ,āYāİ,āāō 1/2āō āāİāİāñÔā
1'āĒāā%āŠ^{3/4}āā 'āĀā 'āāāĀİāāā|āĀ|ā ‡āŠĀ¶āā 'āāPā¶ā Öö ý**

**•ā¶āİ 'āāñÔāYā ‡ āñŠ ,ā¶ā|āŌāĀ|ā 'āāPā¶ā ,āİāİāāñÔāYā,
ÔİāāāŌāāē†āŠĀYā ,āāōĀ °āāāÖ:āāñ'āYā -**

,ā1/4āāē ,āā'ā ¶āñ •ā¶āİ,āāō 'āĀā āāİāāā1/4ā ,ā āāİāāāfā^{3/4}āāō Öāñ 1/4āāñ•ā¶ā
‡ āñŠ ,ā¶ā|āŌāĀĒÖYā ‡ āñŠ °āāĀñ 1/2āō •āā¶ā ‡ āŠāĀāē 'āĒā'ā ‡ āŠāē Ööý
,āā'ā •āā¶ā|āñ Öö āā ‡ āŠ Ōā1/2āŌ|ā ‡ āŠİāñĀ ‡ āŠāē 'āĒāāāYā^{3/4}āāō |ā©āā
1/2ā¶āİŌ^{3/4}ā 1/2āō 'āāPā¶ā ‡ āŠā ‡ āŠā^{3/4}āĀ Ōāİāāİā ‡ āŠāāŌā|ā 'āāPā¶ā |āā'ā
‡ āñŠ 'āĀā Ōāñ|āā Ööý f¶ā1/2āō † ‡ āŠ Ō'āŌ> ,āāŌāĀ ¶āāĒā 1/2āİĒā Ōāñ
Ōāİ^aā |ā ‡ āŠ āāİā ‡ āŠāāŌā|ā Ōāñ|āāē Öö āā•āŌā1/2āō 'āāPā¶ā āāİāİāñÔā
'āĒ ‡ āŠĀĀ ‡ āñŠ ĀŌāā^{3/4}ā¶ā(† ¶•āāf1/2ā) „1'ā ,ā Ōāñ¶āñ ‡ āñŠ ‡ āŠĀĀYā
Ōāñ|āā Ööý † ¶•āāf1/2ā ‡ āŠā Ōāāİā ,āāŌāĀ ¶āāĒā ‡ āñŠ āāİāāā1/4ā ,ā
1/4āāŌāāō 1/2āō Ōāñ|āā Ööý f¶ā ‡ āŠāē „1'āāāŌ©āāā|ā 1/2āō ,ā¶āñ ‡ āŠ
ĀāŌāā^{3/4}āā¶ā ‡ āŠ ,āāā1/4āāā % āŠ^{3/4}āā ,āāō 'āĀā •āāā>Ēā 1/4āāñ•ā¶ā ŌāĀĒā
,āİā^{3/4}āİāāō 1/2āō |āāñü|ā •āā|āā Ööý

Hkkstu ds bu lĳy vo;oksa dks vkgkj uky dh nhokj }kjk vo'kksf"kr fd;k tkrk
gSA fÔā 1'āĒāā%āŠ^{3/4}āā ‡ āŠāñ ,āİāİāāñÔāYā ‡ āŠŌ|āñ Ööý

,āİāİāāñÔāYā ‡ āñŠ 'āİPāā|āā Ā ‡ ā<|ā 'āāāĀŌāāPāĀYā |āā'ā ‡ āñŠ 'āĀā
İāĀāēĀ ‡ āŠāē 'āĒ|^{3/4}āñ ‡ āŠ ‡ āŠāñāāİā ‡ āŠā |ā ‡ āŠ 'āŌūİPāā^{3/4}āā •āā|āā
ÖöýfÔā 1'āPāñ 1/4āāñ•^{3/4}ā 1'āā©āĀ ‡ āñŠ dksf'kdkvksa ds •āāēİā³İ^{3/4}ā 1/2āō
Ōā1/2āāİāñāāİā|ā Ōāñ¶āñ ‡ āŠāē 'āĒāā % āŠ^{3/4}āā
‡ āŠāñ ÔİāāāŌāāē†āŠĀYā ‡ āŠŌ|āñ Ööý

1/4āāñ•ā¶ā Ōāñ „1'ā^{3/4}āāñŌāāē ,āİā^{3/4}āİāāō ‡ āñŠ ,āİāİāāñÔāYā ‡ āñŠ 'āİPāā|āā
°ā¶āñ Ōİ † ,ā'āāāPā|ā 1'āā©āĀ °āū|āē ,āāā|ā 1/2āō † ‡ āŠāā'ā|ā Ōāñ|āā Ööý
°āū|āē ,āāū|ā ‡ āŠāē °āēİāāĀō fÔā1/2āō Ōāñ •āĒā ‡ āŠā ,āİāİāāñÔāYā
‡ āŠĀ†āñŠ „Ōāñ 1/2āĒā 1/2āō 1'āāāĀİāāā|āĀ|ā ‡ āŠĀ °ñ|āāē Öö ý 1/2āĒā ,Ōāİ^aā
‡ āñŠ ĀāŌ|āñ İāĀāēĀ ‡ āñŠ °āāŌĀ āā¶āŌ ‡ āŠāāāŌā|ā ‡ āŠĀ āā^{a3/4}āā •āā|āā
Öö ý fÔā 1'āĒāā%āŠ^{3/4}āā ‡ āŠāñ °āāāÖ:āāñ'āYā ‡ āŠŌ|āñ Ööý

**İİāŌā¶ā 'āĀā •āāēİā¶ā ‡ āŠñ āāĒā† ,āāİāİ^{3/4}ā†āŠ ...•āāĀ ‡ āŠāē
1'āĒāāā1'ā :-**

,ā°ā ,āā'ā •āā¶ā Ōā^{3/4}āñ Öö āā ‡ āŠ 1/4āāñ•ā¶ā ŌāĒÖYā ‡ āŠĀ¶āñ
‡ āñŠ i'pkr~ 1'āāñŌā†āŠ ,āİā^{3/4}āİā ‡ āōŠŌāñ ‡ āŠāñāāİā†āŠā ‡ āñŠ •āāēİā³İ^{3/4}ā
1/2āō Ōā1/2āāİāñāāİā|ā Ööý ,āāāāĒĀ ‡ āŠāñāāİā ‡ āŠā ,āāō cesbñ ...•āāĀ
‡ āōŠŌāñ 1/2āİ ‡ ā<|ā Ōāñ|āāē Öö ? İİāŌā¶ā 1/2āō Ēāē Ōā^{3/4}āāē

,ãuù†ã.Ôããè•ã¶ã À†ã<|ã †ãñŠ Ôãã©ã †ãŠãñããÍã†ãŠã,ããò |ã†ãŠ 'ãÖìÚPã|ããè
 Öò ãã•ãÔãÔãñ ÌãÔãú „'ãããÔ©ã|ã 'ããñÔã †ãŠ |ã|Ìãò (½ãìƎ¾ã|ã:
 ØÊãì†ãŠãñ•ã) †ãŠã ,ãuù†ã<Ôããè†ãŠÀ¥ã (°Ö¶ã) Öãñ|ãã Ööý °Ö¶ã †ãñŠ
 'ãŠÊãÔÌãÂ¹ã ...•ããÃ „'ã¶¶ã Öãñ|ããè Öò •ããñ †ãŠãñããÍã †ãŠã,ããò
 ½ãò †ãè¹ããè (†ãè¶ããñããÔã¶ã >ÈãfÃ 'ãŠãÔ¹ãñŠ) ¶ãã½ã†ãŠ ,ã¥ãì,ããò
 ½ãò ÔããããPã|ã Öãñ •ãã|ããè Ööý †ãŠãñããÍã†ãŠã,ããò ½ãò Öãñ¶ãñ ÌããÊããè
 fÔã ãã % ãŠ¾ãã †ãŠãñ „'ãã¹ãPã¾ã (cesšeyeefuepce) †ãŠÖ|ãñ Ööý
 ¾ãÖ ÔããããPã|ã ...•ããÃ Ôã½ãÔ|ã •ããèÌã£ããããÀ¾ããò †ãñŠ ÍãÀãèÀ
 ½ãò Öãñ¶ãñ ÌããÊããè •ãããÌã†ãŠ ãã%ãŠ¾ãã,ããò ½ãò †ãŠã½ã ,ãã|ããè
 Öò ý ,ããf¾ãñ •ãã¶ãñ ãã †ãŠ ,ãuù†ã<Ôããè•ã¶ã ØãöÔã †ãŠãè 'ãÆããã¹ã
 †ãöŠÔãñ Öãñ|ããè Öò ?

**ÌãÔã¶ã ãã % ãŠ¾ãã ½ãò •ã¶|ãì ,ããòÀ Ìãã¾ãì½ã¥;Êã †ãñŠ
 °ããèPã ØãöÔããè¾ã ,ãã¹ã¶ã-¹ãÆ³ã¶ã -**

•ããèÌã£ãããÀãè ããÌããã¹ã¶¶ã ããÌããã£ã¾ããò Ôãñ Ìãã¾ãì½ã¥;Êã Ôãñ
 ,ãuù†ã<Ôããè•ã¶ã 'ãÆã¹ã †ãŠÀ|ãñ Ööý †ã<¾ãã ,ãã¹ã¶ãñ ÔããñPãã Öò ãã†ãŠ
 Ìãã¾ãì½ã¥;Êã Ôãñ Ôã½ãÔ|ã •ããèÌã£ãããÀãè ,ãuù†ã<Ôããè•ã¶ã Pããö°ããèÔããò
 Ûããñ Êãñ|ãñ ÀÖ|ãñ Öò ãã¹ãŠÀ ¼ããè Ǝã|½ã ¶ãÖãè Öãñ|ããè Ööý ¾ãñ
 †ãŠÖãã Ôãñ ,ãã|ããè Öò? ¾ãã¹ †ãŠãèãã•ã † ,ãã¹ã¶ãñ 'ãuüã Öò
 ãã †ãŠ Ìãã¾ãì½ã¥;Êã ½ãò ,ããò †ã<Ôããè•ã¶ã †ãŠãè „'ãÊã°£ã|ãã
 'ãÆ†ãŠãÍã ÔããÍÊãñÔã¥ã 'ãÃã °ã¶ããè ÀÖ|ããè Ööý
 ÌãÔã¶ã ãã%ãŠ¾ãã ½ãò ,ããò†ã<Ôããè•ã¶ã †ãñŠ 'ãÃã 'ããñÔã†ãŠãò †ãñŠ
 °Ö¶ã †ãñŠ 'ãŠÊãÔÌãÂ¹ã ...•ããÃ †ãñŠ Ôãã©ã-Ôãã©ã †ãŠã°ãÃ¶ã
 |ãfZ ,ããò †ã<Ôããf; ØãöÔã °ã¶ã|ããè Ööý ÔãããÔã 'ãÃã Ôã¹ããè
 •ããèÌã£ãããÀãè fÔã ØãöÔã †ãŠãñ Ìãã¾ãì½ã¥;Êã ½ãò œãñü; ñ|ãñ Öò ý fÔã
 'ãÆ †ãŠãÀ Ìãã¾ãì½ã¥;Êã Ôãñ •ããèÌã£ããããÀ¾ããò 'ãÃã
 ,ããò†ã<Ôããè•ã¶ã †ãŠã Êãñ¶ãã ,ããòÀ †ãŠã°ãÃ¶ã |ãfZ ,ããò†ã<Ôããf;
 œãñü;¶ãã ØãöÔããè¾ã ,ãã¹ã¶ã-¹ãÆ³ã¶ã †ãŠÖÊãã|ãã Öò ý

½ã¶ãìÖ¾ã ½ãò ÌãÔã¶ã †ãñŠ ÔãÔã¾ã†ãŠ ,ããÔã -

†ãŠããã 6 (ããPãã 8.24) ½ãò ,ãã¹ã •ãã¶ã Pãì†ãñŠ Öò ãã†ãŠ ½ã¶ãìÖ¾ã ½ãò
 ,ã¶ãñ †ãŠ ,ããÔã ÌãÔã¶ã ãã % ãŠ¾ãã ½ãò ¼ããÔã Êãñ|ãñ Ööý ¶ãã †ãŠ,
 ÌããÔã¶ãÊããè †ãã 'ãñŠ¹ãŠü;ñ ÌãÔã¶ã ,ããÔã Öò ý
 •ã°ã Ö½ã ÔãããÔã Êãñ|ãñ Öò |ããñ Ìãã¾ãì½ã¥;Êã †ãŠãè Ìãã¾ãì ¶ãã†ãŠ Ôãñ
 Öãñ†ãŠÀ Ûããú;ãè 'ãÀ †ãñŠ ãã¶ã¾ãã¥ã ½ãò ÌããÔã ¶ãÊããè †ãñŠ 'ãÃã
 ÌãÔããã¶ã†ãŠã,ããò Ôãñ Öãñ|ãñ Öì† 'ãñŠ¹ãŠü;ãò ½ãò 'ãÆÌãñÍã †ãŠÀ|ããè
 Ööý 'ãñŠ¹ãŠü;ãò ½ãò ,ãã¾ããè Ìãã¾ãì †ãŠãè ,ããò†ã<Ôããè•ã¶ã Áãã£ãÀ Ôãñ
 ¾ãì †ã<|ã Öãñ †ãŠÀ ÍãÀãèÀ †ãŠãè 'ãÆ|¾ãñ †ãŠ †ãŠãñããÍã †ãŠã |ã †ãŠ
 'ãÖàiPã •ãã|ããè Öò ý †ãŠãñããÍã†ãŠã,ããò †ãñŠ •ããèÌã³¼ã ½ãò 'ããñÔã†ãŠ

¹ã^aã©ãão ‡ ãŠã fÔã ,ãàu ‡ ã<Ôããè•ã¶ã ‡ ãñŠ Ôãã©ã ÀãÔãã³/₄ããã¶ã ‡ ãŠ
ãã%ãŠ³/₄ãã Ôãñ|ããè Ôõ ãã•ãÔãñ ,ãàu‡ã<Ôããè‡ãŠÀã (°Ö¶ã)‡ãŠÖ|ãñ Ööý
^aÖ¶ã ‡ ãñŠ ¹ãŠÊãÔÎãÂ¹ã „¹ã¶¶ã ‡ ãŠã°ãÃ¶ã |ãfÃ ,ãàu ‡ ã<Ôããf| ÂããfãÀ
Ôãñ ³/₄ãì‡ã<|ã Ôãñ‡ãŠÀ ¹ãŠñ¹ãSü|ãò ¹/₂ãò Îãã¹ãÔã ¹ãÖùìPã •ãã|ããè Ôõ •ããñ
ãã ‡ ãŠ ³/₄ãÖãã Ôãñ ãã¶ã:ÎãÔã¶ã ¹ãÀã °ããÖÀ ‡ ãñŠ Îãã|ããÎãÀãã ¹/₂ãò
œãñü|ãèè •ãã|ããè Ôõ ý ³/₄ãÖ ãã%ãŠ³/₄ãã ãã¶ãÀ¶ãÀ PãÊã|ããè ÀÖ|ããè Ôõ ý

ãã%ãŠ³/₄ãã ‡ãŠÊãã¹ã 11.3

,ãã¹ã ¹ãÆãã|ã ãã¹/₂ã¶ã> ãã‡ãŠ|ã¶ããè °ããÀ ÔãããÔã Êãñ|ãñ Öö, ããÔããã¶ã³/₄ãñ
-

- ,ããÀã¹/₂ã ‡ãñŠ Ôã¹/₂ã³/₄ã ý
 - Î³/₄ãã³/₄ãã¹/₂ã ‡ãñŠ °ãã^a ý
- ¹ãÆã¹|ã ¹ãããÀããã¹/₂ã ‡ãŠãè |ãìÊã¶ãã ‡ãŠãèãã•ã† ý Î³/₄ãã³/₄ãã¹/₂ã ‡ãñŠ °ãã^a
ÔãããÔã Êãñ¶ãñ ‡ãŠãè Ôããã|ã °ãüœ •ãã|ããè Ôõ ý ‡ã<³/₄ããò ?
ãã¶ã¹/₂¶ãããÊãããCã|ã |ãããÊã ‡ãŠã ‡ãñŠ ,ããfããÀ ¹ãÀ ,ã¹ã¶ãñ ,ã¶³/₄ã
ÔãÖ¹ããããÿ³/₄ããò ‡ãñŠ Ôãã©ã ããÎããã¹/₄ã¶¶ã ¹ãããÀããÔããããã³/₄ããò ¹/₂ãò
ÎãÔã¶ã ^aÀ —ãã|ã ‡ãŠãèãã•ã†

|ãããÊã‡ãŠã - 1

ÔãÖ ¹ ããÿãè ‡ãŠã ¶ãã ¹ / ₂ ã	Ôãã ¹ / ₂ ãã¶ ³ / ₄ ã ,ãìãÔããã ¹ / ₂ ãò
15 ãã ¹ / ₂ ã¶ã> ã‡ãŠ ãñ•ã	100 ¹ / ₂ ããè>À ^a ãöü ãñ
ããÎãÑãã ¹ / ₂ ã ‡ãŠãè ,ãìãÔããã ¹ / ₂ ãò	

PãÊã¶ãñ ‡ãñŠ „¹ãÀã¶ã

‡ãñŠ „¹ãÀã¶ã

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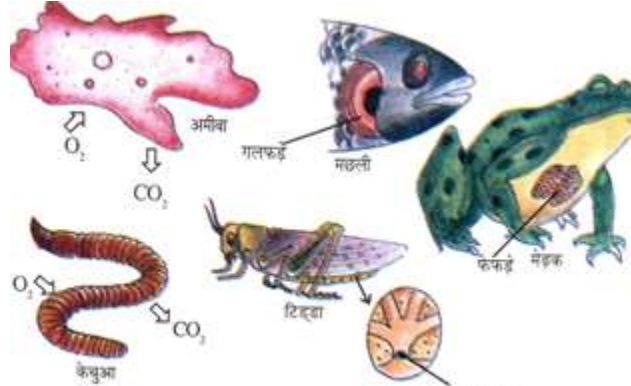
ÎãÔã¶ã ^aÀ ‡ã<³/₄ãã Ôõ ,ãã¹ã •ãã¶ã¶ãã PããÖòÔãñý ‡ãŠãñfÃ Î³/₄ããã ‡ã<|ã
† ‡ãŠ ãã¹/₂ã¶ã> ¹/₂ãò ãã•ã|ã¶ããè °ããÀ ÎããÔã Êãñ|ãã Öö ÎãÖ
„Ôã‡ãŠãè ÎãÔã¶ã ^aÀ ‡ãŠÖÊãã|ããè Ööý ‡ãŠ ÎããÔã ,ã©ãìãã ÎããÔã ‡ãŠã
,ã©ãÃ Ôãñ|ãã Öö ‡ãŠ ,ãã|ã: ÎãÔã¶ã ,ããõÀ ‡ãŠ ÎããÛã ÎãÔã¶ãý

•ãªã ,ãã¹ã Ì¼ãã³¼ãã½ã ‡ ãŠÀ|ãñ Öö |ãñ ,ããããã ‡ ãŠ ...•ããÃ ‡ ãŠãè ,ããÌãÌ³¼ã‡ãŠ|ãã Öãñ|ããè Öö ý fÔãããÊã† ,ããããã‡ãŠ ,ããù‡ã<Ôããè•ã¶ã ‡ãŠãè ,ããÌãÌ³¼ã‡ãŠ|ãã Öãñ|ããè Öö ,ããõÀ ,ãã¹ã ‡ãŠãè ÎãÔã¶ã Øããã|ã °ãü□ •ãã|ããè Öö ý



ããPãªã Ôãã0 11.7 ½ã¶ãìÓ³ããñã 'ãÀã ããÌããã¼ã¶ã Øããã|ããÌããããã³¼ããü ããPãªã 11.7 ‡ãŠã £³¼ãã¶ã Öãñ ,ãÌãÊããñ‡ãŠ¶ã ‡ãŠãèãã•ã† ý ,ãã¹ã ,ã¹ã¶ãñ PããÀãõ ,ããñÀ Öãª‡ãŠãñ |ãÀÖ-|ãÀÖ ‡ãŠãè Øããã|ããÌããããã³¼ããü ‡ãŠÀ|ãñ 'ãÊãã|ã ãã¶ã ãñÊã|ãñ Ööý ‡ã<³¼ãã ,ãã¹ã °ã|ãã Ôã‡ãŠ|ãñ Öö ãã‡ãŠ ãã‡ãŠÔã ããÔ©ããã|ã ½ãõ ÎãÔã¶ã °À ,ããããã‡ãŠ|ã½ã ÖãñØããè ,ããõÀ ‡ã<³¼ããõ ?

ããÌããã¼ã¶ã •ã¶ãì,ããõ ½ãõ ããÌããã¼ã¶ã ÎãÔã¶ã ,ããÔã -
 ,ãÊãÔã - ,ãÊãÔã Ìãã|ããÌãÀã ½ãõ ÀÖ¶ãñ ‡ãñŠ ‡ãŠãÀãã ããÌããã¼ã¶ã •ã¶ãì,ããõ ½ãõ ÎãÔã¶ã ãã%ãŠ³¼ãã ‡ãŠ¶ãñ ‡ãñŠ ããÊã† ,ãÊãÔã-,ãÊãÔã ããÌããããã³¼ããü Öãñ|ããè Öö ,ããõÀ ããÌããã¼ã¶ã ÎãÔã¶ã ,ããÔã Öãñ|ãñ Öö ý ,ã½ããèªã |ã©ãã Öãf|Êã •ãõÔãñ •ãÊããè³¼ã •ã¶ãì ½ãõ ããÌãããñÔã ÎãÔã¶ã ,ããÔã ¶ãÖãè Öãñ|ãñ ¾ãñ Ôã½¹ãìããÀ ÍãÀãèÀ ‡ãŠãè Ôã|ãÖ Öãñ ããÌãÔãÀãã 'ãÀã ØãõÔããè³¼ã ,ããªã¶ã-¹ãÊã¶ã ‡ãŠÀ|ãñ Öö (ããPãªã 11.8)ý



चित्र सं० 11.8 विभिन्न जीवों में विभिन्न प्रकार से गैसीय विनिमय

‡ãŠãèãõ ½ãõ ÎãÔã¶ã¶ãããÊã ‡ãŠã,ããõ ‡ãŠã •ããÊã 'ãìÀñ ÍãÀãèÀ ‡ãñŠ ,ã¶ãÀ 'ãõŠÊãã Öãñ|ãã Öö •ããñ ããññ-ããññ ããæ³ãõ 'ãÀã ÍãÀãèÀ ‡ãñŠ °ããÖÀ ÊãìÊã|ãñ Ööý f¶ã ããæ³ãõ ‡ãŠãñ ÎããÔã À¶ããÆ ¾ãã Ô¹ããfÀñ ‡ãŠÊÔã ‡ãÖ|ãñ Ööý f¶ãÖãè ããæ³ãõ Ôãñ Ìãã¼ããì½ããÊããè³¼ã

ÎãÔã¶ã äã%ãŠ¾ãã ½ãò Íã‡ãÃŠÀã ‡ãñŠ äãìãŒã¥;¶ã Ôãñ ...
•ããÃ ‡ãŠãè ¹ãÆããä¹ã -

,ãã¹ã •ãã¶ã Ðãì ‡ ãñŠ Ööâ ãã ‡ ãŠ ÍãÔã¶ã ´ãÀã ¹ãÖúiÐãã³⁄⁴ããè Øã³⁄⁴ããè
,ããù ‡ ã<Ôããè•ã¶ã •ããèÌã£ããããÄ³⁄⁴ããò ‡ ãŠãè ‡ ãŠãñããÍã ‡ ãŠã,ããò ½ãò
¹ããñÓã‡ãŠ ¹ãªã©ããò ‡ãŠã ºÖ¶ã ‡ãŠÀ|ããè Öö ý fÔãñ ‡ãŠãñããÍã‡ãŠãè³⁄⁴ã
ÍãÔã¶ã ‡ãŠÖ|ãñ Ööý fÔã‡ãñŠ ,ã¶ãÔãÃ|ã ,ã¶ãñ‡ãŠ ¹ãÆãã%ããŠ³⁄⁴ãã,ããò
´ãÀã ØÊãì ‡ ãŠãñ•ã ‡ ãñŠ ,ã¥ãì Óãñ ...•ããÃ ½ãì ‡ ã<|ã Öãñ|ããè Öö ý
ØÊãì ‡ãŠãñ•ã ‡ãñŠ ,ã¥ãì ‡ãŠã •ãª ,ããù ‡ ã<Ôããè‡ãŠÀ¥ã Öãñ|ãã Öö |ããñ
„ÔãÔãñ ...•ããÃ, •ãÊã |ã©ãã ‡ãŠãºãÃ¶ã |ãfÃ ,ããù‡ã<Ôããf| ,¹ã¶¶ã Öãñ|ããè
Öö ý

ØÊãì ‡ ãŠãñ•ã + ,ããù ‡ ã<Ôããè•ã¶ã ‡ ãŠãºãÃ¶ã |ãf →Z
,ããù‡ã<Ôããf| + •ãÊã + ...•ããÃ

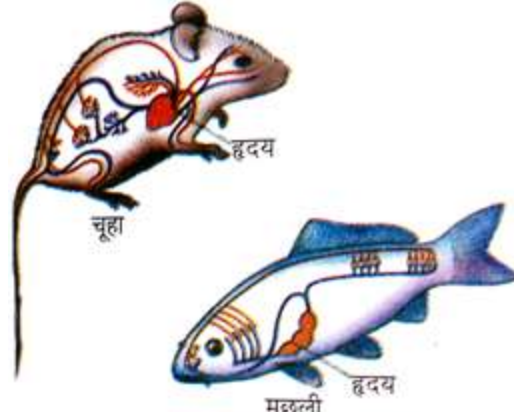
fÔãÔãñ ³⁄⁴ãÖ Ô¹ãÓ> Öö ãã ‡ãŠ ,ããã£ã ‡ãŠããÍã •ããèÌã£ããããÄ³⁄⁴ããò ‡ãŠãñ
ÍãÔã¶ã ‡ãñŠ ããÊã† ,ããù‡ã<Ôããè•ã¶ã ‡ãŠãè ,ããÌãÍ³⁄⁴ã‡ãŠ|ãã Öãñ|ããè Ööý

ÍãÀãèÀ ½ãò ¹ãªã©ããò ‡ãŠã ¹ãããÀãÖ¶ã :-

ØããùÌããò ½ãò ããÔããÐããfÃ ‡ãñŠ ããÊã† •ãÊã Öãñ|ãã Öãñ Æãñ|ããò |ã‡ãŠ
•ãÊã ¹ãÖúiÐã|ãñ ,ãã¹ã¶ãñ ºñÆãã ÖãñØãã ý ÍãÖÀãò |ã©ãã ‡ãŠÖºããò ½ãò
¼ããè ÜãÀãò |ã‡ãŠ ¹ããè¶ãñ ‡ãŠã •ãÊã ¹ãÖúiÐãã¶ãñ ‡ãñŠ ããÊã† ¹ããf¹ã
Êããf¶ãò ããºãæã³⁄⁴ããè •ãã|ããè Öö ãã•ãÔã ‡ãŠã ãã¶ã³⁄⁴ã¶ã¥ã •ãÊã
ÔããÔã©ã¶ã ´ãÀã ãã‡ãŠ³⁄⁴ãã •ãã|ãã Öö ý fÔããè ¹ãÆ‡ãŠãÀ ¹ããð£ããò |ã©ãã
•ã¶ãì,ããò ºãñ¶ããò ‡ãñŠ ÍãÀãèÀ ½ãò ÍããããÖãã¶ã³⁄⁴ããò ‡ãŠã •ããÊã ¹ããŠÊãã
Öãñ|ãã Öö ãã•ãÔã ‡ãñŠ ´ãÀã ,ããÌãÍ³⁄⁴ã ‡ãŠ ¹ãªã©ãã ÍãÀãèÀ ‡ãñŠ †‡ãŠ
¼ããØã Öãñ ºÔãÃñ ¼ããØã |ã‡ãŠ ¹ãÖúiÐã|ãñ Öö ý

¹ããð£ããò ½ãò ¹ãããÀãÖ¶ã -

¹ããð£ããò ½ãò ÍããããÖãã¶ã³⁄⁴ããò ‡ãŠã |ã¶ã Öãñ|ãã Öö •ããñ •ãÊã, ÊãÌã¥ã
,ããòÀ ÜãìÊãñ Òì † ¼ããñ•ã¶ã ‡ãŠãñ „¶ã ‡ãñŠ ÍãÀãèÀ ‡ãñŠ Ôã¼ããè
¼ããØããò ½ãò Êãñ •ãã|ãñ Öö (ããÐãª 11.10) ý ¹ããð£ããò ½ãò •ãü|ãò Öãñ
Êãñ‡ãŠÀ ¹ããã|ã³⁄⁴ããò |ã‡ãŠ ÍããããÖãã¶ã³⁄⁴ããò ‡ãŠã †‡ãŠ |ã¶ã Öãñ|ãã Öö
•ããñ ºãñ ¹ãÆ‡ãŠãÀ ‡ãŠñ •ããã>Êã ...|ã‡ãŠãò ‡ãñŠ ºã¶ãñ Öãñ|ãñ Öö A



चित्र सं० 11.11 जन्तुओं में परिवहन तन्त्र

•ãæèlãfããäÄ¾ãð ½ã Ìã¾ãÃ ¹ãã©ãð ‡ ãŠã
ãä¶ãÓ‡ãŠãÔã¶ã :-

•ã¶|ãì,ãð ½ã -

,ãã'ã •ã¶|ã|ãñ Öö äã‡ãŠ ¼ããñ•ã¶ ‡ãñŠ Üã‡ãŠ ¹ãÆãñãæ¶ã, ÌãÔãã |ã©ãã
‡ãŠã°ããóÖãfjÈñ Öö äã•ãÔã ‡ãñŠ „¹ãã¹ã³¾ã Ôãñ ‡ãŠã°ãÃ¶ã jãfÃ
,ããù ‡ã<Ôããfj, ¹ã¶|ãæ, ¾ãìããÄ¾ãã, ¹ãŠãùÔ¹ãñŠ, ãããã ¹ãã©ãÃ °ã¶|ãñ
Ööý ¹ã¶|ãæ ‡ãñŠ, ããã|ãããÄ‡ã<|ã Ôã¹ããæ ¹ãã©ãÃ, ã¹ãããlãÓ Öãñ|ãñ Öö,
f¶Öò Ìã¾ãÃ ¹ãã©ãÃ ¼ããè ‡ãŠÖ|ãñ Ööý ¾ãñ Ö½ããÄñ ÌãÄãèÄ ½ãò
ãã¶ãÄ¶ãÄ °ã¶|ãñ ÄÖ|ãñ Ööý

¾ããã ¾ãñ Ìã¾ãÃ ¹ãã©ãÃ •ãæèlãfããÄãè ‡ãñŠ ÌãÄãèÄ ½ãò, ãããã ‡ãŠ
Ôã½ã¾ã |ã‡ãŠ ÄÖñ |ãñ Öããã¶ã‡ãŠãÄ‡ãŠ Öãñ Ôã‡ãŠ|ãñ Ööý fÔãããÈã†
f¶Öò ÌãÄãèÄ Ôãñ ãã¶ã ‡ãŠãÈã¶ã, ããã|ã, ããlãl¾ã ‡ãŠ Ööý ÌãÖ
¹ãÆãã %ããŠ¾ãã ãã•ãÔã ‡ãñŠ ¹ãÄã Ìã¾ãÃ ¹ãã©ãã ‡ãŠãñ
ãä¶ãÓ ‡ãŠãããÔã|ã ãã ‡ãŠ¾ãã •ãã|ãã Öö „Ôã•ã¶ã ‡ãŠÖÈãã|ãæè
Ööý ‡ãìŠœ •ã¶|ãì,ãð •ãÔÖãñ - ,ã½ããè°ãã, ÖãfjÈã, ãããã ½ãò Ìã¾ãÃ
¹ãã©ãã ‡ãñŠ ãã¶ãÓ‡ãŠãÔã¶ã ‡ãñŠ ããÈã† ããlãlãñÔã, ããØã ¶ãÖãé Öãñ|ãñ
Ööã ÌãÖ ÌãÄãèÄ Ôã|ãÖ Öãñ ããlãÔãÄã ¹ãã „Ôã•ã¶ã ‡ãŠã|ãñ Ööý
‡ãñŠpài ‡ã½ãò Ìãð ‡ã< ‡ãŠ ‡ãŠ (¶ãñ¹ãÆŠñã¾ãã) ¹ãã, ‡ãŠãèãò
½ãò ½ãòÈ¹ããèÜããè ¶ãããÈã‡ãŠã,ãð ¹ãã |ã©ãã Ôã½ãÔã ‡ãŠlãñÄ‡ãŠãè
¹ãÆãããã¾ããò ½ãò Ìãð‡ã<‡ãŠãò ¹ãã „Ôã•ã¶ã Öãñ|ãã Öö ý

³lã Ìã¾ãÃ ¹ãã©ãÃ •ãÔÖãñ ½ãã'ã ‡ãŠãñ °ããÖã ãã¶ã ‡ãŠãÈã¶ã ‡ãñŠ
ããÈã† Ö½ããÄñ ÌãÄãèÄ ½ãò, ãÈãØã Öãñ ‡ãŠfÃ, ããØã ãã½ãÈã ‡ãŠã
„Ôã•ã¶ã |ãã'ã ‡ãŠã ãã¶ã½ãããã ‡ãŠã|ãñ Ööý ¾ãñ, ããØã Ìãð ‡ã< ‡ãŠ,
½ãã'ãlããããÖ¶ãæ, ½ãã'ããlã¾ã, ½ãã'ã ½ããØãÃ |ã©ãã ½ãã'ãÄããÆ Öö
f¶ã‡ãñŠ °ããÄñ ½ãò, ãã'ã ¶ãñ ‡ãŠããã 6 ½ãò ¼ããè ¹ãüãã Ööý

ÌããÔ|ãÌã ½ãò À ‡ ã<|ã ½ãò „¹ãããÔ©ã|ã Ìã•¼ãÃ ¹ãã©ãÃ Ìãð ‡ ã< ‡ ãŠ ½ãò
œ¶ã ‡ ãŠÀ ,ãÊãØã Ôãñ|ãñ Öö |ã©ãã ½ãîã ½ããØãÃ ¹ãÃ ÌãÀãèÀ Ôãñ
°ããÖÀ ãã‡ãŠ¾ãñ •ãã|ãñ Ööý

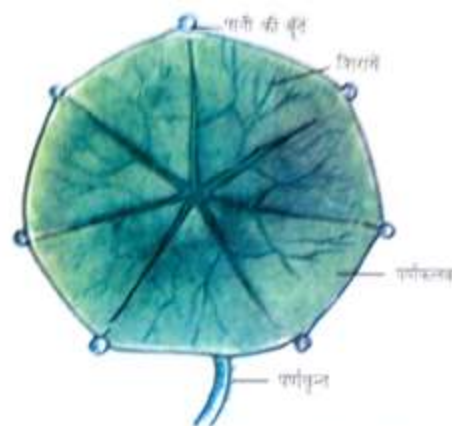
‡ãìŠœ ,ããõÀ ¼ããè •ã¶¶ãò

□ ‡ãŠãñfÃ Ìã¾ãÔ‡ãŠ Ì¾ããã‡ã<|ã Ôãã½ãã¶¶ã¾ã: 24 Üãâ>ñ ½ãò 1 Ôãñ 1.8
Êããè>À ½ãîã ¾ããØã ‡ ãŠÀ|ãã Ööý ãã•ãÔã½ãò 95% •ãÊã, 2.5%
¾ãîããÀ¾ãã (¶ããf>Êãñ•ã¶ããè ¹ãã©ãÃ) ,ããõÀ 2.5% ,ã¶¾ã „|Ôã•ããè
¹ãã©ãÃ Ôãñ|ãñ Ööý

□ ¹ããðfããò Ôãñ ¹ããã|ã¾ããò ‡ ãŠã ããØãÀ¶ãã (¹ã|ãçãüj) ¼ããè ‡ ‡ ãŠ
¹ãÆ‡ãŠÀ ‡ãŠã Ìã•¼ãÃ ¹ãã©ããò ‡ãŠã ¾ããØã ‡ãŠÀ¶ãã Öö ý

,ãã¹ã¶ãñ ,ã¶ãì¼ãÌã ãã ‡ ãŠ¾ãã ÔãñØãã ãã ‡ ãŠ Øããã½ãÃ¾ããò ‡ ãŠãè
,ã¹ãñããã •ããüjñ ½ãò Ö½ã ,ãããfã‡ãŠ ½ãîã-¾ããØã ‡ãŠÀ|ãñ Ööý ‡ã<¾ããò ?
ÌããÔ|ãÌã ½ãò Øããã½ãÃ¾ããò ½ãò Ö½ãò ¹ãÔããè¶ãã (Ôìãñª) ,ãã|ãã Ööý
¹ãÔããè¶ãã ½ãò •ãÊã ,ããõÀ ÊãÌã¶ã Ôãñ|ãñ Ööý ,ãë¹ã¶ãñ ‡ ãŠãÊãñ ÀãØã
‡ ãñŠ ‡ ãŠ¹ãüjãò ½ãò ¹ãÔããè¶ãã ÔãìÆã¶ãñ ¹ãÀ Ôã¹ãñŠª Æã°ããò ‡ ãŠã
°ã¶ã¶ã ãñÆãã ÔãñØããý ¾ãñ ¹ãÔããè¶ãã ½ãò „¹ãããÔ©ã|ã ÊãÌã¶ããò ‡ ãñŠ
•ã½ã¶ãñ ‡ãñŠ ‡ãŠãÀ¶ã °ã¶ã|ãñ Ööý ¹ãÔããè¶ãñ ¹ãÀ fÔã ¹ãÆ‡ãŠÀ ‡ãñŠ
„|Ôã•ãÃ¶ã ½ãò ¹ãã¶ããè ‡ãŠãè ,ãããfã‡ãŠã½ã ½ãããã ÌãÀãèÀ Ôãñ °ããÖÀ
Ôãñ •ãã|ããè Öö ,ã|ã†Ìã ½ãîã ¾ãã ‡ãñŠ Á¹ã ½ãò „|Ôã•ãÃ¶ã ãã¶ã¾ãããããã|ã
Ôãñ •ãã|ãã Ööý

¹ããðfããò ½ãò -



चित्र सं० 11.12 पार्सेन नेस्ट्रेलिया में विन्दु खगण

¹ããðfããò ½ãò Ìã•¼ãÃ ¹ãã©ããò ‡ ãñŠ „|Ôã•ãÃ¶ã ‡ ãñŠ ããÊã† ‡ ãŠãñfÃ
ããÌãÌãñÔã ,ããØã ¶ãÔãè Ôãñ|ãñ Öö Êãñãã‡ã¶ãã ããÌããã¼ã¶ãã ããÌãããfã¾ããò
Ôãñ ¾ãñ „|Ôã•ãÃ¶ã ‡ ãŠÀ|ãñ Ööý ÌãÔã¶ã ãã % ãŠ¾ãã ½ãò „¹ã¶ã
‡ ãŠããÃ¶ã |ãfÃ ,ããü ‡ ã<Ôããfj À¶ãÆãò ¹ãÀ ãã¶ã ‡ ãŠÊã|ããè Öö ý
¹ããðfããò ½ãò ÌããÔ¹ããñ|Ôã•ãÃ¶ã ãã % ãŠ¾ãã ¹ãÀ •ãÊã ÌããÔ¹ã ‡ ãñŠ Á¹ã

½ào À¶ÊãÆão Ôãn ã¶ã‡ãŠÊã|ãã ÄÖ|ãã Ööây İãÓããÃ ¨ãÉ|ài ½ào 'ãÆã|ã:
‡ãŠãÊã ‡ãİSœ İãã‡ãŠãè³⁄₄ã 'ããðããò ‡ãŠãè 'ããã||ã³⁄₄ããò 'ãÄ •ãÊã ‡ãŠãè
°ãîãñ ããªÆãã³⁄₄ããè °ñ|ããè Ööý ³⁄₄ãn •ãÊã ‡ãŠãè °ãîãñ ‡ãŠÖãú Ôãn ,ãã|ããè
Öö ? ›½ãã›Ä, ,ãÄİããè, ¶ãñÖ›Èñããİã³⁄₄ã¹⁄₂ã |ã©ãã ½ã‡ãŠãñ³⁄₄ã ,ããããª ‡ãñŠ
'ããðããò ½ão ,ã¶ããİãİ³⁄₄ã‡ãŠ •ãÊã ,ããòÄ Êãİã¥ã Äããã¨ª ½ão 'ããã||ã³⁄₄ããò
‡ãŠãè ããİãÄã,ããò Ôãn °ãúª-°ãúª ‡ãñŠ Â¹ã ½ãñã ãã¶ã‡ãŠÊã|ãn Ööý fÔã
'ãÆ ‡ãŠãÄ ‡ãñŠ „|Ôã•ãÄ¶ã ‡ãŠãñ ããª¶ã¶i Ôããİã ‡ãŠÖ|ãn Öö (ããPã¨ª
11.12)ý ³⁄₄ãÖãè °ãúªò Ö½ão ããªÆãã³⁄₄ããè °ñ|ããè Ööý ‡ãİSœ 'ããðããò ‡ãŠãè
‡ãŠãñããİã‡ãŠã,ããò ½ão ããİãİãñÖã İã•³⁄₄ãÄ 'ãªã©ãÄ „|ã¶¶ã Öãn|ãn Öö •ãñ
'ããã||ã³⁄₄ããò †İãã œãÊã ½ão †‡ãŠãã¨ã|ã Öãn|ãn ÄÖ|ãn Ööý •ãðÖãn ÄªÄ,
Øããª |ã©ãã ÄãùÊã (Äñãã•ã¶ã) ,ãããª ý f¶ã 'ãªã©ããò ‡ãŠã „ã³⁄₄ãñÖã
Ö½ã Öã¹⁄₄ããè ‡ãŠÄ|ãn Ööý

**İãÄãèããÄ ‡ãŠ 'ãÆãã %ãŠ³⁄₄ãã,ããò ‡ãŠã ãã¶ã³⁄₄ã¶ã¥ã †İãã
Öã¹⁄₂ã¶İã³⁄₄ã¶ã :-**

³⁄₄ããª 'ããPã¶ã ãã %ãŠ³⁄₄ãã Ýãè ‡ãŠ 'ãÆ ‡ãŠãÄ Ôãn ¶ã Öãn |ãñ İãÄãèÄ
‡ãŠãñ ,ããİãİ³⁄₄ã‡ãŠ 'ããñÖã‡ãŠ 'ãªã©ãÄ 'ãÆã|ã ¶ãÖãè ÖãðÖãn ãã•ãÖãÖãn
İãÄãèÄ ‡ãŠãñ ...•ããÄ ¼ããè ¶ãÖãè 'ãÆã|ã Öãn Öã ‡ãñŠÖããèý fÔããè
'ãÆ‡ãŠãÄ ³⁄₄ããª İãð‡ã<‡ãŠ ‡ãŠã³⁄₄ãÄ ‡ãŠÄ¶ãã °ã¶ã ‡ãŠÄ ªò |ãñ ‡ã<³⁄₄ãã
ÖãnÖã ? ÄãããÄ ½ão İã•³⁄₄ãÄ 'ãªã©ãÄ †‡ãŠãã¨ã|ã Öãn •ãã³⁄₄ãðÖãn |ã©ãã
Öã¹⁄₂ãÖ|ã •ãðããİã ‡ãŠ ãã %ãŠ³⁄₄ãã †ú Á ‡ãŠ •ãã³⁄₄ãñãÖããè ý İãÄãèÄ ½ão
•ããèİã¶ã ‡ãŠãè Öã¹⁄₄ããè 'ãÆãã %ãŠ³⁄₄ãã †ú †‡ãŠ °İÖãÄñ Öãn Öã¹⁄₂ª®
Öãn|ããè Öö ,ããðÄ „ããPã|ã Öã¹⁄₂ãã³⁄₄ããñ•ã¶ã Öİããã¶ã³⁄₄ããã¶ã|ã Öãn|ãã Ööý

•ãðããİã‡ãŠ 'ãÆãã %ãŠ³⁄₄ãã †İãã ,ããØããò ½ão Öã¹⁄₂ã¶İã³⁄₄ã¶ã -

•ãðÖãn ãã‡ãŠ °ãüñ ‡ãŠãÄÆãã¶ããò †İãã ããİã¹⁄₄ããÖããò ½ão ããİããã¹⁄₄ã¶ã
‡ãŠã³⁄₄ããò ‡ãŠãñ ‡ãŠÄ¶ãñ ‡ãñŠ ããÊã † ,ãÊãØã-,ãÊãØã ããİã¹⁄₄ããØã †İãã
‡ãŠ¹⁄₂ããè Öãn|ãn Öö ý ‡ãŠPãñ ½ããÊã Öãn „ã³⁄₄ããñÖããè İãÖ|ài °ã¶ã¶ãñ
‡ãñŠ ããÊã † |ã ‡ãŠ¶ããè ‡ãŠãè İ³⁄₄ããã ‡ã<|ã, 'ã¨ã İ³⁄₄ãİãÖãÄ ‡ãñŠ ããÊã †
‡ãŠ³⁄₄ããÊã³⁄₄ã ‡ãñŠ ÊããñÖã |ã©ãã ããª %ãŠãè ‡ãñŠ ããÊã †
'ãÆãã|ããã¶ããããã Öãn|ãn Öö ý f¶ã Öã¹⁄₄ããè ããİã¹⁄₄ããØããò ‡ãŠãñ
ÖããÖãããÝ|ã ‡ãŠÄ‡ãñŠ ÖãİPããÄ Â¹ã Öãn ‡ãŠã³⁄₄ãÄ ‡ãŠÄ¶ãñ ‡ãñŠ ããÊã‡ã
'ãÆª¶ã ‡ãŠ (½ãð¶ãñ•ãÄ) Öãn|ãã Öö ãã•ãÖã ‡ãŠã ‡ãŠã³⁄₄ãÄ Öã¹⁄₄ããè
ããİã¹⁄₄ããÖããò ½ão Öã¹⁄₂ãİããPã|ã Öã¹⁄₂ã¶İã³⁄₄ã¶ã ‡ãŠÄ¶ãã Öãn|ãã Ööý fÔããè
'ãÆ ‡ãŠãÄ °ãÖİ‡ãŠãããİã‡ãŠãè³⁄₄ã 'ãÆããã¥ã³⁄₄ããò ½ão ‡ãŠã³⁄₄ãÄ ‡ãŠãñ
ããİããã¹⁄₄ã¶ã ,ããØããò 'ãÄã ãã ‡ãŠ³⁄₄ãã •ãã|ãã Öö ããª¶ã¹⁄₂ãò „ããPã|ã
Öã¹⁄₂ã¶İã³⁄₄ã¶ã Öãn|ãã Ööý ,ããf† f¶ã‡ãñŠ °ããÄñ ½ão •ã¶ãñ-

•ã¶|ài,ããò ½ão Öã¹⁄₂ã¶İã³⁄₄ã¶ã-

•ā||āi,āāò ½āò Ôā½ā||ā³⁄₄ā||ā Ô©āāāā'ā|ā ‡ āŠÀ||āñ ‡ āŠā ‡ āŠā³⁄₄āÃ āñ
|ā||āāò 'āĀā Ōāñ|āā Ōō -

1. |āāā||ā‡āŠā |ā||ā 2. ,ā||ā: Ōāā|āāè |ā||ā

•āōŌāā āā‡āŠ ,āā'ā ‡ āŠāāā 6 ½āò 'āü⊔ Pāi‡āñŠ Ōō āā‡āŠ |āāā||ā‡āŠā |ā||ā
½āò ½āāāŌ|āŌ ‡ āŠ, ½āñĀĀ•āi ,āāōĀ fŌāŌāñ āā||ā ‡ āŠĒā||āñ |āāĒāāè
|āāā||ā ‡ āŠā³⁄₄āò Ōāñ|āāè Ōō ý |āĀāèĀ ½āò |āāā||ā ‡ āŠā,āāò ‡ āŠā •āāĒā
āā°āēā ĀŌ|āā Ōōý |āāā||ā ‡ āŠā |ā||ā, |āāā||ā ‡ āŠā ‡ āŠāñāā|ā ‡ āŠā,āāò
(||āĀĀā||ā) Ōāñ °ā||āā Ōāñ|āā Ōō ý ‡ āiŠē |āāā||ā ‡ āŠā ‡ āŠāñāā|ā ‡ āŠā ‡ ū
½āāāŌ|āŌ ‡ āŠ |ā©āā ½āñĀĀ•āi Ōāñ Ōā||āñĀ Ēāñ||āñ |ā©āā ‡ āiŠē
¼āñ•ā||āñ ‡ āŠā ‡ āŠā³⁄₄āÃ ‡ āŠĀ|āāè Ōōý |āĀāèĀ ½āò ‡ āŠīē āā|ā|āñŌā
'āĒē‡āŠāĀ ‡ āŠāē ŌāĒāā||ā³⁄₄āāū Ōāñ|āāè Ōō •āāñ Ōā½āāō||ā ‡ āŠā Ōāā|ā
‡ āŠĀ|āāè Ōō f||Ōò ,ā||ā: Ōāā|āāè ŌāĒāā||ā³⁄₄ā ‡ āŠŌ|āñ Ōōý Ōā½āāō||ā
Ā ‡ ā<|ā 'āĀā 'āiĀñ |āĀāèĀ ½āò ŌāāPāāāĀ|ā Ōāñ •āā|āñ Ōōý
ŌāĀ½āāñ||ā ĀāŌāā³⁄₄āāā||ā ‡ āŠ Ōā||āñĀ |āāŌ ‡ āŠ ‡ āŠāē |āĀŌ
āā|āāā¹⁄₄ā||ā ,āāŌāāò ‡ āŠāē ‡ āŠāñāā|ā ‡ āŠā,āāò |ā ‡ āŠ 'āŌiūPā|āñ Ōōā
,ā||āñ ‡ āŠ āā % āŠ³⁄₄āā,āāò ‡ āŠāñ 'āĒēāāĀ|ā ‡ āŠĀ|āñ Ōōý •āōŌāñ
,āāāfā|āð‡ā<‡āŠ Ōāñ āā||ā‡āŠĒā||āñ |āāĒāā ŌāĀ½āāñ||ā (‡āā|Ēē||āñāāĒā||ā)
‡ āŠāē ½āāāā •āā °āü⊔ •āā|āāè Ōō |ā°ā ,āā'ā % āŠāñāāfā|ā ,ā©ā|āā
,||āñāā•ā|ā Ōāñ|āñ Ōōā ,āāōĀ |āĀāèĀ ‡ āŠāñ 'āi||ā: Ōāā½āā||ā³⁄₄ā āāŌ©āāā|ā
½āò Ēāā||āñ ‡ āŠā ‡ āŠā³⁄₄āÃ ,ā||ā āā|āāā|āŌ> ŌāĀ½āāñ||ā
||āāĀ ‡ āā|Ēē||āñāāĒā||ā ‡ āŠĀ|āā Ōōý fŌāāē 'āĒē ‡ āŠāĀ ©āā³⁄₄āĀāfj,
'āōĀā©āā³⁄₄āĀāfj, 'āōāā||ā % āŠ³⁄₄āā•ā, 'āāē³⁄₄āiŌā ŌāĒāā||ā³⁄₄ā |ā©āā
•ā||ā||āāāŌā ,āāāā°ā ,ā||ā: Ōāā|āāè ŌāĒāā||ā³⁄₄āāū ½ā||āiŌ³⁄₄ā ½āò 'āā³⁄₄āāè
•āā|āāè Ōō āā•ā||āŌāñ āā|āāā¹⁄₄ā,ā 'āĒē ‡ āŠāĀ ‡ āñŠ ŌāĀ½āāō||ā ‡ āŠā
Ōāā|ā Ōāñ|āā Ōōý

'āāōfāāò ½āò Ōā½ā||ā³⁄₄ā||ā -

'āāōfāāò ½āò |āāā||ā ‡ āŠā |ā||ā ||āŌāē Ōāñ|āā Ōō 'āĀ||āi 'ā³⁄₄āāĀ|āĀā
½āò Ōāñ ĀŌñ 'āāāĀ|ā|āĀ||ā ‡ āñŠ Ōāā©ā ,ā'ā||āñ |³⁄₄ā|āŌāĀ ‡ āŠāñ 'āāōfāñ
ŌāĀ½āāñ||ā 'āĀā Ōā½āāā||ā|ā ‡ āŠĀ|āñ Ōō ý ŌāĀ½āāñ||ā, Ōā½ā||ā³⁄₄ā||ā
‡ āñŠ Ōāā©ā-Ōāā©ā 'āāōfāāò ½āò |āðāā®, 'āĒē ‡ āŠā|ā ‡ |āā •āĒā ‡ āñŠ
'āĒēā|ā ,ā°āē'ā||ā ,āāāā°ā āā%āŠ³⁄₄āā,āāò ‡ āŠā ¼āāē āā||ā³⁄₄ā||āā ‡ āŠĀ|āñ
Ōōý

Pā||āā / ½ā>Ā ‡ āñŠ Ēāñ|āāò ½āò 'āāōfāāò ‡ āŠāē 'āĒēĀāā¹⁄₂¼ā ‡ āŠ
,ā|āŌ©āā ½āò āā‡āŠŌāā||ā ,||Ōò ...'āĀ Ōāñ Ēāāò> Ēāñ|āñ Ōō ý ‡ ā<³⁄₄āā
,āā'ā •āā||ā|āñ Ōō āā‡āŠ ‡ āŌāā ‡ ā<³⁄₄āāò āā‡āŠ³⁄₄āā •āā|āā Ōō ?

Pā||āñ / ½ā>Ā ‡ āñŠ 'āāōfāñ ‡ āŠāñ Ēāāò> Ēāñ||āñ Ōāñ 'āāōfāñ ½āò •āŌāŌ-
•āŌāŌ ,āāōĀ ,āāāfā‡āŠ |āāĒāā³⁄₄āò āā||ā‡āŠĒā||āñ ĒāŌā|āāè Ōōý ‡ āŌāā

1ãõõfãñ ½ãò „1ãããÖ©ã|ã 1ãã¹ã ÖãÀ½ããñ¶ã (,ããùãã ‡ ã<Ôã¶ã) ‡ ãŠãè
 Ôããã % ãŠ³⁄ã|ãã ‡ ãñŠ ‡ ãŠãÀ¶ã Öãñ|ãã Ööý ,ããùãã ‡ ã<Ôã¶ã,
 ãã•ãªÆããÊã¶ã, Ôããf>ãñ‡ãŠãfãã¶ã¶ã ,ãããã¹ã 1ãã¹ã Öã½ããó¶ã Ööý

**„Pã Nãñ¶ããè ‡ãñŠ •ã¶|ãì,ããò ½ãò ½ãããÔã¹ãñããìã³⁄ããò ,ããòÀ
 Ôãã;ã;³⁄ããò ‡ãŠãè Ôã½ããã¶|ã|ã Øããã|ã : -**

‡ ã<³⁄ãã ,ãã¹ã¶ãñ ‡ ãŠ¹⁄ããè ÔããñPãã Öö ãã ‡ ãŠ ÍãÀãèÀ ‡ ãŠã ðãùPãã
 ãã ‡ ãŠÔã ‡ ãñŠ ¹ãÀã ãã¶ãããìPã|ã Öãñ|ãã Öö? ÍãÀãèÀ ‡ ãŠãñ † ‡ ãŠ
 ãã¶ãããìPã|ã ,ãã‡ãŠãÀ ¹ãÆªã¶ã ‡ ãŠÀ¶ãñ ‡ ãñŠ ããÊã† ,ãããÖ©ã³⁄ããò ‡ãŠã
 ðãùPãã Öãñ|ãã Öö, ãã•ãÔãñ ‡ããŠ‡ãŠãÊã ‡ãŠÖ|ãñ Öö ý fÔã ‡ããŠ‡ãŠãÊã
 Ôãñ ½ãããÔã ¹ãñããìã³⁄ããã •ãìü;ãè Öãññ|ããè Öö ý ‡ ããŠ ‡ãŠãÊã ‡ãñŠ
 ããìããã¹⁄ã¶¶ã •ããñü;ãò ¹ãÀ ½ãããÔã ¹ãñããìã³⁄ããã ããìããã¹⁄ã¶¶ã ‡ãŠã³⁄ãÀ
 ‡ãŠÀ|ããè Öö ,ããòÀ ÍãÀãèÀ ‡ãŠãñ Øããã|ã ¹ãÆªã¶ã ‡ãŠÀ¶ãñ ½ãò
 ÔãÖã³⁄ã ‡ãŠ Öãñ|ããè Ööý ,ãã¹ã¶ãñ ¹ñÆãã ÖãñØãã ãã ‡ãŠ ãã ‡ãŠ¶Öãè
 ‡ãŠãÀ¶ããò Ôãñ Ö;ã;ãè >ì> •ãã¶ãñ ¹ãÀ ³⁄ãã ½ãããÔã ¹ãñããìã³⁄ããò ‡ãñŠ ¹ãŠ>
 •ãã¶ãñ Ôãñ ¹ãÆ¹⁄ããããìã|ã •ããñü; ‡ãŠã ‡ãŠã³⁄ãÀ ,ãìãÁ® Öãñ •ãã|ãã Öö ý
 ÍãÀãèÀ ‡ãŠãñ ÔãìPããÁ Á¹ã Ôãñ Øããã|ã ¹ãÆªã¶ã ‡ãŠÀ¶ãñ ‡ãñŠ ããÊã†
 ¹ãñããìã³⁄ããò ,ããòÀ Ôãã;ã;³⁄ããò ‡ãŠã Ôã½ããã¶|ã|ã ‡ãŠã³⁄ãÀ ,ããìãì³⁄ã‡ãŠ
 Öö ý

**ããìããã¹⁄ã¶¶ã •ããèìãfããããÀ³⁄ããò ½ãò Øããã|ã ‡ãŠãè ãã¹⁄ã¶¶ã-
 ãã¹⁄ã¶¶ã ãã%ãŠ³⁄ãã ããìãããfã -**

† ‡ãŠ ‡ãŠãñããìã ‡ãŠãè³⁄ã •ããèìã •ãòÔãñ -,ã¹⁄ããèªãã, ‡ãìŠ>¹ããª
 (Pseudopodia) ‡ãŠãè ÔãÖã³⁄ã|ãã Ôãñ PãÊã|ãã Öö ý ‡ãìŠœ
 † ‡ãŠ ‡ãŠãñããìã ‡ãŠãè³⁄ã •ããèìã •ãòÔãñ ¹ãòÀ½ããèããìã³⁄ã¹⁄ã, Àãñ¹⁄ã
 •ãòÔããè ÔããÀPã¶ãã ÔããèããÊã³⁄ãã ‡ãŠãè ÔãÖã³⁄ã|ãã Ôãñ Øããã|ã
 ‡ãŠÀ|ãã Öö ý

‡ãìŠœ ªÖì‡ãŠãñããìã ‡ãŠãè³⁄ã tUrq ããªã¶ãã Ö;ã;ãè ‡ãñŠ ðããPãñ ÌããÊãñ
 Öãñ|ãñ Öö •ãòÔãñ - ‡ãñŠPãì,ãã •ããñ ããìãìãñÔã ÔããÀPã¶ãã Ôãì ‡ãŠ
 (Ôããè>ãè) ‡ãŠãè ÔãÖã³⁄ã|ãã Ôãñ PãÊã|ãã Öö ý

Ôã½ãì³, ¶ãããª³⁄ããò ,ãããã¹ã ½ãò ÀÖ¶ãñ ÌããÊãñ tUrq •ãòÔãñ ½ãœÊããè ,ãããã¹ã
 Øããã|ã ‡ãñŠ ããÊã† ¹ãÆããñã (Fins)‡ãŠãè ÔãÖã³⁄ã|ãã Êãñ|ããè Ööý Ôããã¹ã
 ÀòÔã‡ãŠÀ PãÊã|ãñ Öö ý ããPãããü;³⁄ããù ¹ããÆããò ‡ãŠãè ÔãÖã³⁄ã|ãã Ôãñ
 „ü;|ããè Ìã ¹ãòÀãò ‡ãŠãè ÔãÖã³⁄ã|ãã Ôãñ PãÊã|ããè Ööý ¹ããùPã
 ,ããØãìããÊã³⁄ããò ÌããÊãñ ‡ãìŠœ tUrq PããÀ ¹ãòÀãò Ôãñ PãÊã|ãñ Ööý †ñÔãñ
 ¹ããùPã tUrqvksa ‡ãŠã ¶ãã¹⁄ã ,ã¹ã¶ããè „||ãÀ ¹ãìããÔ|ã‡ãŠã ½ãò ããÊãããÆã†ý
 ½ã¶ãìÓ³⁄ã, ØãìããÀÊÊãã ,ããããªªñ ¹ãòÀãò Ôãñ PãÊã|ãñ Öö ý

**¼ãñ•ã¶ã ¾ãã¹ã¶ã, ,ããlããÔã Çããñ•ã¶ãñ, 'ãÆ•ã¶ã¶ã |ã©ãã
 'ãÆ‡ãŠãè¥ãÃ¶ã ½ãò Ôããä'ã ÔãÖã¾ã‡ãŠ -**

•ã¶ãlãÀ ããlã‡ãŠãÀ ‡ãñŠ ããÊã† PãÊã‡ãŠÀ Üãã|ã ÊãÔãã|ãñ Öö ý 'ãã¶ããè
 'ããè¶ãñ ‡ãñŠ ããÊã† ¶ããè ¾ãã °ããlãü|ãè ‡ãñŠ 'ããÔã •ãã¶ãã 'ãü|ãã Ööý
 ½ã¶ãìÓ¾ã ,ã¶ãã „Ôãã¶ãñ ‡ãñŠ ããÊã† Çãñ|ã ‡ãŠãñ •ããñ|ã|ãã ,oa cht °ããñ|ãã
 Ööý ½ã‡ãŠã¶ã °ã¶ãã¶ãñ ‡ãñŠ ããÊã† fÃ>, ãã½ã>á>ãè ,ããããª ‡ãŠãñ ðãñ¶ãã
 'ãü|ãã Ööý fÔããè 'ãÆ‡ãŠãÀ ,ã¹ã¶ããè •ãããã|ã lãðãã® ‡ãñŠ ããÊã† 'ããð£ããò
 ½ãò °ããè•ããò ‡ãŠã ãããÇãÀãlã ('ãÆ‡ãŠãè¥ãÃ¶ã) Öãñ|ãã Ööý ‡ãìŠce •ã¶ãì
 •ãðÔãñ ½ãceÊããè, 'ããããè 'ãÆ•ã¶ã¶ã ‡ãñŠ ããÊã† Ôãã©ããè ‡ãŠãè |ãÊããlã
 Öñ|ãì Ôããã|ãlããèÊã Öãñ|ãñ Ööý



``‡ãŠ ããªÊããè |ã©ãã „ÔããñŠ °ããñ"

ãããªã Ôãã0 11.13 'ãÆ•ã¶ã¶ã 'ãÀ ‡ãŠ •ããlã Ôãñ °ÔãÀñ •ããlã ‡ãŠãè „'ããã|ã

'ãÆ•ã¶ã¶ã : -

,ã¹ã¶ãñ •ãðÔãñ •ããlã ‡ãŠãè „'ããã|ã-

'ãÆ•ã¶ã¶ã Ôã•ããlããò ‡ãŠã 'ãÆ½ãìÇã Êããã¥ã Ööý ‡ãŠ •ããlã ‡ãŠã
 ,ã¹ã¶ãñ Ôãè 'ãÆ‡ãŠãÀ ‡ãñŠ •ããlã ‡ãŠãñ •ã¶½ã °ñ¶ãã 'ãÆ•ã¶ã¶ã Ööý
 'ãÆ•ã¶ã¶ã •ããlã¶ã ‡ãŠãè ‡ãŠ Ôlãã¼ããããlã‡ãŠ 'ãÆãã%ãŠ¾ãã Ööý •ã¶ãì
 Öãñ ¾ãã 'ããð£ãñ, 'ãÆ•ã¶ã¶ã ‡ãŠãè ãã½ã|ãã ÀÇã|ãñ Ööý Ôã¼ããè •ããlã
 Ôã½ã¾ã ‡ãñŠ Ôãã©ã-Ôãã©ã lãðãã® ‡ãŠÀ ,ã¶ã|ã: ½ãð¾ãì ‡ãŠãñ 'ãÆã¹ã
 Öãñ|ãñ Ööý 'ããð£ãñ ¾ãã •ã¶ãì,ããò ‡ãŠãñ ,ã¹ã¶ããè •ãããã|ã keãe
 DeefmlelJe °ã¶ãã¾ãñ ÀÇã¶ãñ ‡ãñŠ ããÊã† heÇpeveve ‡ãŠÀ¶ãã
 ,ããlãl¾ã‡ãŠ Ööý •ããlããò ½ãò 'ãÆ•ã¶ã¶ã ¶ã Öãñ |ããñ ‡ã<¾ãã ÖãñÔãã ?
 'ãÆ¾ãñ ‡ãŠ •ããlã ‡ãŠãè •ãããã|ã „Ôã ‡ãŠãè ½ãð¾ãì ‡ãñŠ Ôãã©ã
 Ôã½ãã¹ã Öãñ •ãã¾ãñÔããè ,ããðÀ ‡ãŠ ‡ñÔãã Ôã½ã¾ã ,ãã¾ãñÔãã •ãª
 'ãð©lããè 'ãÀ ‡ãŠãñfÃ •ããlã ¶ãÖãè ÀÖ •ãã¾ãñÔããý 'ãÆ•ã¶ã¶ã 'ãÀã Ôãè
 ¶ãfÃ •ãããã|ã¾ããò ‡ãŠãè „'ããã|ã Ôã½¼ãlã Öö ,ã|ã: 'ãÆ•ã¶ã¶ã Ôãñ Ôãè
 •ããlã¶ã ½ãò Ôã|ã|ãã Ôãlãã¶ãããlãã Öãñ|ããè Öö (ãããªã 11.13)ý



चित्र सं० 11.15 अजूबे की पत्ती द्वारा वर्धी प्रजनन



,aaAan'aYa 'aAa ढ़ाŞÊa½ã

ÊaOaaढ़aŞÀ

ªaªa ढ़ाŞÊa½ã 'aAa

ããBª"ª Ôãã0 11.16 ढ़ाढ़oŞãã"ª½ã aaÌãããÊã¾ãão 'ãÀã ÌãÊããÊ 'ãÆ•ã¶ã¶ã

2. ,ãÊãöããOãढ़ãŞ 'ãÆ•ã¶ã¶ã -

fÔã aaÌãããÊã ½ão ¶ã¾ãñ •ããèÌã ढ़ãŞãè „Ìããã¶ã ढ़ ढ़ãŞ Ôãè •ã¶ã ढ़ãŞ Ôãñ
Ôãñ|ããè Ööý •ããèÌãÊããããÀ¾ãão ½ão ,ãÊãöããOã ढ़ãŞ •ã¶ã¶ã
ãã¶ã½¶ãããÊãããÊããã aaÌãããÊã¾ãão Ôãñ Ôãñ|ãã Öö-

ããÌãÊã¶ã¶ã 'ãÀã -

fÔã aaÌãããÊã Ôãñ 'ãÆã¾ã: ढ़ ढ़ãŞ ढ़ãŞãñããÌã ढ़ãŞãè¾ã •ããèÌã 'ãÆ•ã¶ã¶ã
ढ़ãŞÀ|ãñ Öö ý •ããèÌã ढ़ãŞã 'ãÌãã ÌãÀãèÀ ªãñ ¼ããOãão ½ão ªãü> •ãã|ãã Ööý
fÔã½ão 'ãÖÊãñ ढ़ãñŞ¶ ढ़ãŞ ढ़ãŞã aaÌã¼ãã•ã¶ã Ôãñ|ãã Ööãã'ãŞÀ
ढ़ãŞãñããÌã ढ़ãŞã ªãñ ढ़ãŞãñããÌã ढ़ãŞããão ½ão ªãü> •ãã|ããè Ööý aaÌãÊã¶ã¶ã
'ãÀã •ããèÌãã¶ãì, ¾ãìOÊããè¶ãã, ,ã½ããèªãã ,ããããª Ôãìã½ãã •ããèÌã 'ãÆ•ã¶ã¶ã
ढ़ãŞÀ|ãñ Öö

½ãìढ़ãìŞÊã¶ã aaÌãããÊã (ªããã;ãOã) 'ãÀã -

fÔã aaÌãããÊã ½ão ÌãÀãèÀ 'ãÀ ढ़ढ़ãŞ œãñ>ã Ôãã „¼ããÀ ªããÖÀ ढ़ãŞãè ,ããñÀ
ãã¶ã ढ़ãŞÊã¶ãñ ÊãOã|ãã Ööãã•ãÔãñ ½ãì ढ़ãìŞÊã(ªã;) ढ़ãŞÖ|ãñ Öö ý ¾ãÖ
½ãìढ़ãìŞÊã ÊããèÀñ-ÊããèÀñ ªãüãã Ôãñ •ãã|ãã Öö ,ããoÀ •ã¶ã ढ़ãŞ •ããèÌã Ôãñ
,ãÊãOã Ôãñ •ãã|ãã Ööý •ããÔãñ ¾ããèÔ> ½ãöý
ªãÖì ढ़ãŞãñããÌã ढ़ãŞãè¾ãã•ã¶ãì •ããÔãñ -Ô'ã¶ã, ½ãìüOãã ½ão ¼ããè
½ãì ढ़ãìŞÊã ÌãÀãèÀ ढ़ãñŞ Ôãã©ã •ãìüãã ÀÖ|ãã Ööý ÖãfìÊã ½ão ¼ããè
½ãìढ़ãìŞÊã¶ã 'ãÀã 'ãÆ•ã¶ã¶ããããããŞ¾ããã Ôãñ|ããè Ööý

ªããè•ãã¶ãì (Ô'ããñÀ) aaÌãããÊã 'ãÀã -

fÔã½ãò 'ããð£ãñ ½ãò ,ã¼ã¶ã ¶ã ããñ>ãè-ããñ>ãè ÀÞã¶ãã¾ãò °ã¶ã|ããè Öö ý
 f¶Öñâ °ããè•ãã¶ãì ‡ ãSÖ|ãñ Ööý ¾ãÖ °ããè•ãã¶ãì 'ãÆãã|ã ‡ ãîSÊã
 'ãããÀããÖ©ããã|ã¾ããò ('ãã¶ããè |ã©ãã ¼ããñ•ã¶ã ,ããããª ‡ãSãè ‡ãS½ããè)½ãò
 ¼ããè •ããèãã|ã|ã ÀÖ|ãñ Öö ý °ããè•ãã¶ãì Öìãã ‡ãñS Ôãã©ã ¶ã½ã Ö©ãã¶ããò
 'ãÀ ããØãÀ •ãã|ãñ Öö •ããñ ,ãã ‡ãîSããÀ|ã Öãñ ‡ãSÀ ¶ã¾ãñ 'ããð£ãñ ‡ãSãñ
 •ã¶½ã ãñ|ãñ Öö •ãöÔãñ °ãÆñ, Þã½ãüñ, ãÞããÀ ,ããããª 'ãÀ 'ãS¹ãúS¹ª
 ÊãØã¶ãã |ã©ãã ãã¶ãÀ¶ãÀ ØããèÊãñ Ö©ãã¶ã 'ãÀ ‡ãSãfÃ •ã½ã¶ãã ,ããããª
 'ãS¹ãúS¹ªè, ÍãðÌããÊã, ½ããüÔã ,ããöÀ 'ãS¶ãÃ ½ãò °ããè•ãã¶ãì 'ãÀã •ã¶ã¶ã
 Öãñ|ãã Öö (ããÞãª 11.17)ý

°ããè•ãã¶ãì



‡ãSÌã‡ãS |ã¶ãì

ããÞãª Ôãã0 11.17 Àãf•ããñ¹ãÔã ('ããS¹ãíSª) ½ãò °ããè•ãã¶ãì 'ãÀã 'ãÆã•ã¶ã¶ã

¹ãì¶ã•ãÃ¶ã¶ã 'ãÀã -

‡ ãîSce •ã¶ãì •ãöÔãñ-¹Êãñ¶ãñããÀ¾ãã,Öãf;Êã,ããÔã|ããÀã ½ããèÊããè,
 ‡ãñSÞãì,ãã ,ããããª ,ã¹ã¶ãñ ÍãÀãèÀ ‡ãñS ‡ãîSce ¼ããØããò Ôãñ 'ãíÀã •ããèÌã
 °ã¶ã Êãñ¶ãñ ‡ãSãè ãã½ã|ãã ÀÆã|ãñ Öö ý ÍãÀãèÀ ‡ãñS ‡ãS ¼ããØã Ôãñ
 ‡ãS 'ãíÀñ •ããèÌãããÀãè ‡ãSãñ „¹ã¶ã ‡ãSÀ¶ãñ ‡ãSãè ãã%ãS¾ãã ¾ãã
 ‡ãS>ñ ¼ããØã ‡ãSñ 'ãì¶ã: °ã¶ã •ãã|ãñ ‡ãSãè ãã½ã|ãã
 ‡ãSãñ 'ãì¶ã•ãÃ¶ã¶ã ‡ãSÖ|ãñ Öö ý
 ‡ãîSce •ã¶ãìvksa ½ãò 'ãì¶ã•ãÃ¶ã¶ã ‡ãSãè ãã½ã|ãã 'ãíÀñ ÍãÀãèÀ ½ãò ¶ã
 ÀÖ ‡ãSÀ ‡ãîSce ¼ããØããò ½ãò Ôããèãã½ã|ã ÀÖ|ããè Öö •ãöÔãñ
 ããce¹ã‡ãSÊããè ‡ãSãè 'ãíãíce ‡ãS> •ãã|ãñ 'ãÀ 'ãì¶ã: °ã¶ã •ãã|ããè Öö ý

3. ÊãöããØã‡ãS¹ãÆ•ã¶ã¶ã -

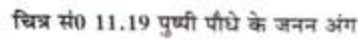
fÔã ããÌããã£ã ½ãò ¶ã¾ãñ ããñ ããÌããã¼ã¶ã ããÊããØããò ÍããÊãñ
 •ããèÌãããããÀ¾ããò Ôãñ •ããèÌã ‡ãSãè „¹ããã|ã Öãñ|ããè Ööý ÊãöããØã ‡ãS
 •ã¶ã¶ã ‡ãSÀ¶ãñ ÍããÊãñ •ããèÌããò ½ãò ããÌã|ãñÓã ,ããØã Öãñ|ãñ Öö,
 ãã•ã¶Öö •ã¶ã¶ã ,ããØã ‡ãSÖ|ãñ Öö ý

•ã¶ãì,ããò ½ãò ÊãöããØã‡ãS¹ãÆ•ã¶ã¶ã -

¶āÀ •ā¶ā¶ā ,āâðā ‡ āŠāñ ÌāðÓā¶ā † Ìāâ ½āāªā •ā¶ā¶ā ,āâðā ‡ āŠāñ ,ā¶
;āÍā¾ā ‡ āŠÖ|āñ Öö ý f¶ā ,āâðāð ½āð ¾āìð½ā ‡ āŠ „¶ā¶ā Öāñ|āñ Öö ý
ÌāðÓā¶ā ½āð ¶āÀ ¾āìð½ā ‡ āŠ (Íāì%āŠā¶āì) °ā¶ā|āñ Öö ,āāðÀ ,ā¶;āÍā¾ā
½āð ½āāªā ¾āìð½ā ‡ āŠ (,ā¶;ā¶āì) °ā¶ā|āñ Ööý Íāì%āŠā¶āì |ā©āā ,ā¶;ā¶āì
‡ āñŠ ,āā¹āÔā ½āð Ôāâ¾āāñ•ā¶ā Ôāñ ¾āìð½ā¶ā•ā (•āāfðāāñ) °ā¶ā|āñ
Ööý fÔā āā%āŠ¾āā ‡ āŠāñ āā¶āÓāñPā¶ā ‡ āŠÖ|āñ Öö (āāPāªā 11.18)ý
fÔā ¾āìð½ā¶ā•ā ½āñò āāÌā¼āā•ā¶ā † Ìāâ āāÌāāÍāÓ> 'āāāÀÌā|ā¶ā Öāñ|āñ
Öö āā•āÔāÔāñ ¶ā¾āā •āāèÌā °ā¶ā •āā|āñ Ööý ,āāāfā ‡ āŠāÍā •āāèÌāð ½āð
¶āÀ ¾āā ½āāªā •ā¶ā¶ā ,āâðā ,āÊāðā-,āÊāðā 'āā¾āñ •āā|āñ Ööý † ñÔāñ
•āāèÌāð ‡ āŠāñ † ‡ āŠāāÊāâðāāè ‡ āŠÖ|āñ Ööý •āðÔāñ - ½āāÊāāè,
½āñ□ ‡ āŠ, āāPāāü¾āā |ā©āā ½ā¶āìÓ¾ā ,āāāāý •āªā ¶āÀ ,āāðÀ ½āāªā
•ā¶ā¶ā ,āâðā † ‡ āŠ Öāè •ā¶āì ½āð 'āā¾āñ •āā|āñ Öö |āāñ f¶Öò āā
'āāÊāâðāāè •ā¶āì ‡ āŠÖ|āñ Öö •āðÔāñ - ‡ āñŠPāì,āāý

'āāðāāð ½āð Êāðāððā‡āŠ 'āÆ•ā¶ā¶ā -

'āìÓ'āāè 'āāðāāð ‡ āñŠ •ā¶ā¶ā ,āâðā 'āìÓ'ā ½āð 'āā¾āñ •āā|āñ Ööāý 'āìÓ'ā
¼āāè † ‡ āŠāāÊāâðāāè Öāñ|āñ Öö •āðÔāñ - Êāāð ‡ āŠāè, ‡ āŠªª 'āāāª
,ā©āÌāā āā'āāÊāâðāāè •āðÔāñ -ÔāÀÔāāð, Øāü;ÖÊā, ½ā>À ,āāāāý
Ôāā½ā¶¾āā: † ‡ āŠāāÊāâðāāè 'āìÓ'ā ‡ āŠ½ā āā½āÊā|āñ Ööý 'āìÓ'ā ‡ āñŠ
¶āÀ •ā¶ā¶ā ,āâðā ‡ āŠāñ 'āāì ‡ āñŠÔāÀ ,āāðÀ ½āāªā •ā¶ā¶ā ,āâðā
‡ āŠāñ Ôªāāè‡āñŠÔāÀ ‡ āŠÖ|āñ Öö (āāPāªā 11.19)ý



1'aaaÀlāñlā Ôāñ ½ā→À, ÔāÀÔāāò, Ôāñ½āÊā, Øāiü;ÔÊā |ā©āā fā|āiAā ‡āñŠ
 'aiÓ'ā ‡āŠāāā|ā ‡āŠÀòý 'āÆ|³4āñ ‡āŠ 'aiÓ'ā ‡āñŠ 'aiā ‡āñŠÔāÀ , āāòÀ
 Ôāāè ‡āñŠÔāÀ ‡āŠāè ÔāāÀPā¶āā ‡āñŠ āāPāā , āā¶āāè Glòej 'aiāāÔ|ā ‡āŠā
 ½āò 'ā¶āā³4āò ý f¶ā vaxksa ‡āŠāè ÔāāÀPā¶āā, āāò ½āò ‡āŠāā
 Ôā½āā¶ā|āā Öö ? 'aiā ‡āñŠÔāÀ |ā©āā Ôāāè ‡āñŠÔāÀ ÔāāÀPā¶āā ½āò ‡āŠ
 'iÔāÀñ Ôāñ āā½ā¶¶ā Ôāñ|āñ Öö 'āÀ¶¶āi 'āÆ|³4āñ ‡āŠ 'aiÓ'ā ½āò
 ÊāØā¼āØā Ôā½āā¶ā Ôāñ|āñ Öö ý 'aiā ‡āñŠÔāÀ ½āñā 'āÀāØā ‡āŠ¥ā , āāòÀ
 Ôāāè ‡āñŠÔāj ds v¥;āíā³4ā esa chtk.M āāíā ‡āŠāāÔā|ā Ôāñ|āñ Öö ý ‡āŠāā
 6 ½āò , āā'ā •ā¶ā Pāi ‡āñŠ Öö āā ‡āŠ 'āÀāØā ‡āŠ¥ā Ôāñ ¶āÀ ¾āiØ½ā ‡āŠ
 |ā©āā , ā¥;āíā³4ā ‡āñŠ 'āāè•āā¥; ½āò ½āāā ¾āiØ½ā ‡āŠ 'ā¶ā|āñ Öö ý
 'āÀāØā ‡āŠ¥āāò ‡āŠā ‡āŠ 'aiÓ'ā ‡āñŠ 'aiā ‡āñŠÔāÀ Ôāñ , Ôāāè •āāā|ā
 ‡āñŠ 'aiÓ'ā ‡āñŠ Ôāāè ‡āñŠÔāÀ ‡āñŠ íāā|āÀ ‡āŠāØāÆ |ā ‡āŠ 'āÖúiPā¶āñ
 ‡āŠāè āā%āš³4āā ‡āŠāñ 'āÀāØā¥ā ‡āŠÖ|āñ Öö ý
 íāāā|āÀ ‡āŠāØāÆ 'āÀ 'āÀāØā ‡āŠ¥ā , āā ‡āiŠāāÀ|ā Ôāñ ‡āŠÀ ¶āÀ
 ¾āiØ½ā ‡āŠāò ‡āŠāñ , ā¥;āíā³4ā ‡āñŠ , ā¶ā , 'āāāÔ©ā|ā 'āāè•āā¥; ‡āñŠ
 ½āāā ¾āiØ½ā ‡āŠ Ôāñ āā½āÊā|āñ Öö (‡āŠāā 6 āāPāā Ôāāò 8.16)ý

¾àìØ½ã † ãŠãò † ãñŠ ãä½ãÊã¶ãñ Ôãñ ¾àìØ½ã¶ã•ã † ãŠã ãä¶ã½ããÃ¶ã
 Ôãñ|ãã Ööý fÔã äã%ãŠ¾ãã † ãŠãñ † ã<¾ãã † ãŠÖ|ãñ Öö ? Ôã¼ããè 'àiÓ¹ããè
 'ããô£ããò ½ãò ÊãöããÔã†ãŠ 'ãÆ•ã¶ã¶ã fÔããè 'ãÆ†ãŠãÀ Ôãñ|ãã Öö ý

°ããè•ã † ãŠã ãä¶ã½ããÃ¶ã:

,ãã¹ã •ã¶ã Pài † ãñŠ Öö äã † ãŠ 'àiÓ¹ã ½ãò 'ãÀãÔã¶ã |ã©ãã äã¶ãÓãñPã¶ã
 äã %ã ãŠ¾ãã Ôãñ|ããè Ööý fÔã äã %ã ãŠ¾ãã † ãñŠ 'ãÍPãã|ã~ 'àiÓ¹ã † ãñŠ
 °ããÛãÊã, °Êã |ã©ãã 'àiã†ãñŠÔãÀ ,ããããª ÔãíCã†ãŠÀ äãÔãÀ •ãã|ãñ Ööý
 ,ã¹ã¶ãñ Cãñ|ã/°ããÔã/°ãããèPãã ½ãò ÊãÔãñ ½ã>À / äã¼ã¶ã|ãè/ °ãöÔã¶ã
 † ãñŠ äãCãÊãñ 'àiÓ¹ã † ãŠã ,ãìãÊããñ†ãŠ¶ã † ãŠãèãã•ã†ý 'àiÓ¹ã äãCãÊã¶ãñ
 † ãñŠ 'ãÍPãã|ã~ äã † ãŠ|ã¶ãñ äãª¶ããò ½ãò 'àiÓ¹ã † ãñŠ ½ããª ¼ããÔã ,ã¶
 |ãíã¾ã Ôãñ ½ã>À/äã¼ã¶ã|ãè/°ãöÔã¶ã † ãñŠ Â¹ã ½ãò 'ãŠÊã ½ãò
 'ãããÀìããã|ãÃ|ã Ôãñ|ãã Öö? ,ã¶|ãíã¾ã † ãŠãè °ãèìããÀ 'ãããÀìããã|ãÃ|ã
 Ôãñ † ãŠÀ 'ãŠÊã °ã¶ã|ããè Ööý 'ãŠÊã ½ãò Ôãè °ããè•ã † ãŠã äã¶ã½ããÃ¶ã
 Ôãñ|ãã Ööý † ã<¾ãã ,ãã¹ã¶ãñ ½ã>À † ãŠãè 'ãŠÊããè † ãŠãñ cãèÊãã Öö?
 † ã<¾ãã äãªCãã¾ããè °ñ|ãã Öö? ½ã>À •ããñ Ö½ã Cãã|ãñ Öö ìãÖ † ã<¾ãã Öö?
 ìãÖ °ããè•ã Ööý † ãŠ ½ã>À † ãŠãè 'ãŠÊããè/†ãŠ äã¼ã¶ã|ãè/†ãŠ † ãŠÀöÊãã
 ½ãò äã†ãŠ|ã¶ãñ °ããè•ã Ôãñ Ôã†ãŠ|ãñ Ööã ?

†ã<¾ãã ,ãã¹ã •ã¶ã|ãñ Öö -

- Àñ¹ã<Êããèãìã¾ãã (Rafflesia) † ãŠã 'àiÓ¹ã ÔãªÔãñ °ãü|ã |ã©ãã
 ìãíããÊ¹ãŠ¾ãã (Wolfia) † ãŠã 'àiÓ¹ã ÔãªÔãñ cãñ>ã Ôãñ|ãã Ööý
- Êãñ|ãñfããÔã¾ãã (Lodoicea) † ãŠã °ããè•ã ÔãªÔãñ °ãü|ã |ã©ãã ,ãããã†ãŠŠ;
 † ãŠã °ããè•ã ÔãªÔãñ cãñ>ã Ôãñ|ãã Ööý
- 'ãŠÊã ,ã¶|ãíã¾ã † ãŠã 'ãããÀìããã|ãÃ|ã Â¹ã Öö •ããñ äã¶ãÓãñPã¶ã † ãñŠ
 'ãŠÊãÔìãÂ¹ã °ã¶ã|ãã Ööý
- ÔãñÌã, ¶ããìã¹ããããè, ,ããããª ,ãÔã|¾ã ¾ãã ¢ãíŸã 'ãŠÊã (False Fruit) Ööý

'ãÆ†ãŠãè¶ãÃ¶ã:

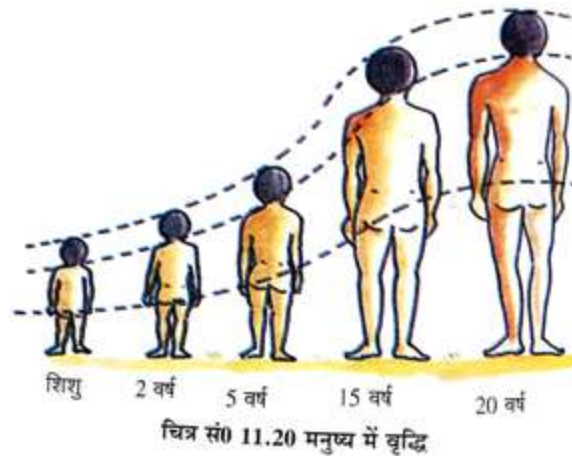
Ôã½ããè † ãñŠ ½ããòÔã½ã ½ãò † ãŠ¼ããè ,ãã¹ã¶ãñ Ôãñ½ãÊã/½ãªÀ/
 ÛããÔããò /ããPãÊããªªãÊã † ãñŠ 'ãñü| 'ããô£ããò Ôãñ ÂfÃ Ôã½ãã¶ã ¾ãã
 Pã¹ã>ãè ÔããPã¶ãã,ããò † ãŠãñ „ü|ãñ Òì† °ñCãã Öö? äã † ãŠÔããè † ãŠ
 ÂfÃ Ôã½ãã¶ã ÔããÀPã¶ãã † ãŠãñ 'ã † ãŠü| † ãŠÀ °ñããCã¾ãñý
 † ã<¾ãã buesa † ãŠãñfÃ † ãŠü|ãèìajpuk äã½ãÊã|ããè Öö? ¾ãÔãè °ããè•ã Ööý
 ¾ãÖ °ããè•ã ÂfÃ ÔãÖì¾ã ÀPã¶ãã Ôãñ Òìãã † ãñŠ 'ãÃã °ìÀ-°ìÀ |ã†ãŠ „ü|
 •ãã|ãñ Ööý fÔããè äã %ã ãŠ¾ãã † ãŠãñ °ããè•ããò
 † ãŠã 'ãÆ † ãŠãè¶ãÃ¶ã (Dispersal of Seeds) † ãŠÖ|ãñ Ööý °ããè•ããò † ãñŠ
 'ãÆ†ãŠãè¶ãÃ¶ã † ãñŠ äãÊã† ½ãã£¾ã½ã † ãŠãè ,ããìãí¾ã†ãŠ|ãã Ôãñ|ããè Öö

‡ã<³⁄₄ãðòãã‡ãŠ ¹ãðôãñ ‡‡ãŠ Ô©ãã¶ã Ôãñ ¹ÔãÀñ Ô©ãã¶ã |ã‡ãŠ ¶ãÖãé •ãã
Ôã‡ãŠ|ãñ Ööý

¶ããããÀ³⁄₄ãÊã, ,ãã¹⁄₂ã, ,ã¹⁄₂ãÂª, ¶ããè¹⁄₂ã, ¹ããè¹ãÊã, ‡ãŠ¹⁄₂ãÊã, ,ãããªªª ¹ãñü;
¹ãðôããò ‡ãñŠ °ããè•ããò ‡ãñŠ ¹ãÆ ‡ãŠãè¥ãÃ¶ã ‡ãñŠ ¹⁄₂ãã£³⁄₄ã¹⁄₂ã ‡ã<³⁄₄ãã
Öãñ|ãñ Öö? ,ã¹ã¶ããè ,ã¹⁄₄³⁄₄ããÔã ¹ãããÔã|ã‡ãŠã ¹⁄₂ãò ããÊãããÆã†ý

•ããèÌã£ããããÀ³⁄₄ããò ¹⁄₂ãò Ìãðãã® ,ããòÀ ããÌã‡ãŠãÔã :-

**ÌãÀãèÀ ‡ãñŠ ¹⁄₄ããÖããò ‡ãŠãè ³⁄₄ãã ¹ãÎãñ ÌãÀãèÀ ‡ãŠãè
Ìãðãã® ‡ãŠãñããÌã‡ãŠã ããÌã¹⁄₄ãã•ã¶ã ¯ãÀã Öãñ|ããè Öö -**



Ìãðãã® ‡Ìãã ããÌã ‡ãŠãÔã, •ããèÌã¶ã ‡ãñŠ Êããã¥ããò ¹⁄₂ãò Ôãñ ‡‡ãŠ Ööý
¹ãÆ¹⁄₄ãñ ‡ãŠ •ããèÌã£ãããÀãè °ãüç|ãã Ööý °ãÞãã ‡‡ãŠ ãã¶ãªª ªñÆã|ãñ Öãè
ªñÆã|ãñ °ãüã Öãñ •ãã|ãã Ööý °ããè•ã ,ãã‡ãÎãŠããÀã Öãñ‡ãŠÀ ¹ãðôãã ³⁄₄ãã
Ìãðãã °ã¶ã •ãã|ãã Ööý •ããèÌã£ããããÀ³⁄₄ããò ¹⁄₂ãò °ãüç|ãã ‡ãŠãè fÔã
ãã % ãŠ³⁄₄ãã ‡ãŠãñÌãðãã® ‡ãŠÖ|ãñ Ööý Ö¹⁄₂ããÀã ¹ãÆãã|ããªª¶ã ‡ãŠã
,ã¶ã¹⁄₄ãÌã ³⁄₄ãÖ °ã|ãã|ãã Öö ãã‡ãŠ •ããèÌã-ã¶ã|ã òÌãã ¹ãñü-¹ãðôãñ Ìãðãã®
‡ãŠÀãñ Öö ý Ìãðãã® ‡ãñŠ ‡ãŠãÀ¥ã •ããèÌã ‡ãñŠ ,ãã ‡ãŠãÀ ‡Ìãã
,ãã³⁄₄ã|ã¶ã ¹⁄₂ãò ¹ãããÀã|ãã¶ã Öãñ|ãã Öö ý •ããèÌããò ¹⁄₂ãò Ìãðãã® ‡ãñŠ
Ôã¹⁄₂ã³⁄₄ã ‡ãŠãñããÌã‡ãŠã†ú ããÌã¹⁄₄ãã•ã¶ã ¯ãÀã ÔããÆ³⁄₄ãã ¹⁄₂ãò °ãüç|ããè Ööã

,ããÕÀ ãã'ãŠÀ ,ãã‡ãŠãÀ †Ìãã ,ãã‡ãðŠãã|ã ½ãò 'ãããÀÌã|ãÃ¶ã Öãñ|ãã Öö ý
 fÔã 'ãÆ‡ãŠãÀ ‡ãŠãñããÌã‡ãŠã,ããò ½ãñò Ìãðãã® ‡ãñŠ ‡ãŠãÀ¶ã ÌãÀãèÀ
 ‡ãñŠ ...|ã‡ãŠãò ,ããÕÀ ,ããØããò ‡ãñŠ ,ãã‡ãŠãÀ ½ãò Ìãðãã® Öãñ|ããè Öö
 (ããPãã 11.20)ý

**‡‡ãŠ ‡ãŠãñããÌã‡ãŠãè¾ã •ããèÌãÆããÀãè ½ãò ‡ãŠãñããÌã‡ãŠã
 Ìãðãã® -**

‡‡ãŠ ‡ãŠãñããÌã‡ãŠãè¾ã •ããèÌã •ãÕÖãñ ,ã½ããè°ãã ½ãò ¼ããñ¾ã 'ãã©ãÃ
 |ã©ãã •ãÊã ‡ãŠãñããÌã‡ãŠã ½ãò ÔããããPã|ã Öãñ|ãã ÀÖ|ãã Öö ãã•ãÔãÖãñ
 ,ã½ããè°ãã ,ã'ã¶ããè •ãðããÌã ‡ãŠ ãã %ã ãŠ¾ãã †ã Ôã½'ã¶¶ã ‡ãŠã|ãã Ööý
 ,ã¶ãì ‡ãìŠÊã 'Ìãã¾ãò ,ãã¶ãñ 'ãÀ ããÌã¼ãã•ã¶ã ‡ãñŠ Ýãè ‡ãŠ 'ãÔÊãñ
 ,ã½ããè°ãã ÊãØã¼ãØã 'ãñ Øãì¶ãã ,ãã‡ãŠãÀ ½ãò °ãü• •ãã|ãã Öö ,ããÕÀ
 ãã'ãŠÀ 'ãñ ¼ããØããò ½ãò ããÌã¼ãã‡ãã|ã Öãñ •ãã|ãã Ööý fÔã 'ãÆ‡ãŠãÀ ¾ãÖ
 ,ã'ã¶ããè ÔããÆ¾ãã ½ãò Ìãðãã® ‡ãŠã|ãã Ööý fÔããè 'ãÆ‡ãŠãÀ Ôã½ãÔã
 †‡ãŠ ‡ãŠãñããÌã‡ãŠãè¾ã •ããèÌãÆããããÀ¾ããò ½ãò Ìãðãã® |ã©ãã
 ããÌã¼ãã•ã¶ã ‡ãñŠ 'ãŠÊãÔãÀ'ã ÔããÆ¾ãã ½ãò Ìãðãã® Öãñ|ããè Ööý

'ããðÆããò ½ãò ,ããã¶ãããÌPã|ã Ìãðãã® -

‡ã¾ãã ,ãã½ã ‡ãñŠ Ôã¼ããè 'ãñü; ,ãã‡ãŠãÀ ,ãã‡ãðŠãã|ã ½ãò ‡‡ãŠ
 Ôã½ãã¶ã Öãñ|ãñ Öö ? ¶ãÖãéý ,ã¶¾ã 'ãñü;- 'ããðÆããò ½ãò ‡ã¾ãã
 ããÔ©ããã|ã Öãñ|ããè Öö ? Ìãñ ¼ããè ‡‡ãŠ Ôã½ãã¶ã ¶ãÖãé Öãñ|ãñ Öö
 ,ã©ããÃ|ããã 'ããðÆãñ ,ããã¶ãããÌPã|ã Ìãðãã® 'ÌããÃ|ãñ Ööãý ¾ãÖ
 ,ããÀ½¼ã ½ãò •ãÊãè-ãÊãè Ìãðãã® ‡ãŠã|ãñ Öö Êãñãã ‡ãŠ¶ã 'ãìÀã¶ãã
 Öãñ|ãñ ‡ãñŠ °ãã f¶ã‡ãñŠ ‡ãìŠœ Öãè ¼ããØããò ½ãò Ìãðãã® Öãñ|ããè Ööý
 fÔã 'ãÆ‡ãŠãÀ 'ããðÆããò ½ãò 'ãã¾ãñ •ãã¶ãñ ÌããÊãñ ããÌã¼ãã¾ããñ|ã ‡ãŠ
 ,ã©ããÃ|ã ããÌã¼ãã•ã¶ã ‡ãŠã¶ãñ ÌããÊããè ‡ãŠãñããÌã‡ãŠã,ããò ‡ãñŠ ‡ãŠãÀ¶ã
 Ìãðãã® •ããèÌã¶ã 'ã¾ãÃ¶ã PãÊã|ããè ÀÖ|ããè Ööý

‡ãìŠœ ,ããÕÀ ¼ããè •ãã¶ãò

- 'ããðÆããò ‡ãñŠ ÌãÆããè ¼ããØããò ½ãò 'ãã¾ããè •ãã¶ãñ ÌããÊããè
 ‡ãŠãñããÌã‡ãŠã,ããò ‡ãñŠ Ìãñ Ôã½ãìÖ ãã•ã¶ã½ãò ããÌã¼ãã•ã¶ã ‡ãŠãè
 ãã½ã|ãã Öãñ|ããè Öö ããÌã¼ãã¾ããñ|ã‡ãŠãè ...|ã‡ãŠ ‡ãŠÖÊãã|ãñ Ööý
- 'ããðÆããò ½ãò •ãü; ,ããÕÀ |ã¶ããò ‡ãñŠ ããÔãÀñ 'ãÀ ÌããèÓãÃÔ©ã
 ããÌã¼ãã¾ããñ|ã‡ãŠãè, 'ãìãÃ Ôããã¶ãÆ¾ããò (ØããüÝãò) 'ãÀ ,ã¶|ãããÌãÃÓ
 ããÌã¼ãã¾ããñãã|ã‡ãŠãè |ã©ãã 'ããÌããò ½ãò 'ããÌãÃ ããÌã¼ãã¾ããñ|ã‡ãŠ
 'ãã¾ãñ •ãã¶ãñ Ööý f¶ãÔãñ 'ããðÆãñ Êã½°ããfÃ |ã©ãã ½ããñãfÃ ½ãò
 Ìãðãã® ‡ãŠã|ãñ Öö ý
- 'ããðÆããò ½ãò ãã¶ã½ããÃ¶ã ‡ãŠãÀãè ãã %ã ãŠ¾ãã †ü,
 ããÌã¶ããÌã‡ãŠãÀ ‡ãŠãÀãè ãã %ã ãŠ¾ãã,ããò ‡ãŠãè |ãìÊã¶ãã ½ãò ,ãããfã ‡ãŠ

Öāñ|āāè Öö fÔāāèāāÊā † 'āāōfāñ •ā¶āi,āāò ‡ āŠāè |āiÊā¶āā ½āò °āüjñ
Öāñ|āñ Ööy

□ 'āāōfāāò ½āò İāðāā® ¶āā'a¶āñ ‡ āñŠ āāÊā † ,āāDtsuksehVj ‡ āŠā
'āÆ³⁄₄āāñØā ‡ āŠÀ|āñ Öö ý

**½ā¶āiÔ³⁄₄ā |ā©āā •ā¶āi ½āò † ‡ āŠ āā¶āāāİPā|ā ,āİāāāā |ā ‡ āŠ
İāðāā® -**

•ā¶āi,āāò ½āò •āōÔāñ ‡ āiŠ||āā, āā°āÊāāè |ā©āā °ā ‡ āŠÀāè ,āāāā ‡ āñŠ
°āPāāò ‡ āŠāñ °āüjñ °ñÊāā ÖāñØāā ý ‡ ā<³⁄₄āā ³⁄₄āñ āā¶āÀ¶āÀ °āüjñ
ÀÖ|āñ Öö ? ¶āÖāéy f¶ā ‡ āŠāè İāðāā® † ‡ āŠ āā¶āāāİPā|ā ,āā³⁄₄āi 'āÆ¹|ā
Öāñ¶āñ ‡ āñŠ °āā° Á ‡ āŠ •āā|āāè Öö ý „Ôā ‡ āñŠ ¼āāÀ ½āò |āāñ
'āāāİā|ā¶ā Öāñ Ôā ‡ āŠ|āā Öö 'āÀ¶āi Êā½°āāfĀ ¶āÖāé °āüjñāè Öö ý
•āōÔāñ Øāā³⁄₄ā ‡ āñŠ °āæüjñ / °āāæ³⁄₄āā •ā¶½ā ‡ āñŠ ‡ āiŠœ Ôā½ā³⁄₄ā °āā°
İāÖ † ‡ āŠ āā¶āāāİPā|ā Êā½°āāfĀ ‡ āŠāñ 'āÆ¹|ā Öāñ ‡ āŠÀ °āōÊā / Øāā³⁄₄ā
‡ āñŠ Ā¹ā ½āò 'āāāİāāā|ā¶ā Öāñ •āā|āāè Öö ý ,āPœñ 'āāñÔāŸā Ôāñ İāÖ
|āā°İĀÔ|ā |āāñ Öāñ|āā Öö 'āÀ¶āi „Ôā ‡ āŠāè Êā½°āāfĀ ½āò İāðāā® ¶āÖāé
Öāñ|āāè Öö ý fÔāāè 'āÆ ‡ āŠÀ Ôā¼āāè •ā¶āi † ‡ āŠ āā¶āāāİPā|ā
,āİāÔ©āā |ā ‡ āŠ İāðāā® ‡ āŠÀ|āñ Ööā „Ôā ‡ āñŠ °āā° İāðāā® Á ‡ āŠ •āā|āāè
Öö ý

**°āÖi ‡ āŠāñāāİā ‡ āŠāè³⁄₄ā •āāèİāāāĀāè ‡ āŠā 'āÆāÀ½¹⁄₄ā āā¶ā³⁄₄āāā½ā|ā
'āāāİā|ā¶āāāò ‡ āñŠ °āā° °āÖi ‡ āŠāñāāİā ‡ āŠāè³⁄₄ā •āāèİā ‡ āŠñ
āāİāāāİāÓ> ÔİāĀ¹ā ½āò Öāñ|āā Öö -**

āā%āŠ³⁄₄āā ‡ āŠÊāā¹ā 11.6



चित्र सं० 11.21 मेढक के अण्डे तथा टैडपोल

İāÔāāĀ °āÊāi ½āò ½āñ□ ‡ āŠ ,ā'a¶āñ ,āŸjñ 'āā¶āāè ½āò °ñ|āā Ööy
āā ‡ āŠÔāāè |āāÊāā°ā ‡ āñŠ 'āāōfāāò ½āò „Êāçāñ / |āōÀ|āñ Öi† ,āŸjñ (•āÊāāŸ
j ‡ āŠ) † ‡ āŠāā°ā|ā ‡ āŠÀòy † ‡ āŠ 'āā°İāāè ‡ āŠāüPā ‡ āñŠ °āüjñ °āāè ‡ āŠÀ
³⁄₄āā °āÀ|ā¶ā ½āò 'āā¶āāè |āÊā ‡ āŠÀ •āÊāāè³⁄₄ā 'āāōfāāò ÔāāāÖ|ā •āÊāāŸ

ı † aš ÀĖāòý fÔā „,¹ā † ašÀŸā † ašāñ ½āÖāè¶ā •āāĖāāè Ôāñ □ † aš ¹ñāý
¹āĖāā|āāā¶ā ,āŸ;āò † ašā ,āĭāĖāāñ†aš¶ā † ašÀò (āāPā˘ā 11.21) ĖāØā¹⁄₄Øā
15 āā¶āāò ¹āā † ā<³⁄₄āā ¹ñĖā|āñ Öö ?

¹āā¶āāè ½āò |āòÀ|āñ Òì † āìŠœ •ā¶āiý ¾āñ •ā¶āi † ašÖāú Ôāñ ,āā³⁄₄āñ ?
¾āñ •ā¶āi ½āñ□†aš āāĭāĭāi (¹⁄₄āñ†aš āāĭāĭāi)Ööý ,āāØāñ PāĖā†ašÀ ¾āÖāè
½āñ□ † aš ½āò ¹āĖā •āā|āñ Ööý ¼āñ † aš āāĭāĭāi † āñŠ ĭāāÀāèāāÀ † aš
¹āāÀĭā|ā¶āāò † ašā ,āĭāĖāāñ†aš¶ā † ašÀòý

•ā¶āi,āāò ½āò ĭāi % āšāŸāi |ā©āā ,āŸ;āŸāi ,āāòÀ ¹āāòfāāò ½āò
¹āĖāØā † ašŸā ¼uj ;qXed½ |ā©āā ,āŸ; † ašāñāĭā † ašā¹⁄₄eknk
;qXed½ † āñŠ Ôāā³⁄₄āāñ•ā¶ā Ôāñ ¹ā¶āāè † † aš † ašāñāĭā † ašāè³⁄₄ā
ÔāāÀPā¶āā ¾āiØ½ā¶ā•ā Ôāñ|āāè Ööý ¾āÖ •āāèĭā „,¹āā¶ā † ašāè
¹āĖ©ā¹⁄₂ā ,āĭāÔ©āā Ôāñ|āāè Ööý ¾āiØ½ā¶ā•ā † ašā % āšāā¹⁄₂ā † aš
āāĭā¹⁄₄ā•ā¶ā 2,4,8,16 † ašāñāĭā†ašā,āāò ,āāā¹ † āñŠ Ā¹ā ½āò Ôāñ†ašÀ
¹āÒì † ašāñāĭā † ašāè³⁄₄ā ÔāāÀPā¶āā ¼āĖĭŸā ¹ā¶āā|āā Öö •āāñ ¼āñ † aš
āāĭāĭāi / āāĭāĭāi ,ā©āĭāā ¶ā¶Öò ¹āāòfāñ † ašā āā¶ā¹⁄₂āĖā † ašÀ|āā Ööý

•ā¶āi,āāò ½āò ¼āĖĭŸā † āñŠ ¹āāÀĭā®Ā¶ā Ôāñ „Ôā † āñŠ āāĭāĭāi † āñŠ
āāĭā † ašāÔā † āñŠ ¹āāèPā † ašfĀ ¹āĖĭĭāÔ©āā³⁄₄āò Ôāñ|āāè Ööý f¶ā
,āĭāÔ©āā,āāò † āñŠ ¹āā¹⁄₄āĖĭŸā ¶ā¶Öò āāĭāĭāi † ašā Ā¹ā ¹āĖā¹ā † ašÀ|āā
Ööý fÔāāè āāĭāāāfā Ôāñ ¼āñ † aš āāĭāĭāi ¼āāè āāĭā † ašāāÔā|ā Ôāñ † ašÀ
¹āĖāòü□ ½āñ□†aš ¹ā¶ā •āā|āā Ööý

¹āāòfāāò ½āò ¼āĖĭŸā ¹āāè•āāò ½āò ÔāĭÀāāāā|ā ÀÖ|āā Öö ý ,ā¶āi † āĭŠĖā
¹āāāÀāāÔ©āāā|ā ½āò ¹āāè•ā ,āā † āĭŠāāÀ|ā Ôāñ † ašÀ ¶ā¶Öò ¹āāòfāñ † ašā
āā¶ā¹⁄₂āĖā † ašÀ|āā Ööý ¶ā¶Öò ¹āāòfāā ¼āāāĭāÓ³⁄₄ā ½āò āāĭā † ašāāÔā|ā
Ôāñ † ašÀ ¹āñü; ¹ā¶ā|āā Öö ,āāòÀ ,ā¹ā¶ā āāĭāāĭāÓ ÔĭāĀ¹ā fāāĖā
† ašÀ|āā Ööý

**ĭāāÀāèāāÀ † aš ,ā¹āāØā|āā (āāĭā † ašĖāāāØā|āā),
¶āñ˘āÖāè¶ā|āā, ¹āÖĀā¹ā¶ā, ,āāā¶ā³⁄₄āāā˘ā|ā ĭāāÀāèāāÀ † aš
ĭāðāā® ,āāā¹ ¹ā³⁄₄āāĭāĖā ½āò ¹āĖ¹⁄₄āāĭāāè •āāèĭā¶ā Òñ|āi
Ā†ašĭā : -**

**¹āĖāā % āš³⁄₄āā ½āò ,āÔā¶āĭĖā¶ā † āñŠ † ašāĖā
ĭāāÀāèāāÀ†aš ĭ¹⁄₄āāāāfā³⁄₄āāú -**

½ā¶āiÓ³⁄₄ā † āñŠ ĭāāèÀ ½āò † ašfĀ ¹āĖāā% āš³⁄₄āā†ò Ôāā¹⁄₂āā¶ā ¼ā Ā¹ā
Ôāñ āā¶āĀ¶ā Ôāñ|āāè ÀÖ|āāè Ööý ¾āÖāè ¹āĖāā% āš³⁄₄āā³⁄₄āò „Ôā†ašāñ
•āāèāāĭā|ā ĀĖā|āāè Ööý •āðāāĭā † aš ¹āĖāā% āš³⁄₄āā,āāò † ašāñ ,ā¹ā¶āāè
„,||āÀ ¹āĭāāÔā † ašā ½āò āāĖāĖā†ašÀ ,āf³⁄₄āā¹ā † aš † ašāñ āāĖāāf³⁄₄āñý
f¶āÔāñ Ôā½¹āāā¶ā|ā ,āāØāāò † āñŠ † ašā³⁄₄āĀ ½āò ,āĭāĀāñfā „,¹ā¶ā

„1aaā•āĀ|ā āālā † āŠÊāāāāā|āā •āāēlā¶ā † āŠāÊā ½āō āā † āŠÔāāē ¼āāē
Ôā½ā¾ā Ōāñ Ōā † āŠ|āāē Ōō ý •āōŌāñ- ¹iŪāĀ,¶āā,āāō ¾āā
,āā†āŠāāÔ½ā†āŠ ,āāŪāā|āāō †āŠāē āāÔ©āā|ā ½āōý

½ääâô|äó ‡ äš ‡ äñš °ääâ³ääñ ¼ääöä ¹äÀ ,ääÛää|ä Öän¶än ¹äÀ ÍäÀäèÀ
‡ äšä ºä³/ääâ ¼ääöä |ä©ää ºäú³/ääñ ¼ääöä ¹äÀ ,ääÛää|ä Öän¶än ¹äÀ

Äã·³¼ã Ò|ãÀ † Îãâ ÄãÓ>Eãè³¼ã Ô|ãÀ ¹ãÀ ¹ãî¶ãÎãÃÔã ‡ ãñŠ¶³ãò ‡ ãŠãè
 Ô©ãã¹ã¶ãã ‡ ãŠãè ØãfÃ Öö ý ,ã¹ãâØã|ãã ‡ ãŠã ¹ãEã©ãã¹½ã ‡ ãŠ „¹ãPããÀ
 ,ããòÀ ããÎãã¹¼ã¶¶ã Î³¼ãã³¼ãã½ããò ‡ ãñŠ ´ãÀã ½ã¶ãîÓ³¼ã ‡ ãŠãè
 ‡ ãŠã³¼ãÃãã½ã|ãã ‡ ãŠãñ °ãü©ã³¼ãã •ãã|ãã Öö ý fÔã ‡ ãñŠ ,ããã|ãããÀ ‡ ã<|ã

Íã^oaãÌãÊããè

†ãŠãä¾ã†ãŠ Vegetative

(iii) „|Ôã•ãÃ¶ã (iv) ,ã¶ãØãÃÆÖ¥ã

(Üã) ÎãÔã¶ã ‡ãñŠ Ôãã^{a1}/₄ãÃ ½ãò ãã¶ã½¶ã ½ãò Ôãñ ‡ã<³/₄ãã „¹ã³/₄ãì ‡ã<¶ã ¶ãÖãé Öö -

(i) ,ããù‡ã<Ôããé•ã¶ã (ii) °ãããÖ:ããñ¹ã¥ã

(iii) ¹ãñŠ¹ãŠü|ñ (iv) ØãÊã¹ãŠü|ñ

2. ããÀ ‡ã<¶ã Ô©ãã¶ããò ‡ãŠãé ¹ãîãã|ãÃ ,ã¹ã¶ããé ,ã¹/₄³/₄ããÔã ¹ãîããÔ|ã ‡ãŠã ½ãò ‡ãŠãéãã•ã† -

(‡ãŠ) ¹ãŠ¶ãÃ |ã©ãã ½ããùÔã ¹ãÀã ¹ãÆ•ã¶ã¶ã ‡ãŠÀ|ãñ Öö ý

(Æã) •ã¶|ãì,ããò ½ãò ÖãÀ½ãñ¶Ôã ¹ãÀã Öãããìã|ã Öãñ|ãñ Öö ý

(Øã) ÖÀãé ¹ãã|ã³/₄ããò ½ãò ¹/₄ããñ•ã¶ã ‡ãñŠ Â¹ã ½ãò Ôããããã|ã Öãñ|ãñ Öö ý

(Üã) ¶ãÀ ³/₄ãìØ½ã ‡ãŠ ,ããòÀ ½ãã^aã ³/₄ãìØ½ã ‡ãŠ ‡ãñŠ Ôãã³/₄ããñ•ã¶ã Ôãñ °ã¶|ãã Öö ý

3. ÔãÖãé ‡ãŠ©ã¶ã ¹ãÀ (□) |ã©ãã ØãÊã|ã ‡ãŠ©ã¶ã ¹ãÀ ØãÊã|ã (★) ‡ãŠã ããããÜ¶ã ÊãØãã† -

(‡ãŠ) ‡ãòŠãì,ãã ‡ãŠããÊããØããé ¹ãÆã¥ããé Öö ý

(Æã) ìã•³/₄ãÃ ¹ãã©ãÃ ‡ãŠãñ ìãÀãéÀ ½ãò ,ãìãìããñããÓã|ã ‡ãŠÀ¶ãñ ‡ãŠãé ãã%ãŠ³/₄ãã ‡ãŠãñ „|Ôã•ãÃ¶ã ‡ãŠÖ|ãñ Öö ý

(Øã) ¹ããò£ããò ‡ãŠã ¶ãÀ ³/₄ãìØ½ã ‡ãŠ ¹ãî‡ãñŠÔãÀ Öãñ|ãñ Öö ý

4. Ô|ã½¹/₄ã `‡ãŠ' ‡ãñŠ ‡ãŠ©ã¶ã ‡ãŠã Ô|ã½<sup>1</sup>/<sub>4</sub>ã `Æã' ‡ãñŠ ÔãÖãé ‡ãŠ©ã¶ã Ôãñ ãã½ãÊã¶ã ‡ãŠãéãã•ã† -

(,ã) Ô|ã½¹/₄ã `‡ãŠ'
¹ã¥ãÃ

Ô|ã½¹/₄ã `Æã'
ÖããÀ½ã

Ìãðãã®	
Ìãã	‡ãŠãÖãÀãé
	¹ ãÆããÊã¶ã ,ããØã
,ããùãã	‡ãŠã<Ôã¶ã
	¹ ãÆ‡ãŠãìã ÔããìÊãñÓã¥ã
‡ãîŠ> ¹ ãã ^a	¹ ãÀãØã‡ãŠ¥ã
¹ ãìã	ãñŠÔãÀ
	¹ ãÀ ¹ ããñÓããé

5. (‡ãŠ) ãã°ã¶ãîÖããìã ‡ã<³/₄ãã Öö ?

(Æã) ¹ãìÓ¹ã ‡ãñŠ ¶ãÀ ,ããòÀ ½ãã^aã •ã¶ã¶ãããØããò ‡ãŠãñ ‡ã<³/₄ãã ‡ãŠÖ|ãñ Öö ? „¶ã‡ãñŠ ãããããã°ã¶ãã†úý

6. (‡ãŠ) ‡ñÔãñ ^aãñ ¹ããò£ããò ‡ãñŠ ¶ãã½ã ããÊãããÆã ‡ãã•ã¶ã½ãñò ¹ã¥ãÃÖããÀ½ã ¶ãÖãé Öãñ|ãñ Öö ý

- (Ceã) †ñÔãñ ºãñ •ãæèlãão ‡ãŠã ¶ãã½ã äãÊãããCeã† äã•ãÔã½ãò 'ããCeã ,ããòÀ
 'ããª ºãñ¶ããò 'ãã¾ãñ •ãã|ãñ Ööý
- 7 äã•ã¶ã 'ããõ£ããò ½ãò 'ã¶ãÃÖããÀ½ã ¶ãÖãé Öãñ|ãã Öö lãñ ,ã¹ã¶ãã
 ¼ããñ•ã¶ã ‡ãŠÖãú Ôãñ lã ‡ãõŠÔãñ 'ãÆã¹ã ‡ãŠÀ|ãñ Öö ?
8. ºãæè•ãã¶ãì 'ãÀã ,ãã‡ãìŠããÀ|ã Öãñ¶ãñ lããÊãñ ºãñ 'ããõ£ããò ‡ãñŠ ¶ãã½ã
 äãÊãããCeã†ý
- 9û lãã¾ãì½ã¶ãÊã ½ãò ,ããù‡ã<Ôãæè•ã¶ã ‡ãŠã Ôã¶ãìÊã¶ã ºã¶ãã ÀÖ|ãã Öö,
 äã>¹ã¶ãæè ‡ãŠæèãã•ã†ý
10. „¹ãã¹ã¶ã¾ã äã‡ãŠÔãñ ‡ãŠÖ|ãñ Öö ?
11. •ã¶ãì 'ãÀ¹ããñÔãæè Öö, ‡ã<¾ããò ?
- 12.„|Ôã•ãÃ¶ã 'ãÆãã%ãŠ¾ãã ‡ãŠã •ãæèlã¶ã ½ãò ‡ã<¾ãã ½ãÖ|ãã Öö ?
- 13.ããlã ‡ãŠÊãããÖã|ãã ‡ã<¾ãã Öö ? f¶ã ‡ãñŠ ‡ãŠãÀ¶ããò ‡ãŠãñ Ô¹ãÓ>
 ‡ãŠæèãã•ã†ý
- 14.¹ãÆ•ã¶ã¶ã ‡ã<¾ãã Öö ? •ã¶ãì,ããò ½ãò äãlããã¼ã¶ã 'ãÆ‡ãŠãÀ ‡ãŠæè
 'ãÆ•ã¶ã¶ã äãlããã£ã¾ããò ‡ãŠã ÔãããPãã „ÊÊãñCeã ‡ãŠæèãã•ã† ý

ÜãÀ 'ãÀ ‡ãŠÀò

'ãããÀlãñlã ½ãò „¹ãÊã°£ã 'ããúPã † ‡ãŠããÊããÖãæè |ã©ãã 'ããúPã äã
 'ããÊããÖãæè 'ãìÓ¹ããò ‡ãŠæè ÔãìPããè |ãõ¾ããÀ ‡ãŠÀò |ã©ãã ÔããÖãÆÖ
 ‡ãŠÀ ÖÀ¹ãããÀ¾ã½ã |ãõ¾ããÀ ‡ãŠæèãã•ã† ý

**ÀãÓ>Êãè¾ã ,ãã¾ã †lãã ¾ããñÖ¾ã|ãã ,ãã£ããããÀ|ã 'ãÀãèãã 2008 ‡ãñŠ
 'ãÆl¶ã :-**

- (1) 'ã¶ãÃ ÖããÀ½ã 'ãã¾ãã •ãã|ãã Öö -
- (i) ½ããf>ãñkeãã¶ãÊ¾ãã ½ãò (ii) ÀãfºããñÔããñ½ã ½ãò
 (iii) ÖããÊÖãæè ‡ãŠã¾ã ½ãò (iv) Êãlã‡ãŠãò ½ãò
- (2) ,£ããñããÊãããCeã|ã ½ãò Ôãñ ‡ãŠãõ¶ã Ôãæè äãlããã£ã ÊãõããÖã ‡ãŠ
 'ãÆ•ã¶ã¶ã Öö -
- (i) 'ãì¶ã•ãÃ¶ã (ii) äã'ããlã¼ãã•ã¶ã
 (iii) ½ãì‡ãìŠÊã¶ã (iv) ‡ãŠãñfÃ ¶ãÖãé
- (3) `À¶ãÆ' ‡ãŠã Ôã½ºã¶ã lãã¾ãì Ôãñ Öö ¾ãÖ äã ‡ãŠÔã •ã¶ãì ½ãò
 'ãã¾ãã •ãã|ãã Öö -
- (i) ‡ãñŠPãì,ãã (ii) äã>|ããè
 (iii) äãºãPœî (iv) ½ãñü<‡ãŠ
- (4) ,ããùãã‡ã<Ôã¶ã Öö -
- (i) •ã¶ãì Öã½ããó¶ã (ii) ,ããõÓããã£ã
 (iii) „|Ôã•ãæè 'ãã©ãÃ (iv) 'ãã¹ã Öã½ããó¶ã
- (5) ‡ãìŠ>¹ãã¹ãã¾ãã •ãã|ãã Öö -

- (i) ,ã½ããè°ãã ½ãò (ii) Öãf;Èã ½ãò
 (iii) ¾ãîØÊããè¶ãã ½ãò (iv) 'ãõÀã½ããèããÍã¾ã½ã ½ãò
 (6) †%ããŠãñÔããñ½Ôã 'ãã¾ãã •ãã'ãã Öõ- NTS 2008
 (i) ,ã¥;ã¥ài ½ãò (ii) Íài%ããŠã¥ài ½ãò
 (iii) •ããfØããñ» ½ãò (iv) ¼ãÆì¥ã ½ãò
 (7) ‡ãñŠÊãã 'ããõ£ããò ‡ãŠã ããÌã‡ãŠãÔã Öãñ'ãã Öõ - NTS 2008
 (i) Åãf•ããñ½ã Ôãñ (ii) °ããè•ã Ôãñ
 (iii) ÔãñÊã¶ã Ôãñ (iv) Ôã‡ãŠÀ Ôãñ

[back](#)

fṯāšāfĀ :12

**Àṯā<|ā ṯāŠāè ÔāâÀPāṽāā, Àṯā<|ā ĩāØāĀ
†Īāâ Àṯā<|ā ,āāḑāāṽā**



**ÁāāḑāÀ (Àṯā<|ā) ṯāŠāè ÔāâÀPāṽāā
ÁāāḑāÀ ĩāØāĀ |ā©āā ÁāāḑāÀ °āöṯāŠ (°Êā; °āöṯāŠ)
ÁāāḑāÀ ṯāŠā ,āāḑāāṽā †Īāâ Àṯā<|ā °ā°ā
ÁāāḑāÀ Ôāâ%āš½ā¥ā Ôāñ Öāñṽāñ ĩāâÊāñ ÀāñØā**

ĪāĀāèÀ 'āÀ ĈĀĀāòPā ÊāØāṽāñ ¾āā ṯāŠÖāé 'āÀ ṯāŠ> •āāṽāñ Ôāñ ÊāāÊā
ĀāØā ṯāŠā °āÖṽāñ ĩāâÊāā |āĀÊā 'ā°ā©āĀ ,āā'āṽāñ °ñĈĀā ÖāñØāāý ¾āÖ
ĀāāḑāÀ ¾āā À ṯā<|ā Öāñ|āā Öōý À ṯā<|ā Ôā¼āāè ṯāŠĪāñĀ ṯāŠāè¾ā
•āṽāñ,āāò ½āò 'āā¾āā •āā|āā Öōý •āöÔāñ-½āœĒāāè, ½āñ□ ṯāŠ,
āāœ'ā ṯāŠĒāāè, āāPāāü¾āāò |ā©āā °ā ṯāŠĀāè ¾āā ½āṽāñÖ¾āý ṯāŠœ
,āṯāŠĪāñĀṯāŠāè¾ā •āṽāñ,āāò ½āò ¼āāè Àṯā<|ā 'āā¾āā •āā|āā Öō 'āĀṽāñ
ĪāÖ ÊāāÊā ĀāØā ṯāŠā ṽā ÖāñṯāŠÀ jbienerve Üee ,āṽ¾ā ĀāØāāò ṯāŠā
Öāñ|āā Öōý ṯā<¾āā ,āā'āṽāñ ṯāñŠPāì,āā, ÜāāòÜāā ½āò ÊāāÊā À ṯā<|ā
°ñĈĀā Öō? À ṯā<|ā ṯāŠāè ÔāâÀPāṽāā ṯāöŠÔāāè Öāñ|āāè Öō ? À ṯā<|ā
ṯā<¾āā Öō, ĪāĀāèÀ ½āñò ṯāŠÖāú 'āā¾āā •āā|āā Öō ,āāöÀ fÔā ṯāŠā
½āāṽāñ ṯāñŠ āāÊā† ṯā<¾āā ½āÖĪā Öō ? ,āāf¾āñ fÔāṯāñŠ °āāĀñ ½āò
•āāṽāṯāŠāāè 'āĒā'ā ṯāŠĀ|āñ Öōý

ÁāāḑāÀ ṯāŠāè ÔāâÀPāṽāā :-

āā%āš¾āā ṯāŠĒāā'ā 12.1

½āṽāñÖ¾ā ṯāñŠ À ṯā<|ā ṯāŠāè |āö¾āāĀ ÔĒāāfṯ ṯāŠā Ôāñ½āĪāāè 'āĀā
āāĪāāṯāŠ ṯāŠāè ÔāÖā¾ā|āā Ôāñ āāṽāĒāā¥ā ṯāŠĀò ý ṯā<¾āā °ñĈĀāñ
Öō ? (āāPāā 12.1)



ããPã"ã Ôãã0 12.2 ½ã¶ãíÓ¼ã ‡ãŠãè ÊããÊã Áãã£ãÀ ‡ãŠãã¥ã‡ãŠã¾ãð

ÊããÊã Áãã£ãÀ ‡ãŠãã¥ã‡ãŠã ‡ãñŠ ‡ãŠã¾ãÃ :-

ãã¹ãœÊãñ ,ã£¾ãã¾¼ã ½ãð ,ãã¹ã¶ãñ ¹ãüðã Öð ãã ‡ãŠ ½ãã¶ãíã ÍãÀãèÀ ½ãð ,ããü ‡ã<Ôããè•ã¶ã |ã©ãã ‡ãŠã°ãÃ¶ã |ãfÃ ,ããü ‡ã<Ôããf | ÖãðÔããð ‡ãŠã ‡ãŠãñããíã ‡ãŠã,ããð |ã‡ãŠ ,ãã¹ã¶ã-¹ã£¹ã¶ã À ‡ã<|ã ‡ãñŠ ¹ãÀã Öãñ|ãã Ööý À ‡ã<|ã ‡ãŠãè ÊããÊã À ‡ã<|ã ‡ãŠãã¥ã‡ãŠã¾ãð Öãè ,ããü ‡ã<Ôããè•ã¶ã |ã©ãã ‡ãŠã°ãÃ¶ã |ãfÃ ,ããü ‡ã<Ôããf | Ôãñ °ã¶£ã °ã¶ãã‡ãŠã ,¶ã‡ãŠã ¹ãããÀíãÖ¶ã ‡ãŠã|ããè Ööý

Íãñ|ã Áãã£ãÀ ‡ãŠãã¥ã‡ãŠã¾ãð (White Blood Corpuscles ¾ãã W.B.C.) :-

,ãã¹ã¶ãñ ÔÊããf | ½ãð ÊããÊã Áãã£ãÀ ‡ãŠãã¥ã ‡ãŠã,ããð ‡ãŠãè ,ããñããã °ãüãè |ã©ãã ‡ãñŠ¶ ‡ãŠ ¾ãí ‡ã<|ã ‡ãŠãã¥ã ‡ãŠã¾ãð ¼ããè °ñÊããè ÖãñãÖããéý ¾ãñ Íãñ|ã Áãã£ãÀ ‡ãŠãã¥ã ‡ãŠã¾ãð Öãñ|ããè Öö ý Íãñ|ã Áãã£ãÀ ‡ãŠãã¥ã ‡ãŠã¾ãð ,ã½ããè°ãã ‡ãñŠ Ôã½ãã¶ã ,ããã¶ã¾ããã½ã|ã ,ãã‡ãŠãÀ ‡ãŠãè Öãñ|ããè Öö ý f¶ã½ãð ‡ãŠãñfÃ Íã¥ãÃ ‡ãŠ ¶ãÖãè Öãñ|ãã Öð fÔããèããÊã† ¾ãñ ÁãÖãÖãè¶ã Öãñ|ããè Ööý ¾ãñ ¹ÊããèÖã ½ãð °ã¶ã|ããè Öö ý f¶ã‡ãŠã •ããèìã¶ã‡ãŠãÊã 1 Ôãñ 4 ãã¶ã |ã‡ãŠ ‡ãŠã Öãñ|ãã Ööý ¾ãñ ‡ãŠãã¥ã‡ãŠã ‡ãŠfÃ ¹ã£‡ãŠãÀ ‡ãŠãè Öãñ|ããè Öð (ããPã"ã 12.3)ý



ããPã"ã Ôãã0 12.3

½ã¶ãíÓ¼ã ‡ãŠãè ‡ãíœ Íãñ|ã Áãã£ãÀ ‡ãŠãã¥ã‡ãŠã¾ãð

Íãñ|ã Áãã£ãÀ ‡ãŠãã¥ã‡ãŠã,ããð ‡ãñŠ ‡ãŠã¾ãÃ :-

- ÍãÀãèÀ ‡ãŠãñ •ã°ã ¼ããè ‡ãŠãñfÃ ÀãñÖãã¥ãí ¾ãã °íÔãÀã ¹ãÀ•ããèìããè ¹ã£¼ããããíã|ã ‡ãŠã|ãã Öð |ãñ Íãñ|ã Áãã£ãÀ ‡ãŠãã¥ã ‡ãŠã,ããð ‡ãŠãè ÔããÊ¾ãã ½ãð Íãðãã® Öãñ •ãã|ããè Ööý ¾ãñ ¹ã£ãã|ãÀããã ‡ãŠã ‡ãŠã¾ãÃ ‡ãŠã|ããè Ööý ãã•ãÔãÖãñ ÍãÀãèÀ ½ãð ÀãñÖã ,¹ã¶¶ã ¶ã Öãñ ;k ,Ôã‡ãŠã ¹ã£¼ããíã ‡ãŠ½ã Öãñ •ãã¾ãý
- Íãñ|ã Áãã£ãÀ ‡ãŠãã¥ã‡ãŠã¾ãð ÍãÀãèÀ ½ãð ,ãíã‡ã<|ã |ã©ãã »ãè ÖífÃ ‡ãŠãñããíã ‡ãŠã,ããð ‡ãŠã ¼ããã¥ã ‡ãŠã Áãã£ãÀ ‡ãŠãè Ôã¹ãŠãfÃ ‡ãŠã|ããè Öö ý

Áãã£ãÀ ¹Êãñ>Êãñ>áÔã ¾ãã ©ã£ãñ½°ãñÔããf>áÔã (Blood Platelets Or Thrombocytes) :-

Áãä£ãÀ 'Êãñ»Êãñ»áÔã ,ãã ‡ ãŠãÀ ½ãò °ãÖì|ã œãñ»ãè,
 ‡ ãñŠ¶ ‡ ãŠãì|ãÖãè¶|ã,ãã',||ãÊããè³/ã (Biconvex)'Êãñ»¶|ã½ãã Öãñ|ããè Ööý
 ‡ ãŠ Üã¶|ã ãã½ã½ããè. Á ‡ ã<|ã ½ãò f¶|ã ‡ ãŠãè Ôãâ£³/ãã ÊãØã½ãØã
 2,50,000 |ã‡ãŠ Öãñ|ããè Öö (ããPãã 12.4)ý



ããPãã Öãã0 12.4 Áãä£ãÀ 'Êãñ»Êãñ»áÔã

Áãä£ãÀ 'Êãñ»Êãñ»áÔã ‡ ãñŠ ‡ ãŠã³/ãÃ :-

Áãä£ãÀ 'Êãñ»Êãñ»áÔã Áãä£ãÀ ‡ ãŠã ©ã‡ã<‡ãŠã °ã¶|ã¶|ãñ ½ãò ÔãÖã³/ã|ãã
 ‡ ãŠÀ|ããè Ööý •ããñ Pããñ» ÊãØã¶|ãñ ‡ ãñŠ ‡ ãŠãÀ¥ã ÊãØãã|ããÀ Öãñ¶|ãñ
 ÌããÊãñ Áãä£ãÀ °ãÖãì|ã ‡ ãŠãñ ãã¶|ã³/ãããããã|ã ‡ ãŠã¶|ãñ ½ãò ÔãÖã³/ãã ‡ ãŠ
 Öãñ|ãã Ööý

‡ ãìŠœ ,ããòÀ ¼ããè •ãã¶|ãò

- 'ãìÁÓãò ‡ ãñŠ ‡ ãŠ Üã¶|ã ãã½ã½ããè. Á ‡ ã<|ã ½ãò R.B.C.‡ãŠãè Ôãâ£³/ãã
 55 Êãâ£ã |ã©ãã ããÔã³/ããò ½ãò 45 Ôãñ 50 Êãâ£ã Öãñ|ããè Ööý
- ÊããÊã Áãä£ãÀ ‡ ãŠãã¥ã‡ãŠã ‡ ãŠã •ããèì|ã ‡ ãŠãÊã ,ããä£ã‡ãŠ|ã½ã 127
 ãã¶|ã ‡ ãŠã Öãñ|ãã Ööý
- ½ã¶|ãìÓ³/ã ‡ ãñŠ ‡ ãŠ Üã¶|ã ãã½ã½ããè Á ‡ ã<|ã ½ãò W.B.C ‡ ãŠãè
 Ôãâ£³/ãã 5000 Ôãñ 9000 |ã‡ãŠ Öãñ|ããè Ööý
- ...ú ‡ ãñŠ Áãä£ãÀ ½ãò ÊããÊã Áãä£ãÀ ‡ ãŠãã¥ã‡ãŠã³/ãò ,ã¥|ã‡ãŠãÀ
 |ã©ãã ‡ ãñ¶|ã‡ãŠ³/ãã½ã<|ã Öãñ|ããè Ööý
- òØãì ÁãñØã ‡ ãŠã ¶|ã½ã ,ãã•ã‡ãŠÊã ‡ ãŠã¹ãŠãè PãããPãÃ|ã Öö •ããñ
 ããì|ãñÓã •ãããã|ã ‡ ãñŠ ½ãPœÀ ‡ ãñŠ ‡ ãŠã¶|ãñ Ôãñ Öãñ|ãã Ööý
 'Êãñ»Êãñ»áÔã ‡ ãŠãè Ôãâ£³/ãã FÔã ÁãñØã ½ãò ‡ ãŠ½ã Öãñ¶|ãñ
 ÊãØã|ããè Ööý f¶|ã ‡ ãŠãè Ôãâ£³/ãã ‡ ãŠãè •ãã¶|ã ‡ ãŠãÀãè Ôãñ fÔã
 ÁãñØã ‡ ãŠã ¹ã|ãã ÊãØã|ãã Ööý

2. Áãä£ãÀ 'Êãã•½ãã (Blood Plasma):-

³/ãÖ ÖÊ ‡ ãŠã ¹ããèÊãã, Ôãã¹ãŠ, ããPã¹ãããPã¹ãã |ã©ãã ¹ããÀ¹ããè |ãÀÊã
 ¹ãã©ãÃ Öãñ|ãã Öö ý ³/ãÖ Áãä£ãÀ ‡ ãŠã ÊãØã¼ãØã 50-60% ¼ããØã
 Öãñ|ãã Ööý Ôãã½ãã¶|ã Á¹ã Ôãñ fÔã½ãò 90% •ãÊã |ã©ãã 10%
 ,ã ‡ ãŠã°ãÃãã¶|ã ‡ ãŠ ‡ Ìãã ‡ ãŠã°ãÃãã¶|ã ‡ ãŠ ¹ãã©ãÃ Öãñ|ãñ Ööý
 ,ã‡ãŠã°ãÃãã¶|ã‡ãŠ ãããÀãè³/ã Êãìã¥ããò ‡ ãñŠ ‡ ãŠãÀ¥ã Áãä£ãÀ 'Êãã•½ãã
 ãããÀãè³/ã Öãñ|ãã Öö ý ‡ ãŠã°ãÃãã¶|ã ‡ ãŠ ¹ãã©ããò ½ãò

¹ãÆãñ>ãè¶Ôã, ØÊãî¶ãŠãñ•ã, ÌãÔãã ,ã½Êã |ã©ãã ÖãÀ½ãñ¶Ôã ããÌã²ã½ã¶ã
Öãñ|ãš Öö ý

,ãã¹ã ¶ãñ •ãã¶ãã ãã¶ãŠ ÁããfãÀ •ãñ ãã¶ãŠ ÊããÊã ÀãØã ¶ãŠã °ãÖ|ãã
Öì,ãã |ãÀÊã ¹ãªã©ãÃ ããªÆããfÃ ªñ|ãã Öö „Öã½ãð ¼ããè
¶ãŠãñããÌã¶ãŠã¾ãð Öãñ|ããè Ööý ,ã|ã: ¾ãÖ †¶ãŠ |ãÀÊã Ôãã¾ãñ•ããè
...|ã ¶ãŠ Öö •ãñ ããÌããã¼ã¶ã ¹ãªã©ããð ¶ãŠã ¹ãÌãñ ÍãÀãèÀ ½ãð
¹ãããÀÌãÖ¶ã ¶ãŠã|ãã Ööý

ÁããfãÀ ¶ãñŠ ¶ãŠã¾ãÃ :-

,ãª |ã¶ãŠ ,ãã¹ã •ãã¶ã Þãì¶ãñŠ Ööã ãã¶ãŠ ÍãÀãèÀ ½ãð ÁããfãÀ ,ã¶ãñ¶ãŠ
½ãÖ|Ìã¹ãîãã ¶ãŠã¾ãÃ ¶ãŠã|ãã Öö •ãðÖãñ -

□ ÁããfãÀ ,ããù ¶ã<Ôããè•ã¶ã |ã©ãã ¶ãŠãªã¶ã |ãfÃ ,ããù ¶ã<Ôããf| ¶ãŠã
¹ãããÀÌãÖ¶ã ¶ãŠã|ãã Ööý

□ ÁããfãÀ ¹ãñÓã¶ãŠ ¹ãªã©ããð |ã©ãã „Ôã•ããè ¹ãªã©ããð ¶ãŠã ¹ãããÀÌãÖ¶ã
¶ãŠã|ãã Öö ý

□ °ããÖÀ Öãñ ,ãã¾ãñ •ããèÌãã¶ãì,ããð † Ìãã ããÌãÓãã¶ãì,ããð Öãñ
Îãñ|ã ÁããfãÀ ¶ãŠãã¶ã ¶ãŠã,ããð ¹ãã ÍãÀãèÀ ¶ãŠãè Àããã ¶ãŠã|ãã Öö
,ã©ããÃ|ãã ÀãñØããð Öãñ °ãÞããÌã ¶ãŠã|ãã Öö ý

□ ÁããfãÀ ¶ãŠãñ •ã½ãã ¶ãŠã °ããÖÀ °ãÖ¶ãñ Öãñ Àãñ ¶ãŠ|ãã Öö |ã©ãã
ÜããÌã ¼ãã¶ãñ ½ãð ÔãÖã¾ã|ãã ¶ãŠã|ãã Ööý

□ ,ã¶¾ã ¹ãªã©ããð •ãðÖãñ Öã½ããó¶ã, †¶ãè°ããù|ãè•ã (¹ãÆãã|ãÀããèè) ,ãããª
¶ãŠã ¹ãããÀÌãÖ¶ã ¶ãŠã|ãã Öö ý

ÁããfãÀ ¶ãŠã •ã½ã¶ã |ã©ãã fÔã¶ãñŠ Êãã¼ã :-

ÍãÀãèÀ ¶ãñŠ ãã ¶ãŠÖããè ¼ããè ,ããØã ¶ãñŠ ¶ãŠ> •ã¶ãñ ¹ãÀ ÁããfãÀ
°ãÖ¶ãñ ÊãØã|ãã Öö ý fÔã ¶ãŠã ¶ã<¾ãã ¶ãŠãÀ¶ã Öö ? À ¶ã<|ã
¶ãããÊã¶ãŠã,ããð ¶ãñŠ ¶ãŠ> •ã¶ãñ Öãñ ÁããfãÀ °ããÖÀ ãã¶ã¶ãŠã¶ãŠã
°ãÖ¶ãñ ÊãØã|ãã Öö ý °ãÖ|ãã À¶ã<|ã ©ããñü|ñ Ôã½ã¾ã °ãã Øããüã Öãñ¶ãñ
ÊãØã|ãã Öö ,ããðÀ ,ã¶|ã ½ãð †¶ãŠ ¹ãÀ|ã ¶ãŠãè |ãÀÖ ¶ãŠ>ñ Ôãã¶ã ¶ãñŠ
...¹ãÀ •ã½ã •ãã|ãã Öö ý ¹ãÀ¶ãì ¹ÜãÃ>¶ãã,ããð ¶ãŠãè ããÔããã|ã ½ãð •ãª
À ¶ã<|ã ¶ãŠã °ãÖãÌã •¾ããª Öãñ|ãã Öö |ãª ÁããfãÀ •ã½ã¶ãñ ¶ãŠãè
¹ãÆãã % ãŠ¾ãã ¶ãÖãèã Öãñ ¹ãããè Öö ãã•ãÔãÔãñ ãã¶ãÀ¶ãÀ À ¶ã<|ã
°ãÖ¶ãñ ¶ãŠãè ããÔããã|ã ½ãð ½ãð¾ãì ¶ãŠãè Ôãã¼ããÌã¶ãã °ãüã •ãã|ããè
Ööý

ÁããfãÀ ¶ãðŠÖãñ •ã½ã •ãã|ãã Öö ?

ÁããfãÀ ¶ãŠã •ã½ã¶ãñ †¶ãŠ ÁãÔãã¾ãã¶ã¶ã¶ã ¶ãŠ ãã%ãŠ¾ãã Ööý ÁããfãÀ
•ã½ã¶ãñ ¶ãŠãè Ôã½ã¹ãîãã ¹ãÆãã % ãŠ¾ãã ããÌããã¼ã,ã ÞãÀ¶ããð ½ãð
¹ãÌããè Öãñ|ããè Öö ý ÍãÀãèÀ ¶ãñŠ ãããã|ãØãÆÔã Ôãã¶ã ¶ãŠãè ÁããfãÀ

‡ āñŠāāīā ‡ āŠā † ú 'āŠ› •āā|āāē Öö ,āāōÀ ÁāāfāÀ °āÖ ‡ āŠÀ İāā^{3/4}āī ‡ āñŠ
 Ōā^{1/2}ā ‡ āŠ^{1/2}āō ,āā|āā Öö ý āāāā|āŌāÆŌ|ā ...|ā ‡ āŠāō ‡ āñŠ ÁāāfāÀ ‡ āŠāē
 'Ēāñ>Ēāñ>áŌā ‡ āñŠ āāīāŪāāā>|ā Ōāñ|āñ Ōāñ † ‡ āŠ |ā|īā °ā|ā|āā Öö
 āā•āŌāŌāñ 'Ēāā•^{1/2}āā ^{1/2}āō „¹āāāŌā|ā 'āŠāfāā°āÆ|āāñ•ā|ā |āā^{1/2}ā ‡ āŠ
 āā|āāāŌ % āŠ^{3/4}ā 'āÆāñ>āē|ā 'āŠāfāā°āÆ|ā ^{1/2}āō °āĒā •āā|āāē Ööý •āāñ
 Àñīāñ ‡ āŠāē ^{1/4}āāúāā|ā Ōāñ|āāē Ööý ,ā|āñ ‡ āŠ 'āŠāfāā°āÆ|ā ‡ āñŠ Àñīāñ
 āāāā|āŌāÆŌ|ā Ōāā|ā ‡ āñŠ ...¹āÀ •āāĒā ‡ āñŠ Ā¹ā ^{1/2}āō •ā^{1/2}ā •āā|āñ Ööý
 f|ā Àñīāāō ^{1/2}āō À ‡ ā<|ā ‡ āŠāāŸā ‡ āŠā†ú (R.B.C. |ā©āā W.B.C.) „Ēāçā •āā|āāē
 Öö ,āāōÀ āāāā|āŌāÆŌ|ā Ōāā|ā 'āÀ ĒāāĒā ©ā ‡ ā< ‡ āŠā •ā^{1/2}ā •āā|āā Öö
 ,āāōÀ À ‡ ā<|ā ‡ āŠā °āŌ|āā # ‡ āŠ •āā|āā Ööý ©āāñū|ñ Ōā^{1/2}āā^{3/4}ā °āā^a
 āāāā|āŌāÆŌ|ā Ōāā|ā Ōāñ 'āŠāfāā°āÆ|ā •āāĒā Ōāñ † ‡ āŠ ŌĒ ‡ āñŠ
 'āāēĒāñ ÀāŌā ‡ āŠā ³īā āā|ā ‡ āŠĒā|āā Ööý ‡ ā<^{3/4}āā ,āā¹ā|āñ ‡ āŠ^{1/4}āāē
 āā ‡ āŠŌāāē Pāāñ> ^{3/4}āā Ūāāīā Ōāñ āā|ā ‡ āŠĒā|āñ † ñŌāā Ōāāīā āñĒāā Öö ?
 fŌāñ ŌāāēÀ^{1/2}ā ‡ āŠŌ|āñ Ööý

ÁāāfāÀ İāŌāÃ :-

,āā¹ā •āā|ā|āñ Öö āā ‡ āŠ ,ā¹ā|āñ ŌāŌāñ Ōāā°āāfāāē ‡ āñŠ ^aīŪāÃ>|āā ‡ āŠāē
 ŌāīPā|āā ¹āā ‡ āŠÀ |āīÀ|ā ĒāāñŌā āñĒā|āñ † İāā ŌāŌā^{3/4}ā|āā ‡ āŠÀ|āñ
 Ōñ|āī °āōū| ¹āū|āñ Ōōāý ^{3/4}āŌāā |ā ‡ āŠ āā ‡ āŠ ,ā¹ā|āā À ‡ ā<|ā ^{1/4}āāē °ñ|āñ
 ‡ āñŠ āāĒā † |āō^{3/4}āāÀ Ōāñ •āā|āñ Ōōāý ^{3/4}āāā^a ÁāāfāÀ İāŌāÃ ‡ āŠāē
 •āā|ā ‡ āŠāÀāē |āŌāē Öö |āāñ 'āŌĒāñ |āū ‡ ā<À „|ā ‡ āñŠ ÁāāfāÀ İāŌāÃ
 ‡ āŠāē •āā|ā ‡ āŠāÀāē ‡ āŠÀ|āñ Ööý

fŌā Ōā^{1/2}ā|āā ^{1/2}āō Ōā°āŌāñ 'āŌĒāñ ‡ āŠāĒāÃ ĒāōŸ;Ō,āē|āÀ (1868-
 1943) |āā^{1/2}ā ‡ āŠ İāō—āāāā|ā ‡ āŠ ‡ āŠāē Ēāāñ•ā ‡ āñŠ 'āŠĒāŌİāĀ¹ā 'ā|āā
 PāĒāā āā ‡ āŠ ÁāāfāÀ °ñ|āñ İāāĒāñ |ā©āā Ēāñ|āñ İāāĒāñ İ^{3/4}āāā ‡ ā<|ā ‡ āŠā
 À ‡ ā<|ā İāŌāÃ Ōā^{1/2}āā|ā Ōāñ|āā PāāāāŌ†ý ^{3/4}āāā^a °ñ|āāō ‡ āñŠ ÁāāfāÀ
 İāŌāÃ Ōā^{1/2}āā|ā |āŌāē Öö |āāñ À ‡ ā<|ā °ñ|āñ İāāĒāñ (°ā|āā) ‡ āŠā À ‡ ā<|ā
 Ēāñ|āñ İāāĒāñ (ŌāÆāŌāē) ‡ āñŠ À ‡ ā<|ā ^{1/2}āō 'āŌūīPā ‡ āŠÀ ÁāāfāÀ ‡ āŠā
 ©ā ‡ ā< ‡ āŠā °ā|āā °ñ|āā Öö āā•āŌāŌāñ ÁāāfāÀ 'āÆīāāŌ Á ‡ āŠ •āā|āā Öö
 fŌā ,āīāŌāā ^{1/2}āō ŌāÆāŌāē ‡ āŠāē ^{1/2}āō^{3/4}āī ^{1/4}āāē Ōāñ •āā|āāē Ööý
 ,āāāāĒā † ñŌāā ‡ ā<^{3/4}āāō Ōāñ •āā|āā Öö ? 'āÆ^{1/3}āñ ‡ āŠ İ^{3/4}āāā ‡ ā<|ā ‡ āñŠ
 À ‡ ā<|ā ^{1/2}āō ,āāāāĒā ‡ ā<^{3/4}āā ,ā|āÀ Ōāñ|āā Öö ?

„¹ā^{3/4}Āİ ‡ ā<|ā Ēāāñ•ā ^{1/2}āō ^{3/4}āŌ °ā|āā^{3/4}āā Ōā^{3/4}āā āā ‡ āŠ ^{1/2}ā|āīŌ^{3/4}ā ‡ āñŠ
 ÁāāfāÀ ^{1/2}āō °āñ 'āÆ ‡ āŠāÀ ‡ āñŠ 'āÆāñ>āē|ā 'ā°ā©āÃ Ōāñ|āñ Öö
 - 'āÆāā|ā•ā|ā |ā©āā 'āÆāā|āÀāāāē

'āÆāā|ā•ā|ā ĒāāĒā ÁāāfāÀ ‡ āŠāāŸā ‡ āŠā,āāō ‡ āŠāē •āāēīā ‡ āŠĒāā ‡ āŠāē
 °āāŌāē Ōā|āŌ 'āÀ āāŌā|ā Ōāñ|āñ Ööý ^{3/4}āñ °āñ 'āÆ ‡ āŠāÀ ‡ āñŠ Ōāñ|āñ

Öö - 'ā/Ēāā|ā•ā¶ā A |ā©āā 'ā/Ēāā|ā•ā¶ā Bý ('ā/Ēāā|ā•ā¶ā ‡ āñŠ āāĒā† °āü|ā ,āāāĀ A |ā©āā B Ōāā‡āñŠ|ā 'ā/Ē³/āāñŌā ‡ āŠĀ|āñ Öö)ý
 'ā/Ēāā|āĀāāē ÁāāfāĀ ‡ āñŠ 'Ēāā•½āā ½āō 'āā³/āñ •āā|āñ Öö ý ³/āñ °āñ
 'ā/Ē ‡ āŠĀĀ ‡ āñŠ Ōāñ|āñ Öö ý 'ā/Ēāā|āĀāāē -a |ā©āā 'ā/Ēāā|āĀāāē -
 b ('ā/Ēāā|āĀāāē ‡ āñŠ āāĒā† œāñ>ā ,āāāĀ a |ā©āā b Ōāā ‡ āñŠ|ā
 'ā/Ē³/āāñŌā ‡ āŠĀ|āñ Öö)ý
 ÁāāfāĀ ‡ āñŠ ©ā ‡ ā< ‡ āñŠ ‡ āñŠ Ōā½āā¶ā •ā½ā¶āā (,āāā¼āĪĒāñŌā¥ā)
 |ā¼āāē Ōāñ|āā Öö •ā°ā 'ā/Ēāā|ā•ā¶ā A |ā©āā 'ā/Ēāā|āĀāāē a Ōāā©ā-Ōāā©ā
 „,āāāŌ©ā|ā Ōāō ,ā©āĪāā 'ā/Ēāā|ā•ā¶ā B |ā©āā 'ā/Ēāā|āĀāāē b ‡ ‡ āŠ Ōāā©ā
 „,āāāŌ©ā|ā Ōāō ý f¶ā ‡ āñŠ Ōāē ,āāā¼āĪĒāñŌā¥ā ‡ āñŠ ‡ āŠĀĀ¥ā Ā ‡ ā<|ā
 ‡ āñŠāĪā ‡ āŠā†ú (ĪāāāŌ¶āāē) Áúfā •āā|āāē Öö |ā©āā Ā ‡ ā<|ā ‡ āŠā °āŌāĪā
 Ā ‡ āŠ •āā|āā Öö āā•āŌā ‡ āñŠ ‡ āŠĀĀ¥ā Ā ‡ ā<|āŌāĒāŌāē ½ā¶āĪŌ³/ā ‡ āŠāē
 ½āō³/āĪ Ōāñ •āā|āāē Öö ý
 Ēāāñ•āāō ‡ āñŠ ,āāfāāĀ 'āĀ ‡ āŠāĒāĒ Ēāō¥ĪŌ>āē¶āĀ ¶āñ °ā|āā³/āā āā ‡ āŠ
 ĒāāĒā ÁāāfāĀ ‡ āŠāā¥ā ‡ āŠā,āāō ½āō 'āā³/āñ •āā¶āñ ĪāāĒāñ 'ā/Ēāā|ā•ā¶ā
 ‡ āñŠ ,āāfāāĀ 'āĀ ½ā¶āĪŌ³/ā ‡ āñŠ Ā ‡ ā<|ā ‡ āŠāñ PāāĀ ĪāŌāāō ½āō °āāü>ā
 •āā Ōā ‡ āŠ|āā Öö A,B,AB |ā©āā oý (°ñĒāō |āāāĒāĒāŠā - 1)

Ā ‡ ā<|ā ĪāŌāĀ - A,B,AB, |ā©āā O

|āāāĒāĒāŠā - 1

क्रमांक	रुधिर वर्ग	प्रतिजन (एण्टीजन)	प्रतिस्त्री (एण्टीबॉडी)
1.	A (ए)	A	b
2.	B (बी)	B	a
3.	AB (बी)	A और B	कोई नहीं
4.	O (ओ)	कोई नहीं	a तथा b

„,ā³/āĀ ‡ ā<|ā ŌāāĀ¥āāē ‡ āñŠ 'āĀ ½ā¶āĪŌ³/ā ‡ āñŠ Ā ‡ ā<|ā ĪāŌāāō ‡ āŠāē
 •āā¶ā ‡ āŠāĀāē Ōāñ Ōā ‡ āŠ|āāē Ööý

ÁāāfāĀ ĪāŌāĀ ‡ āŠā ½āŌĪā :-

ÁāāfāĀ ĪāŌāĀ ‡ āŠāē •āā¶ā ‡ āŠāĀāē Ōāñ Ā ‡ ā<|ā °ā¶ā •āōŌāē ½āŌĪā'āĪ¥āĀ
 ‡ āŠā³/āĀ Ōā½āā•ā ‡ āñŠ āāĒā† ĪāĀ°ā¶ā Ōāāāā°ā|ā ŌĪ,āāý fŌā½āō
 ,āā'ā ‡ āŠāñ |ā©āā •āĀĀ|ā ½āā° āāē½āāĀāō ‡ āŠāñ Ā ‡ ā<|ā °ā|āā,āāō |ā©āā
 Ā ‡ ā<|ā °āō ‡ āŠāō Ōāñ ¼āāē Ā ‡ ā<|ā āā½āĒā •āā|āā Ööý ÁāāfāĀ ĪāŌāāō
 ‡ āŠāē •āā¶ā ‡ āŠāĀāē Ōāñ āāPāāā ‡ āŠĪŌāā ‡ āŠā¶āĪ¶ā ‡ āñŠ ½āĪ ‡ āŠ¹/½āāō
 ½āō ¶³/āā³/āāĒā³/āāō ‡ āŠāñ °āŌĪā ŌāŌā³/ā|āā āā½āĒā|āāē Ööý fŌā ‡ āŠāē
 ŌāŌā³/ā|āā Ōāñ 'āō|āō ‡ āŠ ¢āŌāüñ °āŌĪā Ōāē ,āāŌāā¶āāē Ōāñ
 āā¶ā'ā>ā³/āñ •āā Ōā ‡ āŠ|āñ Öö ý

‡ āĪŠœ ,āāōĀ ¼āāē •āā¶āō

ÍáÀæèÀ ½ão À†ã<|ã †ãŠæè †ãŠ½ãæè Öän¶āñ 'ãÀ (Üää¾ãÊã / ,ää'ãÀñÍã¶ā
†āñŠ Ôā½ã¾ā) ¡àu†ã<À †ã<¾ää †ãŠÀ|ää Öö ? Üää¾ãÊã †āñŠ ÍáÀæèÀ
½ão À†ã<|ã Þäüðā|ää Öö ý

□ Üää¾ãÊã †āñŠ ÍáÀæèÀ ½ão À†ã<|ã Þäüðā¶āñ Öñ|äi ¡àu†ã<À À†ã<|ã
†ãŠÖäü Öän Êää|ää Öö ?

□ ¡àu†ã<À Üää¾ãÊã †āñŠ ÍáÀæèÀ ½ão À†ã<|ã Þäüðā¶āñ Öñ|äi ÔäØāñ-
Ôā½°ā¶āæè Öän À†ã<|ã °ñ¶āñ †āñŠ ääÊã† †ãŠÖ|ää Öö ý ¾ää°ä ÔäØāñ
Ôā½°ā¶āæè Öän À†ã<|ã 'ãÆã'|ã †ãŠ¶āñ ½ão °ñÀæè Öän|ääè Öö |ään
ÁääfãÀ °äö†ãŠ Öän À†ã<|ã 'ãÆã'|ã †ãŠÀ|ää Öö ý

□ ÁääfãÀ 'Êää•½ää †ãŠāñ 'ää,,¡À †āñŠ Á'ã ½ão ,äääfã†ãŠ ää°āäö |ã†ãŠ
ÔäiÀäää|ã ÀÆää •ää Ôä †ãŠ|ää Ööý fÔä †ãŠ ,,'ã¾āñÖä ¼ääè
¡àu†ã<À ,ää†ãŠääÔ½ã†ãŠ|ää ½ão †ãŠÀ|āñ Öö ý

ÁääfãÀ °äö†ãŠ (°Êä; °äö†ãŠ) -

,ã°ã ,ää'ã À†ã<|ã °ā¶ā †āñŠ ½äÖ|ä †ãŠāñ •ää¶ā Þäi †āñŠ Ööý ,ääf¾āñ
†ñÖän †āñŠ¶ †āñŠ °ääÄñ ½ão •ää¶āñ •äÖäü À†ã<|ã ää½ãÊã Ôä†ãŠ|ää Ööý
¾āñ À†ã<|ã °äö†ãŠ (ÁääfãÀ °äö†ãŠ)†ãŠÖÊää|āñ Ööý

ÁääfãÀ °äö†ãŠ 'ãÆ|¾āñ†ãŠ ää•äÊää ,ãÔ'ä|ääÊã ½ão ÇääñÊää Øã¾ää Öö
ý f¶ā †āñŠ ,ãÊäälää ÁääfãÀ °äö†ãŠ °äüñ-°äüñ ääÞäää †ãŠ|ÔääÊã¾ääö
½ão ¼ääè ÇääñÊāñ Øã¾āñ Ööäý f¶ā ,ãÔ'ä|ääÊääö ½ão °ä|ää,ääö †ãŠ
ÁääfãÀ Êāñ †ãŠÀ ÁääfãÀ lãØāÃ †ãŠāñ —ää|ä ää †ãŠ¾ää •ää|ää Öö ý
ÁääfãÀ lãØāÃ ää¶āfääÄää|ä Öän¶āñ †āñŠ °ää° À†ã<|ã †ãŠāñ
,ääfäiä¶ā†ãŠ ,,'ã†ãŠÀ¥ä †lää ää|äääfã¾ääö 'ãÄ 4.5°C(40°F)'ãÀ †ãŠäüÞä
†ãŠæè/'ÊääääÖ> †ãŠ †ãŠæè lãã¾äiÁ® °ään|äÊääö ½ão ÔäiÀäää|ã ÀÆää
•ää|ää Öö ý ÁääfãÀ †ãŠāñ ÁääfãÀ °äö†ãŠ ½ão ÔääÄäää|ã ÀÆā¶āñ †āñŠ
ääÊã† ,,'Ôā½ão Ôääñää|¾ä½ä Ôääf>Èñ> ää½ãÊää†ãŠÀ ÀÆää •ää|ää Öö ý
fÔä 'ãÆ †ãŠÀ ÀÆää Øã¾ää ÁääfãÀ ÊäØā¼äØä 30 ää¶ā |ã †ãŠ
ÔäiÀäää|ã ÄÖ|ää Ööý ,äälãÍ¾ä †ãŠ|ää 'äü¶āñ 'ãÀ fÔä ÁääfãÀ †ãŠāñ
Üää¾ãÊã / ÄāñØääè l¾äää †ã<|ã †āñŠ ÁääfãÀ lãØāÃ Öän ää½ãÊää¶ā
†ãŠÀ¶āñ †āñŠ °ää° Þäüðã¾ää •ää|ää Öö ý lãÖ ÔääÔ©ää/ Ô©ää¶ā, •äÖäü
ääläää¼ä¶ā lãØääö †āñŠ ÁääfãÀ ÔäiÀäää|ä †lää ÔääØäÆääÖ|ä
ÄÖ|āñ Öö ``ÁääfãÀ °äö†ãŠ''†ãŠÖÊää|ääè Öö ý

†ã<¾ää ,ää'ã •ää¶ā|āñ Öö ?

□ ää|äiä †ãŠ ÔääÔāñ 'ãÆ½äiÇä ÁääfãÀ °äö†ãŠ Äñj- % äŠäÔä
ÔääñÔääf>äè Öö ý

À†ã<|ã †ãŠä ,ääfää¶ā †lää À†ã<|ã °ā¶ā -

À†ã<|ã °ā¶ā †ã<¾ääö? -

āā † āSŌāāē ½ā¶āiŌ³āā † āñŠ ÍāĀāēÀ ½āō À † ā<|ā † āŠāē † āS½āāē Ōāñ
 •āā¶āñ 'āÀ ,āĒāŌā Ōāñ À†ā<|ā Pāūā†āŠÀ À†ā<|ā † āŠāē † āS½āāē † āŠāñ
 'āīĀā āā † āS³āā •āā|āā Ōōý fŌā āā % āS³āā † āŠāñ **ÁāāfāÀ**
,āāfāā¶ā † āSŌ|āñ Ōōý fŌā 'āĒāā % āS³āā ½āō 'ā|āā |ā©āā ŌāĒāŌāē
 'āñ¶āāō † āñŠ À † ā<|ā ĪāŌāāō † āŠāñ Ōāī½āñĒā¶ā āā † āS³āā •āā|āā Ōōý
 •āōŌāā āā†āŠ |āāāĒā†āŠā 2 ½āō 'ÍāāĀ³āā Ōā³āā Ōōý Ōā°āŌāñ 'āŌĒāñ
 ĀāñŌāāē † āŠā À † ā<|ā ĪāŌāĀ —āā|ā āā†āS³āā •āā|āā Ōō ,āāōĀ ÁāāfāÀ
 °āō † āS Ōāñ „'āĒā°fā † āŠāā³āñ Ōā³āñ Ōā½āā¶ā ÁāāfāÀ ĪāŌāĀ † āñŠ
 À † ā<|ā † āŠāñ ĀāñŌāāē † āñŠ ÍāĀāēÀ ½āō ,āāĪāĪ³ā † āS|āā¶āīŌāāÀ
 Pāūā³āā •āā|āā Ōōý ÁāāfāĀ °āō†āS Ōāñ 'āĒā'ā À†ā<|ā † āŠāñ ĀāñŌāāē
 † āŠāñ 'ñ¶āñ † āñŠ 'āīĪāĀ ¼āĒāāē-¼āāúāā|ā 'ñĒāā •āā|āā Ōō āā † āS ĪāŌ
 † PāŌ,āāfĀŌĪāāēŌ(½āā¶āĪā 'āĒāā|āĀāā ,ā'āīŸāĀ|āā āāĪāŌāāŸāī)½āī † ā<|ā
 Ōōý ,āā•ā † āŠĒā 'āāāĀāāāā|ā À † ā<|ā † āŠāē °āāñ|āĒāāō 'āĀ
 † PāŌ,āāfĀŌĪāāēŌ ½āī † ā<|ā Ōāñ¶āñ † āŠā 'āĒ½āāŸā 'ā'ā ¼āāē āāĒāĒā
 ĀŌ|āā Ōō ý f¶ā † āñŠ ,āāā|āāāÀ † ā<|ā À † ā<|ā •āāēĪāāŸāī, 'āĒāñ>āñ•āñ,āā
 † Īāā † āSĪā † āSāō Ōāñ ½āī † ā<|ā Ōāñ¶āā PāāāāŌ † ý † ñŌāā Ōāē À † ā<|ā

ÀãñØãæ ‡ãñŠ ÍãÀãèÀ ½ãñò ÿàù ‡ã<À ‡ãŠãè ãñÆãÀñÆã ½ãò Þãüã³⁄⁴ãã
 •ãã¶ãã ÞããããÖ†ý Áãã£ãÀ ãñ¶ãñ ÌããÊãñ ‡ãŠãñ ãããã ãã©ãã Áãã£ãÀ ¹ãÆã¹ã
 ‡ãŠÀ¶ãñ ÌããÊãñ ‡ãŠãñ ØãÆãÖãè ‡ãŠÖãñ Ööý Áãã£ãÀ ,ãã£ãã¶ã ‡ãñŠ
 ããÊã† Ôã½ÌãØããè³⁄⁴ã Ì³⁄⁴ããã‡ã<ã³⁄⁴ãò ‡ãŠã Þã³⁄⁴ã¶ã ‡ãŠÀ¶ãã ÞããããÖ†ý

¹ããããÊã‡ãŠã - 2

दाता	ग्राही				
	रुधिर वर्ग	A	B	AB	O
A	v	×	v	×	×
B	×	v	v	×	×
AB	×	×	v	×	×
O	v	v	v	v	v

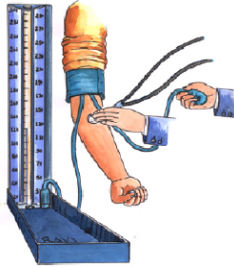
ãã%ãŠ³⁄⁴ãã ‡ãŠÊãã¹ã 12.2

‡ãŠ¹⁄⁴ãæ- ‡ãŠ¹⁄⁴ãæ ,ãã¹ã ¶ãñ ãñÆãã ÖãñØãã •ã°ã ‡ãìŠœ ÊããñØã ÔãìÔã,
 Üã°ãüã³⁄⁴ãñ, °ãðÞãñ¶ã, ÊãüãÆãüãã¶ãñ Öì† ããÆããfÃ ãñ¶ãñ Ööã ããñ ‡ãŠÖã
 •ãããã Öö ãã ‡ãŠ ÞãÊããñ ¼ããfÃ f¶Öò ãã ‡ãŠÖãæ ÿàù ‡ã<À ‡ãŠãñ
 ããÆãã³⁄⁴ãã •ãã³⁄⁴ãý ‡ãŠÀ¥ã ‡ã<³⁄⁴ãã Öãñ Ôã‡ãŠãã Öö? ÿàù ‡ã<À ¹ãÀã
 ¶ã°ã ãã©ãã À‡ã<ã ãã°ã (°Êã ãÆãñãÀ) •ãããÞã ‡ãŠÀ‡ãñŠ °ããã³⁄⁴ãã •ãããã
 Öö ãã ‡ãŠ À‡ã<ãã°ã (B.P.) ,ãÖãã½ãã¶³⁄⁴ã Öö ãããÖãÖãñ f¶Öò fÔã
 ¹ãÆ‡ãŠãÀ ‡ãŠãè ¹ãÀñãã¶ããè Öãñ ÀÖãè Ööý
 °ããè0¹ããè0 ‡ãŠãè ‡ãŠ Ôãã½ãã¶³⁄⁴ã ,ãìãÔããã Öãñããè Ööý °ããè0¹ããè0
 ‡ã<³⁄⁴ãã Öö ,ããf† fÔã‡ãŠãè •ãã¶ã‡ãŠãÀãè ¹ãÆã¹ã ‡ãŠÀ¶ãñ Ööý

À‡ã<ã ãã°ã (°ããè0¹ããè0) :-

ÔãìãÀ¹ãÆã½ã ÒñÊÔã (S. Hales 1733) ¶ãñ Üããñüãñ ½ãò À‡ã<ã ãã°ã
 ¶ãã¹ãã ©ããý ,ãã¹ã •ãã¶ããñ Öö ãã‡ãŠ ×³⁄⁴ã ¹ãÀã À‡ã<ã ãã¶ãããÌÞãã Êã³⁄⁴ã
 ³⁄⁴ãã Þã%ãŠ ½ãò ¹ã½¹ã ãã‡ãŠ³⁄⁴ãã •ãããã Ööý À‡ã<ã °ã¶ã ¶ãããÊã‡ãŠã,ããò
 ½ãò °ãÖãã Öö ,ãã: ¾ãÖ ¶ãããÊã‡ãŠã,ããò ‡ãŠãè ãèÌããÀ ¹ãÀ °ããìã ãÊããã
 Ööý ×³⁄⁴ã ¹ãÆ‡ãìãÞã¶ã ‡ãñŠ Ôã½ã³⁄⁴ã ¾ãÖ ãã°ã ,ããã£ã‡ãŠ Öãñãã Öö
 ãã©ãã ×³⁄⁴ã ããìãããããÊã¶ã ‡ãñŠ Ôã½ã³⁄⁴ã ‡ãŠ½ã Öãñãã Ööý fÔãñ À‡ã<ã
 ãã°ã (B.P.) ‡ãŠÖãñ Öö ãããÖã ‡ãŠãè ããñ ,ãìãÔããã ‡ã ð Öãñããè
 Ööý ¹ãÆ‡ãìãÞã¶ã ãã°ã- ¾ãÖ À‡ã<ã ãã°ã ‡ãŠãè ...¹ãÀãè Ôããè½ãã Ööý
 •ããñ ×³⁄⁴ã Ôãã ‡ãìãÞã¶ã ‡ãŠãè ,ãìãÔããã ¹ãÆãããìãÀã ‡ãŠÀããè
 Ööý ããìãããããÊã¶ã ãã°ã- ¾ãÖ À‡ã<ã ãã°ã ‡ãŠãè ãã¶ãÞãÊããè Ôããè½ãã Öö
 •ããñ ×³⁄⁴ã ããìãããããÊã¶ã ‡ãŠãè ,ãìãÔããã ¹ãÆãããìãÀã ‡ãŠÀããè Ööý
 À‡ã<ã ãã°ã ¶ãã¹ã¶ãñ ‡ãñŠ ¾ã¶ã ‡ãŠãñ ããÊã† ãã°ã¶ã¶ã½ããè ‡ãŠÖãñ
 Öö (ããÞãã 12.5)ý À‡ã<ã ãã°ã ½ã¶ãìÓ³⁄⁴ã ½ãò °ãããì ‡ãñŠ %ããñŠãã¶ã³⁄⁴ãÊã
 £ã½ã¶ããè ½ãò ¶ãã¹ãã •ãããã Ööý ÔìãÔãã ½ã¶ãìÓ³⁄⁴ã ‡ãŠã ãã°ã (B.P.)

120/80mm Hg Öāñ|āā Öōý 'āÆ‡āiāŠPā¶ā 'ā°ā 120Hg |ā©āā āāīāāā©āÊā¶ā
 'ā°ā 80 Hg 'īāāĀ|āā Öōý ‡ ā<³⁄₄āā ,āā'ā¶āñ 'ā°āā¶ā¶āĀ½āā'āāē 'ñĒāā Öō?
 ,ā'ā¶āñ 'āāŌā ‡ āñŠ āāPāāā ‡ āŠ|Ōā ‡ āŠ ‡ āñŠ 'āāŌā •āā ‡ āŠĀ
 'ā°āā¶ā¶āĀ½āā'āāē 'ñĒāā¶āñ ‡āŠā 'āÆ³⁄₄āāŌā ‡āŠĀòý



āāPā"ā 12.5 'ā°āā¶ā¶āĀ ½āā'āāē 'āĀā ĀāāĒāĀ 'ā°ā ¶āā'ā|āñ Ōi‡

ĀāāĒā Ōāā%āŠ½āŸā Ōāñ Ōāñ¶āñ İāāÊāñ ĀāñŌā:-

āā'āēĒāāē f ‡ āŠā $f^{3/4}$ āāò ½āò ,āā'ā >āē0°āāē0, Ōō•āā, PāñPā ‡ āŠ,
 ĵā³⁄₄āāāĀ³⁄₄āā ,āāāā' ĀāñŌāāò Ōāñ 'āāāĀāPā|ā Ōāñ Pāi ‡ āñŠ Ōō ³⁄₄āñ
 āāİāŌāāŸāi, •āāēİāāŸāi, ‡āŠāē> •āāā¶ā|ā, āāİā>āāā½ā¶ā ‡āŠāē ‡āŠ½āāē Ōāñ
 ,ā©āİāā ‡ āİŠē |ā|İāāò ‡āŠāē ‡āŠ½āāē Ōāñ Ōāñ|āñ Öōý 'āĀ¶āi Ā ‡ ā<|ā
 ‡āŠāē ‡āŠ½āāē ³⁄₄āā Ā ‡ ā<|ā ½āò ,āŌā½āā¶ā³⁄₄ā|āā Ōāñ¶āñ 'āĀ ¼āāē ‡āİŠē
 ĀāñŌā Ōāñ •āā|āñ Öōý •āōŌāñ ‡¶āāēāā½ā³⁄₄āā,'āāūĒāāēŌāā f ©āāēāā¶ā³⁄₄āā
 ,āāāā'Ÿ ĀāāĒāĀ Ōāā % āŠ½āŸā Ōāñ Ōāñ¶āñ İāāÊāñ ‡ āİŠē ĀāñŌā
 Ōō- Ōñ'āñ>ā f āā>Ōā °āāē, ‡āŌā, āāāā'Ÿ

āā%āŠ³⁄₄āā ‡āŠĒāā'ā 12.3

Ōāū; ‡ āŠ ‡ āñŠ āā ‡ āŠ¶āāĀñ |ā©āā ,ā¶³⁄₄ā Ō©āā¶āāò 'āĀ ÊāŌāñ Ōāā f ¶ā
 °āāñ;Ā 'āĀ ,āā'ā¶āñ +,▲,♣,,⚡, āāāā' āāPā¶Ōāò ‡āŠāñ 'ñĒāā ŌāñŌāā f ¶ā
 āāPā¶Ōāò ‡ āŠā Ōā½°ā¶ā āā ‡ āŠŌā |ā©³⁄₄ā Ōāñ Ōō
 ? + Āñ; % āŠāŌā, 'āāāĀİāāĀ ‡āŠĒ³⁄₄āāŸā, ĀñÊāİāñ Êāā f ¶ā, 'āİĒā, ⚡ Āñ;
 āāĀ°ā¶ā ,āāāā' Öōý Āñ; āāĀ°ā¶ā ‡ āŠā Ōā½°ā¶ā ‡ ‡ āŠ ¼ā³⁄₄āā¶ā ‡ āŠ
 °āāē½āāĀē ‡āŌā Ōāñ Öōý ,āā $f^{3/4}$ āñ f Ōā‡āñŠ °āāĀñ ½āò •āā¶āòý

³⁄₄āŌ ĀāñŌā ‡Pā0,āā f ĀŌİāāē0 (Human Immuno Deficiency Virus) 'āĀ Ōāñ|āā Öōý
 ‡ñŌāñ İ³⁄₄āāā‡ā<|ā ‡āŠāñ ‡Pā0,āā f ĀŌİāāē0 Ēā¶āā|½ā‡āŠ ‡āŠŌ|āñ Öōý f Ōā
 ĀāñŌā Ōāñ ŌāĒāāŌā|ā İ³⁄₄āāā‡ā<|ā 'āñ Ōāñ 'Ōā İāŌāāò |ā‡āŠ Ōāā½āā¶³⁄₄ā
 āā•ā¶āāē āā°ā|āā Ōā‡āŠ|āā Ōō, f Ōā ĀāñŌā ‡āŠā āāİāŌāāŸāi İāĀēĀ ½āò
 Āāā ‡ āŠ İİāñ|ā ĀāāĒāĀ ‡āŠāāŸā ‡āŠā,āāò ‡ İāā ½āāāŌ|āŌ ‡āŠ ‡āŠāē
 ‡āŠāñāİā ‡āŠā,āāò ‡āŠāñ 'āÆ¼āāāāİā|ā ‡āŠĀ|āā Öōý ĒāāēĀñ-ĒāāēĀñ
 'āÆ¼āāāāİā|ā ‡āŠāñāİā‡āŠā³⁄₄āò Ēāİ½ā Ōāñ|āāē •āā|āāē Ōō |ā©āā ‡āİŠē
 İāŌāāò ½āò İāĀēĀ Ōāā½āā¶³⁄₄ā ĀāñŌāāò Ōāñ ¼āāē ,ā'ā¶āā °āPāāİā
 ¶āŌāē ‡āŠĀ 'āā|āā Ōō ,āāōĀ ,ā¶āñ ‡āŠ °āāē½āāāāĀ³⁄₄āāò Ōāñ ¼āāē

ãäÜãÀ¶ãñ ÊãØã|ãã Ööý ,ã¶|ã ½ãò ÀãñØããè ‡ãŠãè ½ãð|¾ãì Öãñ •ãã|ããè
Ööý ‡jáÔã ‡ãŠãñ äãPã¶Ö (**⚡**) Ôãñ Ì¾ã‡ã<|ã äã‡ãŠ¾ãã •ãã|ãã Ööý

‡jáÔã ‡ãñŠ Êããã¶ã :-

‡jáÔã ‡ãñŠ ÀãñØããè ½ãò äã¶ã½¶ãããÊãããÊã|ã Êããã¶ã 'ãã¾ãñ •ãã|ãñ Öö-
¼ãìÊã ¶ã ÊãØã¶ãã, ÍãÀãèÀ ‡ãñŠ Íã•ã¶ã ½ãò ‡ãŠ½ããè, •ÍãÀ, |ãPãã 'ãÀ
ããñÀãè, ©ã ‡ãŠãÌã, ÀãñØã Öãñ Êãü¶ãñ ‡ãŠãè äã½ã|ãã ½ãò ‡ãŠ½ããè
,ãããã^{aa} fÔã ÀãñØã Öãñ 'ããèããü|ã Ì¾ããã ‡ã<|ã ½ãò äã¶ã½ãñãã¶ã¾ãã
|ã©ãã |ãPãã ‡ãðŠÔãÀ Öãñ¶ãã •¾ããã Öãñ|ãã Ööý

‡jáÔã ‡ãñŠ ‡ãŠãÀ¶ã |ã©ãã Àãñ‡ãŠ©ãã½ã :-

‡Pã0,ããfÃ0Ìããè0 äãÌãÓãã¶ãì ‡ãñŠ ÍãÀãèÀ ½ãò 'ãÖìüPã¶ãñ Öãñ
½ã¶ãìÓ¾ã ‡jáÔã Öãñ 'ããèããü|ã Öãñ •ãã|ãã Ööý ‡jáÔã Ôã°ãÖãñ
Êã|ãÀ¶ãã ‡ãŠ •ãã¶ãÊãñÌãã |ã©ãã ,ã½ããè |ã ‡ãŠ ÊããfÊãã•ã ÀãñØã Ööý
ÍãÀãèÀ ½ãò ‡jáÔã äãÌãÓãã¶ãì ‡ãñŠ 'ãÆÌãñÌã ‡ãŠÀ¶ãñ Öãñ ÍãÀãèÀ ‡ãŠãè
ÀãñØããò Öãñ Êãü¶ãñ ‡ãŠãè Íããã ‡ã<|ã ¶ãÓ> Öãñ •ãã|ããè Ööý fÔãÖãñ
ÍãÀãèÀ ÀãñØããò Öãñ Êãü¶ãñ ½ãò ,ãÔã½ã©ãÃ Öãñ •ãã|ãã Öö ,ã¶|ãã:
fÔãÖãñ 'ããèããü|ã Ì¾ããã‡ã<|ã ‡ãŠãè ½ãð|¾ãì Öãñ •ãã|ããè Ööý fÔã ÀãñØã
‡ãñŠ äãÌãÓãã¶ãì Ôãã%ãŠãã½ã|ã Ì¾ããã‡ã<|ã¾ããò Öãñ ÔÌãÔ©ã Ì¾ããã‡ã<|ã
½ãò ‡ãŠfÃ |ãÀãè ‡ãŠãò Öãñ 'ãÖìüPã|ãñ Ööý f¶ã½ãò Öãñ ½ãìÊ¾ã Ã¹ã
Öãñ À ‡ã<|ã ,ããfãã¶ã ½ãò ,ãÔãÌãfãã¶ããè ÌãÌã À ‡ã<|ã ‡ãŠãè •ããPã ¶ã
Öãñ¶ãã ¾ãã Ôãã%ãŠãã½ã|ã Ì¾ããã‡ã<|ã 'ãÃã ,½¾ããñØã äã‡ãŠ¾ãã Øã¾ãã
Àñ•ãÀ/°Êãñ; ¾ãã f¶ãñ ‡ã<Ìã¶ã ãè ØãfÃ ÔãìfÃ ‡ãñŠ ,½¾ããñØã Ööý
¾ãÖ °ããè½ããÀãè Ôãã %ãŠãã½ã|ã ½ãã|ãã,ããò Öãñ °ãPããò ½ãò ¼ããè
•ãã|ããè Ööý ‡jáÔã Öãñ °ãPã¶ãñ ‡ãñŠ äã¶ã½¶ããÊãããÊã|ã ,½ã¾ã Öö -

- äãÌãÓãã %ãŠãã½ã|ã, Ôãã¹ãŠ, ¶ãfÃ ÔãìfÃ ‡Ìãã ÔããèããÀ•ãã ‡ãŠã
'ãÆ¾ããñØã ‡ãŠÀ¶ãã PããããÖ†ý
- À ‡ã<|ã ,ããfãã¶ã Öãñ 'ãìÌãÃ À ‡ã<|ã ‡ãŠãè •ããüPã ¼ãÊããè-¼ããüãã|ã
,ããã¶ãÌã¾ãÃ Ã¹ã Öãñ ‡ãŠã Êãñ¶ããè PããããÖ†ý
- ¶ãÌããèÊããè 'Ìãã,ããò ‡ãñŠ fã•ãñ‡ã<Ìã¶ã ¶ãÖãè Êãñ¶ãñ PããããÖ†ý
- Àñ•ãÀ/°Êãñ; ‡ãŠã ,½¾ããñØã ÔããÌãfãã¶ããè 'ãìÌãÃ ‡ãŠ ‡ãŠÀ¶ãã
PããããÖ†ý

‡ã<¾ãã f¶ã‡ãñŠ ‡ãŠãÀ¶ããò Öãñ °ãPã‡ãŠÀ Ö½ã ‡jáÔã Öãñ ÔãìÀãããã|ã
Öãñ •ãã‡ãØãñ ? Ô¹ãÓ>|ã: fÔã‡ãŠã ,||ãÀ Öãü Öãè Ööý

ããÌãÌãñÔã

f¶ãÔãñ ‡jáÔã ¶ãÖãè 'ãðŠÊã|ãã Öö :-

- ‡jáÔã, Ôãã%ãŠãã½ã|ã Ì¾ããã‡ã<|ã ‡ãñŠ Ôãã©ã °ãã¶ã‡ã‡ãŠ 'ãÆ¾ããñØã
‡ãŠãè ÌãÔ|ãì,ããò ‡ãŠã ,½¾ããñØã ‡ãŠÀ¶ãñ Öãñ ¶ãÖãè 'ãðŠÊã|ãã Ööã

•ãõÔãñ - >ñÊããè¹ãŠãñ¶ã, >ãf¹ãÀãf>À, ãã‡ãŠ|ãã°ã |ã©ãã ‡ãŠÊã½ã ,ããããª
ý

- Öã©ã ãã½ãÊãã¶ãã, œ¶¶ãã ,Ôãã©ã ,ÿ¶ãã-°ãõÿ¶ãã, ããÔã-¹ããÔã Œãüjã
Öãñ¶ãã, ‡‡ãŠ-³iÔãÀñ ‡ãñŠ ‡ãŠ¹ãüjãò ‡ãŠãñ ¹ãÖ¶ã¶ãñ Ôãñ ‡jãÔã ¶ãÖãé
Öãñ|ãã Öõ ý
- ‡‡ãŠ Öãé ‡ãŠ³⁄⁴ããÃÊã³⁄⁴ã, ‡ãŠãÀŒãã¶ãã ,ããããª ½ãò Ôãã©ã-Ôãã©ã
‡ãŠã½ã ‡ãŠã¶ãñ Ôãñ ³⁄⁴ãã „¹ã ‡ãŠã¥ããò ‡ãŠãñ ãã½ãÊãã ‡ãŠã
¹ãÆ³⁄⁴ããñØã ‡ãŠã¶ãñ Ôãñ ‡jãÔã ¶ãÖãé ¹ãõŠÊã|ãã Öõ ý
- Ôãã©ã-Ôãã©ã Œãã¶ãñ-¹ããè¶ãñ |ã©ãã ¹Êãñ, ããØãÊããÔã |ã©ãã ,ã¶³⁄⁴ã
°ã|ãÃ¶ããò ‡ãŠãñ ãã½ãÊãã‡ãŠã ¹ãÆ³⁄⁴ããñØã ‡ãŠã¶ãñ Ôãñ ¼ããè ‡jãÔã
¶ãÖãé ¹ãõŠÊã|ãã Öõ ý
- ŒããüÔã¶ãñ, œãé‡ãŠ¶ãñ, Öiãã ,ããããª Ôãñ ¶ãÖãé ¹ãõŠÊã|ãã Öõ ý
- ‡ãŠãè>-¹ã|ããØããò ‡ãñŠ ‡ãŠã¶ãñ Ôãñ (•ãõÔãñ -½ã ‡ãŒŒããè, ½ãPœÀ,
•ãú |ã©ãã Œã>½ãÊã ,ããããª) Ôãñ ‡jãÔã ¶ãÖãé ¹ãõŠÊã|ãã Öõ ý

‡ã<³⁄⁴ãã ,ãã¹ã •ãã¶ã|ãñ Öõ ?

1. 01 ãã¹Ôã½°ãÀ ‡ãŠãñ ããlãlã ‡jãÔã ãã¹lãÔã ‡ãŠÖ|ãñ Öõ ý
2. °ã¶¹ããò ½ãò ÔãlãÃ¹ãÆ©ã½ã ‡jãÔã ‡ãŠã „á¹⁄⁴ãlã Öi,ãã Öõ ,ããõÀ
„Ôã‡ãñŠ °ããª Öãé ½ã¶ãiÓ³⁄⁴ããò ½ãò ³⁄⁴ãÖ ÀãñØã ¹ãõŠÊãã Öõ ý
3. ‡ÊããèÔãã (ELISA) ¹ãÀãèãã¥ã Ôãñ ‡jãÔã ‡ãŠã ¹ã|ãã ÊãØãã³⁄⁴ãã •ãã|ãã Öõ
ý

4. ‡ [dme (AIDS) keãe hetje veece Acquired Immuno Defficiency
Syndorme Öõ ý

,ã¥jã‡ãŠãÀ Oval
„¼ã³⁄⁴ããlã|ãÊã Biconcave
‡ãñŠ¶³‡ãŠ Nucleus
‡ãŠñããlã‡ãŠã Capillary
¹ãÆ‡ãiãŠPã¶ãªª°ãª Systolic Pressure
¹ãÆãã|ãÀãããè Antibodies
¹ãÆãã|ã•ã¶ã Antigen
¹ãããÀÔããPãÀ¥ã Circulation

,ã¹⁄⁴ããÔã ¹ãÆi¶ã

1. ãã¶ã½¶ãããÊãããŒã|ã ‡ãñŠ ÔãÖãé ããlã ‡ãŠÊ¹ã Pãi¶ã ‡ãŠã ,ã¹ã¶ããè
ã¹⁄⁴ããÔã ¹ãiããÔ|ã‡ãŠã ½ãò ããÊãããŒã† -
(‡ãŠ) `ÁããfãÀ ‡ãŠã ©ã‡ã<‡ãŠã' °ã¶ãã¶ãñ lããÊããè ÁããfãÀ ‡ãŠãã¥ã‡ãŠã
‡ãŠã ¶ãã½ã Öõ -
(i) ÊããÊã ÁããfãÀ ‡ãŠãã¥ã‡ãŠã (ii) ¹Êãñ>Êãñ
(iii) Îãñ|ã ÁããfãÀ ‡ãŠãã¥ã‡ãŠã (iv) f¶ã½ãò Ôãñ ‡ãŠãñfÃ ¶ãÖãé

(Ceã) ½ãã¶ãlã ÁããfãÀ lãØãÃ ‡ãŠãè Ceãñ•ã ÔãlãÃ¹ãÆ©ã½ã ãã ‡ãŠÔã lãõ—ãããã¶ã‡ãŠ ¶ãñ ‡ãŠãè ©ããè -

(i) ÖñÊÔã (ii)Êãð¶;Ô>ãè¶ãÀ

(iii) Êãð½ãã‡ãÃŠ (iv) jãããlãÃ¶ã

(Øã) ãã¶ã½¶ãããÊãããCeã|ã ½ãò Ôãñ ãã‡ãŠÔã‡ãñŠ ‡ãŠãÀ¶ã ÁããfãÀ ‡ãŠã ÀãØã ÊããÊã Öãñ|ãã Öð-

(i) 'ãŠãfãã°ãÆ¶ããñ•ã¶ã (ii) 'ãŠãfãã°ãÆ¶ã

(iii) Öãè½ããñØÊããñ°ããè¶ã (iv) 'ãÆãã|ã•ã¶ã

2. ãã¶ã½¶ãããÊãããCeã|ã ‡ãŠ©ã¶ããò ‡ãñŠ Ôãã½ã¶ãñ ÔãÖãè ,ã©ãlãã ØãÊã|ã ,ã¹ã¶ããè ,ã¼¾ããÔã 'ãlããÔ|ã‡ãŠã ½ãò ããÊãããCeã† -

(‡ãŠ) ½ã¶ãlãÓ¾ã ‡ãŠãè ÊããÊã ÁããfãÀ ‡ãŠãã¶ã‡ãŠã ‡ãñŠ¶³‡ãŠ ¾ãlã‡ã<|ã Öãñ|ããè Öð ý ()

(Ceã) CeããúÔã¶ãñ |ã©ãã æãé‡ãŠ¶ãñ Ôãñ †jãÔã 'ãðŠÊã|ãã Öð ý ()

(Øã) ÁããfãÀ lãØããô Ôãñ ÁããfãÀ ,ããfãã¶ã ½ãò ÔãÖã¾ã|ãã ãã½ãÊã|ããè Öðý ()

(Üã) ÁããfãÀ lãØããô ‡ãŠã ãã¶ãfããÃÀ¶ã †¶>ãè•ã¶ã 'ãÀã Öãñ|ãã Öð ý ()

(Ý) ÔlãÔ©ã ½ã¶ãlãÓ¾ã ‡ãŠã À‡ã<|ã °ãã 120 mm Hg Öãñ|ãã Öðý ()

3. ããÀ‡ã<|ã Ô©ãã¶ããò ‡ãŠãè 'ãlãã|ãÃ ,ã¹ã¶ããè ,ã¼¾ããÔã 'ãlããÔ|ã‡ãŠã ½ãò ‡ãŠããÀ† -

(‡ãŠ) ÁããfãÀ ‡ãñŠ °ãñ 'ãÆ½ãlãCeã ,ãlã¾ãlã Öð (a).....

(b).....

(Ceã) lãÀãèÀ ½ãò ,ãã¾ãñ •ããèlãã¶ãlã,ããò ‡ãŠãñ ½ããÀ¶ãñ ‡ãŠã ‡ãŠ¾ãÃ ‡ãŠÀ|ããè Öð ý

(Øã) ÁããfãÀ ‡ãñŠ lãØãÃ Öãñ|ãã Öðý

(Üã) ÁããfãÀ ,ããfãã¶ã Öãñ|ãã Öð ý

4. Ô|ã½½ã '‡ãŠ' ‡ãŠãñ Ô|ã½½ã 'Ceã' Ôãñ ãã½ãÊãã¶ã ‡ãŠãéãã•ã† -

Ô|ã½½ã '‡ãŠ'

Ô|ã½½ã 'Ceã'

ÊããÊã

ÁããfãÀ

‡

ãŠãã¶ã

‡

ãŠã

†Pã0,ããfÃ0lããè0

Ôããñããj¾ã½ã

Ôããf>Èñ>

ÁããfãÀ ÔããÀ {k¶ã

†jãÔã

80 mm Hg

ããlããã©ãÊã¶ã

°ãã

Öãè½ããñØÊããñãã°ã¶ã

5. ÊããÊã À ‡ã<|ã ,ããòÀ lãñ|ã À ‡ã<|ã ‡ãŠãã¶ã ‡ãŠã,ããò ½ãò ,ã¶ãÀ °ãlããf¾ãñý

6. À‡ã<|ãã¶ã ‡ãŠãè ,ããlãl¾ã‡ãŠ|ãã ‡ãŠãñ Ô¹ãÓ> ‡ãŠãéãã•ã†ý

7. ÁãäƒãÀ †ãñŠ †ãŠññfÃ ¹ãúPã †ãŠã³⁄⁴ããò †ãŠññ ããÊãããƒEã†ý
8. ÁãäƒãÀ •ãã¶ã|ã ¹ãñ °ããè¹⁄²ããããÀ³⁄⁴ããò †ãñŠ ¶ãã¹⁄²ãý
9. `À†ã<|ã †ãñŠ •ã¹⁄²ã¶ãñ' †ãŠãè ãã%ããŠ³⁄⁴ãã †ãŠññ Ôã¹⁄²ãçããƒ³⁄⁴ãñý
10. À†ã<|ã ¹ã°ã ãã†ãŠÔãñ †ãŠÖ|ãñ Öö? fÔã†ãŠññ †ãöŠÔãñ ¶ãã¹ã|ãñ Öö ý
- ÀãÓ>Èãè³⁄⁴ã ,ãã³⁄⁴ã † Ìãâ ³⁄⁴ããñØ³⁄⁴ã|ãã ,ããƒããããÀ|ã ¹ãÀãèàãã 2008**
- †ãñŠ ¹ãÆÍ¶ã :-**
- 1û** ¹ãÆEã|ã•ã¶ã ãã †ãŠÔã ÁãäƒãÀ †ãŠãã¥ã †ãŠã,ããò †ãŠãè ãã¹⁄⁴ããã||ã ¹ãÀ ããPã¹ã†ãŠãè Öãñ|ããè Öö?
1. ¹Êãã•¹⁄²ãã 2 Íãñ|ã ÁãäƒãÀ †ãŠãã¥ã†ãŠã
3. ¹Êãñ>Êãñ>áÔã 4. ÊããÊã ÁãäƒãÀ †ãŠãã¥ã†ãŠã
- 2. ÊããÊã À†ã<|ã †ãŠãã¥ã†ãŠã,ããò †ãŠã ãã¶ã¹⁄²ããÃ¥ã Öãñ|ãã Öö- NTS- 2008**
- 1û ³⁄⁴ã†ãöŠ|ã ¹⁄²ãò 2. ¹⁄²ãããÔ|ãÓ†ãŠ ¹⁄²ãò
3. À†ã<|ã ¹⁄²ã••ãã ¹⁄²ãò 4. ¹Êãã•¹⁄²ãã ¹⁄²ãò
- 3û †Pã0 >ãè0 †Êã0 Ìããè0- III Öö - NTS- 2008**
- 1û †Pã0 ,ããƒÃ0 Ìããè0 2. ,ãã†ãŠññ•ãñã¶ã†ãŠ Ìãã³⁄⁴ãÀÔã
3. ¹ããñããÊã³⁄⁴ããñ Ìãã³⁄⁴ãÀÔã 4. f¶ã<Êã†¶ãã Ìãã³⁄⁴ãÀÔã

[back](#)

f‡ãŠãfÃ : 13

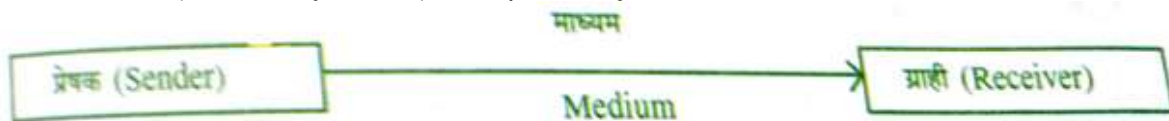
‡ãŠ^{1/2}^{13/4}ãî>À : ¶ãñ>Ìãää‡ãÄŠØã †Ìãâ
f¶>À¶ãñ>



- ¶ãñ>Ìãää‡ãÄŠØã ‡ãŠã 'ãääÀPã^{3/4}ã ý
- f¶>À¶ãñ> ‡ãŠã 'ãääÀPã^{3/4}ã ý
- fÃ-^{1/2}ãñÊã ‡ãŠã 'ãääÀPã^{3/4}ã †Ìãâ 'ãÆ^{3/4}ãñØã ý

^{1/2}ãæ¶ã ØãùãÌã Ôãñ ÍãÖÀ ,ã'ã¶ãñ ^{1/4}ããfÃ ‡ãñŠ 'ããÖã ,ãã^{3/4}ãæ ©ãæý
„Ôã‡ãŠã ^{1/4}ããfÃ ‡ãŠ^{1/2}^{13/4}ãî>À ‡ãñŠ ããÌãÓã^{3/4}ã ‡ãŠæ ,ãPœãæ •ã¶ã‡ãŠãÀæ
ÀÆã|ãã ©ãáy ÍãÖÀ ,ãã¶ãñ ‡ãñŠ °ãã^a ^{1/2}ãæ¶ã ,ã'ã¶ãñ ^{1/4}ããfÃ Ôãñ
‡ãŠ^{1/2}^{13/4}ãî>À ‡ãñŠ Öã;ÃÌãñ^{3/4}ãÀ †Ìãâ Ôãù'ã<Ìãñ^{3/4}ãÀ ‡ãŠæ ããÌãããfãÌã|ãã
•ã¶ã‡ã ‡ãŠãÀæ Êãñ Pãì‡ãŠæ ©ãæý ÍãÖ ‡ãŠ^{1/2}^{13/4}ãî>À ‡ãŠãñ 'ãÆ^{3/4}ãñØã
‡ãŠÀ¶ãñ ‡ãñŠ |ãÀæ‡ãñŠ ^{1/4}ãæ •ã¶ã Pãì‡ãŠæ ©ãæý Êãñãã‡ãŠ¶ã „Ôã‡ãñŠ
^{1/2}ã¶ã ^{1/2}ãò ‡ãŠ °ãã|ã °ããÀ-°ãã ,ãã|ãæ ©ãæ ãã‡ãŠ ‡ãŠ ‡ãŠ^{1/2}^{13/4}ãî>À Ôãñ
°ÍÔãÀñ ‡ãŠ^{1/2}^{13/4}ãî>À 'ãÀã °ãã|ãPãæ|ã ‡ãðŠÔãñ Ôãñ|ãæ Öö? „Ôã¶ãñ ‡ãŠ
ãã¶ã ,ã'ã¶ãñ ^{1/4}ããfÃ Ôãñ 'ãìœã ãã ‡ãŠ ‡ãŠ^{1/2}^{13/4}ãî>À 'ãÀã ,ãã'ãÖã ^{1/2}ãò
°ãã|ãPãæ|ã ‡ãðŠÔãñ Ôã^{1/2}^{1/4}ãÌã Ôãñ|ãæ Öö? ^{1/4}ããfÃ ¶ãñ ‡ãŠÖã ãã‡ãŠ ‡ãŠ
‡ãŠ^{1/2}^{13/4}ãî>À Ôãñ °ÍÔãÀñ ‡ãŠ^{1/2}^{13/4}ãî>À 'ãÀã °ãã|ãPãæ|ã ‡ãŠÀ¶ãñ ‡ãŠãñ ;ñ>ã
>ÈããÔã'ãŠÀ ‡ãŠÖ|ãñ Ööý ^{3/4}ãÖãú °ãã|ãPãæ|ã ‡ãŠã ,ã©ãÃ Öö ãã‡ãŠ ‡ãŠ
‡ãŠ^{1/2}^{13/4}ãî>À °ÍÔãÀñ ‡ãŠ^{1/2}^{13/4}ãî>À ‡ãŠãñ ãã ‡ãŠÔãæ ^{1/2}ããf^{3/4}ã^{1/2}ã ‡ãñŠ
•ããÀ^{3/4}ãñ ;ñ>ã ‡ãŠã ,ããã¶ã 'ãÆã¶ã ‡ãŠÀ|ãã Ööý ãã•ãÔãñ Ö^{1/2}ã
‡ãŠ^{1/2}^{13/4}ãî>À ‡ãŠæ ^{1/4}ããÓãã ^{1/2}ãò ;ñ>ã >ÈããÔããã^{1/2}ãÌã¶ã ^{1/4}ãæ ‡ãŠÖ|ãñ Ööý
;ñ>ã >ÈããÔããã^{1/2}ãÌã¶ã ‡ãñŠ ããÊã† ÔããÀñ ‡ãŠ^{1/2}^{13/4}ãî>À ‡ãñŠ°ãÊã ,ã©ãÌãã
Ìãã^{3/4}ãÊãñÔã ‡ãñŠ ^{1/2}ããf^{3/4}ã^{1/2}ã Ôãñ ,ãã'ãÖã ^{1/2}ãò •ãìü;ñ Òì† Ôãñ|ãñ Ööý
fÔã 'ãÆ ‡ãŠãÀ •ããÊã ‡ãŠæ |ãÀÖ ‡ãŠ^{1/2}^{13/4}ãî>Àãò ‡ãñŠ •ãì;¶ãñ
‡ãŠãñ ¶ãñ>Ìãää‡ãÄŠØã ‡ãŠÖ|ãñ Ööý fÔã °ãã|ã ‡ãŠãñ |ãì^{1/2}ã fÔã |ãÀÖ
^{1/4}ãæ Ôã^{1/2}ãçã Ôã‡ãŠ|ãæ Öãñ ãã‡ãŠ •ã°ã Ö^{1/2}ã ÊãñØã œãñ>ñ ©ãñ |ã°ã °ãñ
^{1/2}ããããPãÔã ‡ãñŠ ÆããÊãæ ããì°ããò ‡ãŠãñ fããØãã Ôãñ °ãããfã ‡ãŠÀ °ÍÀ

CEüjñ Öñ •ää|ñ ©ñý •ã°ã † ‡ ãŠ ãä|°ñ Öñ ,ää|äã•ã °ñ|ñ ©ñ |ññ
 °iÖãÄñ ½ãò Öñ|ääfÄ °ñ|ää ©ñý † ‡ ãŠ ãä|°ñ Öñ |ä½ã °ññÊä|ääè ©ññè
 |ññ °iÖãÄñ ää|°ñ ½ñò ½ãò Öñ|ä|ää ©ñ ,ääòÄ •ã°ã ½ãò ää|°ñ Öñ
 °ññÊä|ää ©ñ |ññ |ä½ã Öñ|ä|ääè ©ññý |ä½ã °ññÊä|ääè ©ññè |ññ
 |ä½Öñ 'ÄñÖã † ãŠ (Sender) ,ääòÄ ½ãò Öñ|ä|ää ©ñ |ññ
 ½ä|çñ ÆñÖñ (Receiver) ,ääòÄ ÆñÖñ
 † ãŠñ ½ãñ³⁄⁴ñ (Medium) † ãŠÖã •ää³⁄⁴ñÖñý ÿè † ãŠ ,Öññè 'Äñ † ãŠÄ
 •ã°ã °ñ † ãŠ¹⁄²¹³⁄⁴ñÄ † ãŠñ ,ää¹ãÖã ½ãò † ãŠñ°ãÊä † ãŠñ ½ãñ³⁄⁴ñ½ã Öñ
 •ääñüj °ñ|ñ Öñ |ññ ,Öññ |ññ|äãä † ãŠÖã † ãŠÖ|ñ Öñý † ãŠ¹⁄²¹³⁄⁴ñÄ
 † ãŠñè |ññ|äãä † ãŠÖã ½ãò ¼ññè
 'ÄñÖã † ãŠ(Öñññ|Ä),ÆñÖñ(ääÖññè|äÄ) ,ääòÄ
 ½ãñ³⁄⁴ñ½ã(½ññèää³⁄⁴ñ½ã)Öñ|ää Öñý



½ññè|ää |ññ † ãŠÖã ää † ãŠ ¾ãÖ † ãŠñ|äÊä °ññ 'ääÖã 'äüjñ † ãŠ¹⁄²¹³⁄⁴ñÄ
 ½ãòñ Öñè Öñ¹⁄²¹³⁄⁴ñ Öñý ¼ääfÄ |ññ † ãŠÖã |äÖñý † ãŠ¹⁄²¹³⁄⁴ñÄ
 |ññ|äñ|ãÄ ,ää¹ãÖã ½ãò •äüjñ Öñ¹⁄²¹³⁄⁴ñÄ † ãŠñ † ãŠñ •ääÊä
 Öñ •ääñ ¼ääòÖññäÊä † ãŠ Ä¹ã Öññ ,äÊäÖã-äÊäÖã Äññ Öñ †
 Öññ|ñ Öñý † ãŠ¹⁄²¹³⁄⁴ñÄ |ññ|äãä † ãŠÖã † ãŠñ ,|ä † ãŠñè 'Äñè † ãŠñ
 ,ääñäÄ 'Äñ °ññ |äñè † ãŠñ Öññ |äñ|äñ|äñ ää † ãŠ¾ãã •ää Öñ † ãŠ|äñ Öñý

(1) Êññ † ãŠÊä † ää¾ã |ññ|äñ|ãÄ (Local Area Network)

† † ãŠ † ãŠ¹⁄²ãÄñ, ¼ä|ä|ä, ,ääüä¹ãÖã ,äç|ä † † ãŠ † äò¹⁄²¹ãÖã ½ãò
 ääÖç|ä † ãŠ¹⁄²¹³⁄⁴ñÄ |ññ|äñ|ãÄ † ãŠñ Êññ † ãŠÊä † ää¾ã |ññ|äñ|ãÄ
 (LAN) † ãŠÖã •ää|ää Öñý ¾ññ † ãŠ¹⁄²¹³⁄⁴ñÄ ,ää¹ãÖã ½ãò ää|äÖñj
 (Twisted) † ãŠñ°ãÊä ¾ää ,ä³⁄⁴ñ † ãŠñ°ãÊä 'Äñ •äüjñ Öññ|ñ Öñý f|ä½ãò
 °ññ † ãŠ¹⁄²¹³⁄⁴ñÄ † ãŠñ °ññè † ãŠñè 'Äñè ,ääñä † ãŠñ Öññ ,ääñä † ãŠñ † ãŠñ
 ½ññèÊä Öññ|ääè Öñý

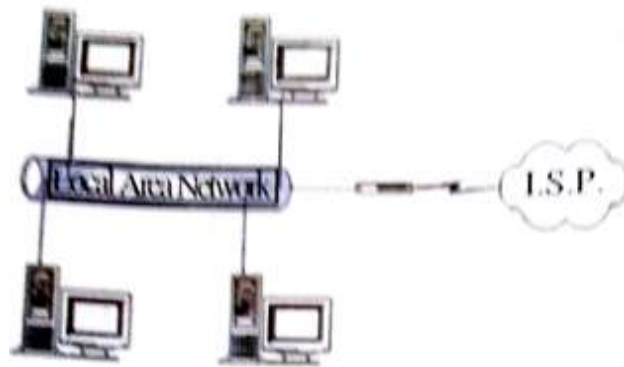
(2) |äñfj † ää¾ã |ññ|äñ|ãÄ (Wide Area Network)

|äñfj † ää¾ã |ññ|äñ|ãÄ † ãŠñ Öññ|äñ|ãÄ: |äñ|ä (WAN) † ãŠÖ|ñ Öñý
 f|ä½ãò °ññ † ãŠ¹⁄²¹³⁄⁴ñÄ † ãŠñ°ãÊä Öññ |ä •äüjñ † ãŠÄ ÖñññÊäñf † ãŠñ
 ½ãñ³⁄⁴ñ½ã Öññ •äüjñ Öññ|ñ Öñý f|ä½ãò °ññ † ãŠ¹⁄²¹³⁄⁴ñÄ † ãŠñè 'Äñè
 ää † ãŠÖññè °ññ |äÖÄ Äñ¾ã ¾ãññ † ãŠñè 'Äñè Öññ Öñ † ãŠ|äñè Öñý
 ää•äÖññ Öññ|äñ|ãÄ: |äñ¾ãÊññÖñ |ññ|äñ|ãÄ ¼ññè † ãŠÖ|ñ Öñý

f|äñ|äñ † ä¾ã Öñ ?

½ññè|ää |ä|ä|ä °ññÊäè Öñ ¾ãÖ |ä¹ã ½ãò|ññ 'äÖññ ¼ññè † ãŠÖñè 'äüñ
 Öñý Êññä † ãŠ|ä ÿè † ãŠ Öññ Öñ¹⁄²ç ½ãò |äÖñè ,ää¾ãñý ¼äò¾ã ,ää¹ã

Öæ fÔ ð ãŠāñ Ÿæ ð ãŠ Ôāñ Ôā½ãçã¾āöý ¼āāfÃ ¶āñ ð ãŠÖā, ¶āñ>İāāā ð ãŠÖā ð ãŠā 'āÆ¾āāñÖā Ôā°āÔāñ 'āÖÊāñ ,ā½āñāāÀ ð ãŠā ð ãŠæ ÔāİÀāā āāİā¼āāÖā ¶āñ āā ð ãŠ¾āā ©āāý İāÖ ,ā'ā¶āñ ĩñ ð ð ãŠāñ ð ð ãŠ Ô©āā¶ā Ôāñ °İÔāĀñ Ô©āā¶ā 'āÀ ¼āñ•ā¶āñ ð āñŠ āāÊā† ¶āñ>İāāā ð ãŠÖā ð ãŠā 'āÆ¾āāñÖā ð ãŠÀ¶āñ ©āāý Êāñāā ð ãŠ¶ā „¶ā ð ãŠæ Ôāæ½āā † ú āā¶āfāāĀāÀ¶ā Öāñ|āæ ©āāéý |ā°ā „¶āÖā¶āñ ,āāÖÀ Çāāñ•ā ð ãŠæ ,āāÖÀ f¶ā>À¶āñ ð ãŠā 'āÆ¾āāñÖā 'āÆāÀ½¼ā āā ð ãŠ¾āāý f¶ā>À¶āñ ð ãŠā ,ā©āĀ f¶ā>À¶āñİā¶āĒā ¶āñ>İāāā ð ãŠÖā Öāñ|āā Öō (āāPāā 13.1)ý f¶ā>À¶āñ °ñİā-āāİā°ñİā ½āò ÀÇāñ ð ãŠ½½¼āİ>Àāò ð ãŠā ¶āñ>İāāā ð āāĀŠÖā Öō •āāñ Ôāñ•ñÊāāf ð āñŠ ½āāf¾ā½ā Ôāñ •āİüñ Öāñ|āñ Öōý



चित्र सं० 13.1

½āæ¶āā °āāñÊāæ āā ð ãŠ ¾āÖ |āāñ Ôā½ãçã¾ā ½āò ,āā Öā¾āā Êāñāā ð ãŠ¶ā fÔā½āò ĩñ ð ð ãŠā >ÊāÔāā½āİā¶ā āā ð ãŠÖā 'āÆ ð ãŠāÀ Öāñ|āā Öō? ¾āÖ °ā|āāf¾āāý ¼āāfÃ ¶āñ ð ãŠÖā ,ā'ā¶ā ð ãŠ½½¼āİ>À f¶ā>À¶āñ Ôāñ ¶āÖāé •āİüñ Öōý ½āæ¶āā ¶āñ ð ãŠÖā f¶ā>À¶āñ Ôāñ •āİüñ ¶āñ ð ãŠā ð ā¾āā ,ā©āĀ Öō? ¼āāfÃ ¶āñ ð ãŠÖā, Ôāİ¶āāñ f¶ā>À¶āñ Ôāñİāā¾āò 'āÆā¶ā ð ãŠÀ¶āñ İāāÊāæ (I.S.P. (Internet Service Provider) ,¶āñ ð ãŠ ð ãŠ½½¼āā¶ā¾āū Öāñ|āæ Öō •āāñ ¼āİÖā|āā ð ãŠÀ¶āñ 'āÀ 'āÆ¾āāñÖā ð ãŠ|āā ð ãŠāñ † ð ãŠ 'āāÔāİāĀ (Ôāİ|ā ð ãŠāñ) °ñ|āæ Öōý ð ãŠ½½¼āİ>À ð ãŠāñ >ñÊāæ'āŠāñ¶ā Êāāf¶ā Ôāñ •āāñü ð ãŠÀ 'āāÔāİāĀ >āfā ð ãŠÀ¶āññ 'āÀ ð ãŠ½½¼āİ>À ,āāfÃ † Ôā°āāè Ôāñ •āİüñ •āā|āā Öō (āāPāā 13.2)ý āā•āÔāÔāñ Ö½ā f¶ā>À¶āñ ð ãŠā 'āÆ¾āāñÖā ð ãŠÀ Ôā ð ãŠ|āñ Öōý Êāñāā ð ãŠ¶ā ,ā'ā¶ā ð ãŠ½½¼āİ>À f¶ā>À¶āñ Ôāñ ¶āÖāé •āİüñ Öōý Ö½ā ÊāāñÖā ð ãŠÊā f¶ā>À¶āñ İāāÊāæ °İ ð ãŠā¶ā 'āÀ PāÊāòÔāñ, İāÖāú ½āñÀā āā½āā Öō „Ôā ð ãŠāñ ,āPœæ |āÀÖ Ôāñ f¶ā>À¶āñ ð āñŠ °āāĀñ ½āò 'ā|āā Öōý



ãäPã"ã Ôãã0 13.2

“îÔãÀñ ãäªª ½ããèªãã ,ããõÀ ¼ããfÃ fªª>Àªªñ> ÌããÊããè ªì ‡ ãŠãªã 'ãÀ 'ãÖìúPãñý ¼ããfÃªªª Æãñ Àã•ãî Ôãñ ½ããèªãã ‡ ãŠã 'ãããÀPã¾ãã ‡ ãŠÀÌã¾ãã ,ããõÀ ‡ ãŠÖã ãã‡ãŠ ½ãñÀãè ºãÖªã ‡ ãŠãñ ¾ãÖ ºã|ãã,ããñ ãã‡ãŠ fªª>Àªªñ> ãã ‡ ãŠÔã |ãÀÖ 'ãÆ¾ããñÖã ãã ‡ ãŠ¾ãã •ãã|ãã Öõ? Àã•ãîªªªñ ‡ ãŠÖã, Ôãîªªãñ ½ããèªãã, ÔãªãÔãñ 'ãÖÊãñ fªª>Àªªñ> ½ãò 'ãÆ¾ããñÖã Ôãñªªñ ÌããÊããè ÍãªãÌãÊããè ‡ ãŠãñ Ôã½ãçããñý fÔã ‡ ãñŠ ºããª fÔã ‡ ãñŠ ‡ ãŠã¾ãã ºã|ãã...úÖãý Àã•ãîªªªñ ‡ ãŠÖã fÔã½ãò ½ãìE¾ãã: ããªª½ªã ÍãªãÌãÊããè 'ãÆ¾ããì‡ã<|ã Ôãñ|ããè Öõ -

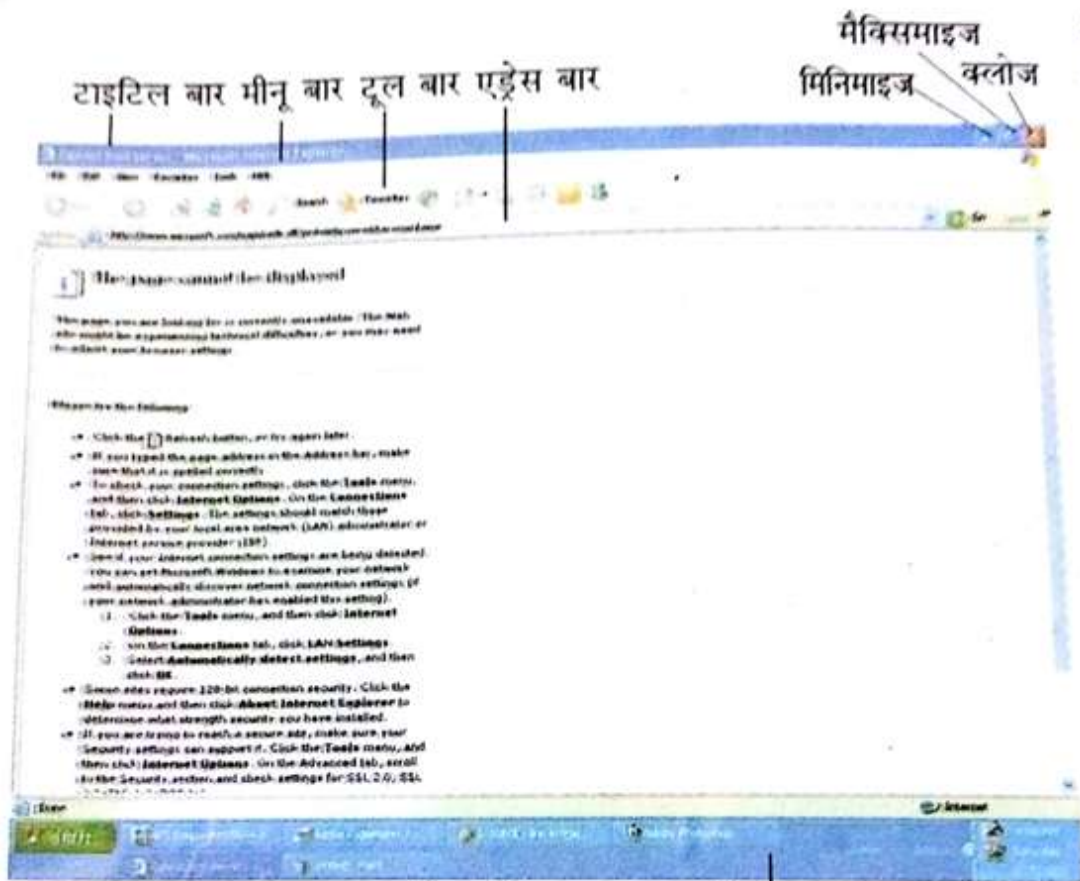
- ☐ WWW (World Wide Web) ☐ ÌãñªãÔããf> (Website)
- ☐ ºãÆã,,•ãÀ (Browser) ☐ Öãù> ããÊãã‡ãŠ (Hot Link)
- ☐ ,ãÊãÃ (URL)

Ìã;Ã Ìããf; Ìãñª

¾ãÖ ÔãÌãÃÀ ‡ ãŠã Ôã½ãîÖ Öãñ|ãã Öõ •ããñ Öãf¹ãÀ >õ ‡ ã<Ô> (Hyper Text)
‡ãñŠ ½ããf¾ã½ã Ôãñ •ãìüªã Öãñ|ãã Öõý

- ☐ ÔãÌãÃÀ ‡ ãŠ½¹¾ãî>À ¾ãã 'ãÆãñÖãÆã½ã,ªªñ>Ìã ‡ ãÃŠ ½ãò ããÔ©ã|ã ãã‡ãŠÔããè ,ãª¾ã ‡ ãŠ½¹¾ãî>À ¾ãã 'ãÆãñÖãÆã½ã ‡ ãŠãñ ÔãñÌãã 'ãÆªãªã ‡ ãŠÀ|ãã Öõý
- ☐ Öãf¹ãÀ >õ‡ã<Ô> (Hyper Text) ÔãªªñÍãª ÌããÃªªñ ‡ ãŠã ‡‡ãŠ |ãÀãè‡ãŠã Öõý ãã‡ãŠÔããè Íãªª ãããñ Öãf¹ãÀ ããÊãã‡ãŠ (Hyper Link)
‡ãñŠ ½ããf¾ã½ã Ôãñ Ì¾ãã<|ã ‡ ãŠÀªªñ ,ããõÀ ‡‡ãŠ 'ãñ•ã Ôãñ “îÔãÀñ 'ãñ•ã 'ãÀ •ããªªñ ‡ ãñŠ ããÊã ‡ Öãf¹ãÀ >õ ‡ ã<Ô> ‡ ãŠã 'ãÆ¾ããñÖã ãã‡ãŠ¾ãã •ãã|ãã Öõý

Àã•ãî ¶ãñ ‡ãŠÖã ,ãã,ããñ Ö½ã Ôã¼ããè ‡ãŠ½¹³⁄⁴ãî>À ‡ãñŠ ½ããù¶ããè>À 'ãÀ
 ãñÆãöý Ôã°ãÔãñ 'ãÖÊãñ Ô%ãŠãè¶ã 'ãÀ ¶ããèPãñ ‡ãŠãè ,ããñÀ Ö>ã>Ã ( start
) °ã>¶ã 'ãÀ ½ãã,,Ôã Ôãñ °ã¾⁄⁴ããã °ã>¶ã °ãã ‡úý ãã¹ãŠÀ ½ããù¶ããè>À 'ãÀ
 ÆãîÊãñ ããìã¶ãñ•ã ½ãò 'ãÆãñÖãÆã½ã 'ãÀ •ãã‡ãŠÀ °ã¾⁄⁴ããã °ã>¶ã °ãã ‡úý
 „Ôã‡ãñŠ °ããª f¶ã>À¶ãñ> ‡‡ã<Ôã¹ÊããñÀÀ 'ãÀ ½ãã,,Ôã ‡ãŠã °ã¾⁄⁴ããã °ã>¶ã
 °ãã‡úý fÔã 'ãÆ‡ãŠÀ f¶ã>À¶ãñ> ‡‡ã<Ôã¹ÊããñÀÀ Ô%ãŠãè¶ã (ããPãª 13.3
)¹ãÀ ÆãîÊã •ã¾⁄⁴ãñÖããý
 Ô%ãŠãè¶ã (ããPãª 13.4)¹ãÀ 'ãÆ¹³⁄⁴ãñ ‡ãŠ ¼ããÖã ‡ãŠãñ ,ãÊãÖã-,ãÊãÖã
 ¶ã½ããò Ôãñ •ã¶ãã •ãã¶ã Öã •ããñ ãã¶ã½¶ã Öã-



चित्र सं० 13.4

स्टेटस बार

□ >ãfãã>Êã °ããÀ (Title Bar) Ôã°ãÔãñ ...¹ãÀ Öãñ|ãã Ööý fÔã½ãò ãã‡ãŠÔããè
 ¼ããè 'ãñ•ã ‡ãŠã ÍããèÓãÃ‡ãŠ (Title) Öãñ|ãã Ööý fÔã‡ãñŠ °ãããÖ¶ãñ |ãÀ¹ãŠ
 ‡ãŠãñ¶ãñ ½ãò ½ãò‡ã<Ôããè½ããf•ã (Maximize), ãã½ããã¶ã½ããf•ã (Minimize)
 ,ããòÀ ‡ã<Êããñ•ã (Close) °ã>¶ã Öãñ|ãã Ööý

□ **½ããè¶āī °ããÀ (Menu Bar)** >ãfää>Êã °ããÀ ‡ãñŠ Ÿæè‡ãŠ ¶ããèPāñ āãÔ©ā|ã Öāñ|ãã Ööý fÔã½ãò Ôã½ãã¶¾ã|ã: 'ãŠãfÊã (File), ‡ãã|> (Edit), Ì¾ãî (View), ÖñÊ¹ã (Help) ,ããããª Öāñ|ãñ Ööý

□ **>îÊã °ããÀ (Tool Bar)** āãîããã¼ã¶¶ã 'ãÆ‡ãŠãÀ ‡ãñŠ °ã¶ããò ‡ãŠã Ôã½ãîÖ Öāñ|ãã Ööý fÔã‡ãñŠ ½ãã£¾ã½ã Öāñ āã¹æÊãã 'ãñ•ã (Back), ,ãØãÊãã 'ãñ•ã (Forward), ‡ãŠã¾ãÃ Äāñ‡ãŠ¶ãã (Stop), 'ãñ•ã ‡ãŠãñ āã¹ãŠÀ Ôāñ ÍaiÁ ‡ãŠÀ¶ãã (Refresh), ¾ãã āã ‡ãŠÔããè ÌāñªÔããf> ‡ãñŠ 'ãÆ©ã½ã 'ãñ•ã (Home)'ãÀ 'ãÖiúPāñ •ãã Ôã‡ãŠ|ãã Ööý

□ **‡;ÊñÔã °ããÀ (Address Bar)** ½ãò āã‡ãŠÔããè ¼ããè ÌāñªÔããf> ‡ãŠã ‡;ÊñÔã ¾ãã ¾ãî0,ããÀ0‡Êã0 āãÊãÆã|ãñ Ööý

□ **Ô>ñ>Ôã °ããÀ (Status Bar)** āã‡ãŠÔããè ¼ããè ÌāñªÔããf> ‡ãñŠ ÇaiÊã¶ãñ ‡ãŠãè 'ãÆØããã|ã (Progress) ‡ãŠãñ āãªÇãã|ãã Öö Ôãã©ã Öæ Ôãã©ã „Ôã ÌāñªÔããf> ‡ãŠã ,ããfÃ0¹ããè0 ‡;ÊñÔã ‡ãŠãñ ¼ããè āãªÇãã|ãã Öö •ãññ āãããŸã‡ãŠ Ôã½ã¾ã ‡ãñŠ āãÊã‡ Öāñ|ãã Ööý

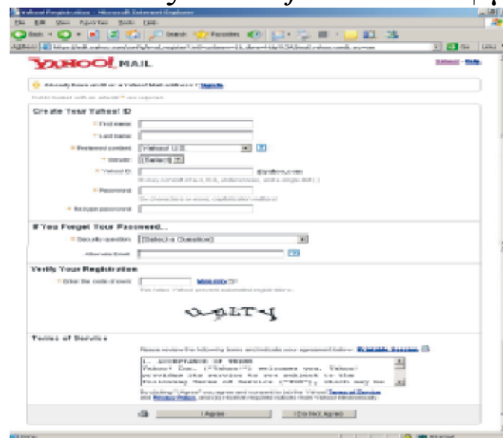
½ããè¶ãã Ô%ãŠãè¶ã 'ãÀ °ãÖi|ã ÔããÄñ Ôã¶ñîã ãñÇã ÀÖæè ©ããèý ¾ãÖ ÖÍ¾ã „Ôã‡ãñŠ āãÊã‡ āãªÊ‡ãîŠÊã ¶ã¾ãã ©ããý ½ããè¶ãã ¶ãñ „Ôãî‡ãŠ|ãã ‡ãñŠ Ôãã©ã 'ãîæã, ¾ãÖ ÌāñªÔããf> (ããPãã 13.5) |ãñ ÇaiÊã Øã¾ããè Êãñãã‡ãŠ¶ã fÔã‡ãŠã „¹ã¾ãñØã āã‡ãŠÔã 'ãÆ‡ãŠãÀ ‡ãŠÀòØāñ? Äã•ãî ¶ãñ ‡ãŠÔã, ÌāñªÔããf> ‡ãŠã „¹ã¾ãñØã ½ãîÇ¾ã Ä¹ã Ôāñ fÃ-½ãñÊã ‡ãñŠ āãÊã ‡ãã ‡ãŠ¾ãã •ãã|ãã Ööý āãªÔāñ fÊãñ ‡ã>Êãùãã¶ã ‡ãŠ ½ãñÊã (Electronic Mail)¼ããè ‡ãŠÖ|ãñ Ööý



चित्र सं० 13.5

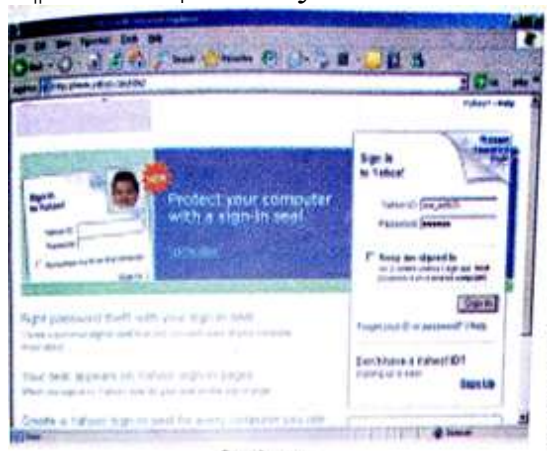
½ããè¶ãã ¶ãñ ‡ãŠÔã „ãPæã fÔããè fÃ-½ãñÊã ‡ãñŠ ½ãã£¾ã½ã Öāñ ‡ãŠ¹¾ãî>À 'ãÀ °ãöŸñ ãñ Ì¾ããã‡ã<|ã ,ãã¹ãÔã ½ãò °ãã|ãPããè|ã ‡ãŠÀ|ãñ Ööý Äã•ãî ¶ãñ ‡ãŠÔã, Öāú ¾ãÖ fÃ-½ãñÊã f¶>À¶ãñ> ‡ãŠãè ÔãªÔāñ •¾ããã „¹ã¾ãñØã Öāñ¶ãñ ÌããÊããè Öāñîãã Ööý fÔã‡ãñŠ ½ãã£¾ã½ã Öāñ f¶>À¶ãñ> 'ãÀ °ãöŸñ °iÔãÄñ Ì¾ããã ‡ã<|ã ‡ãŠãñ |ãî½ã >ö‡ã<Ô>,¹ãÆāñØãÆã½ã, āãPãã, PãÊãããPãã ,ããããª ¼ãñ•ã Ôã‡ãŠ|ããè Öāñý

āā † āŠŌāāē ¼āāē fÃ-½āñÊā † āŠā ¹āÆ³⁄₄āñŌā † āŠÀ¶āñ † āñŠ āāÊā †
 Ōā°āŌāñ ¹āŌÊāñ |āi½ŌāĀā fÃ-½āñÊā † †āŠā,,¶ Ōāñ¶āā PāāāāŌ†ý
 ½āāē¶āā ¶āñ † āŠŌā, ¾āŌ fÃ-½āñÊā † †āŠā,,¶ †ā<¾āā Ōāñ|āā Ōō? Āā•āi
 ¶āñ † āŠŌā Ōāi¶āāñ, •āōŌāñ Ō½ā † āŠāñfÃ ¼āāē ¹ā°ā ¼āñ•ā|āñ Ōō |āāñ
 ¼āāā † ā<|ā † āŠāē ¹āŌPāā¶ā † āñŠ āāÊā † „Ōā † āŠñ ½ā † āŠā¶ā † āŠā ¹ā|āā,
 ŌāÊāāē, ½āāñŌŌÊĀā, ÍāŌĀ |ā©āā ¹āÆ°ñÍā āāÊāĒā|āñ Ōō, Ýāē † āŠ „Ōāāē
 ¹āÆ†āŠāÀ fÃ-½āñÊā † †āŠā,,¶ ½āō ¼āāē ¼āāā†ā<|ā † āŠāē ¹āŌPāā¶ā (User
 ID) |ā©āā „Ōā Íāñ°āŌāāf> † āŠā ¶āā½ā āā•āŌā ¹āĀ ÍāŌ † †āŠā,,¶ ĒāāñÊāā
 Ōā¾āā Ōō, āāÊāĒā|āñ Ōōý fÃ-½āñÊā ¼āñ•ā¶āñ † āñŠ āāÊā † |āi½ŌāĀā
 † Íāā āā•āŌā†āñŠ ¹āāŌā ¼āñ•ā ÀŌñ Ōō „Ōā†āŠā ¼āāē fÃ-½āñÊā † †āŠā,,¶
 Ōāñ¶āā PāāāāŌ † ý |ā¼āāē |āi½ā ,ā¹¶āā |ñ>ā „Ōā † āñŠ ¹āāŌā ¼āñ•ā
 Ōā†āŠ|āāē Ōāñý ½āāē¶āā ¶āñ † āŠŌā, ¾āŌ fÃ-½āñÊā † †āŠā,,¶ āā†āŠŌā
 ¹āÆ†āŠāÀ °ā¶āā¾āā •āā|āā Ōō ?
 fÃ-½āñÊā † †āŠā,,¶ °ā¶āā¶āñ † āñŠ āāÊā† f¶>À¶āñ> † †ā<Ōā¹ÊāāñĀĀ † āñŠ
 † ÍĒñŌā °āāĀ ¹āĀ „Ōā Íāñ°āŌāāf> āā•āŌāñ |āi½ā ŌāPāĀ † āŠÀ¶āā PāāŌ|āāē
 Ōāñ † āŠāñ āāÊāĒā¶āñ † āñŠ °āā† †¶>Ā °ā¶ā °āā¶āñ ¹āĀ (āāPā°ā 13.6)
 •āōŌāā Íāñ°āŌāāf> ĒāiÊā •ā¾⁄₄āñŌāā ,ā°ā fŌā Íāñ°āŌāāf> ¹āĀ fÃ-½āñÊā
 † †āŠā,,¶ ĒāāñÊā|āñ Ōōý fŌā † āñŠ āāÊā † Ōāāf¶ā f¶ā (Sign in) ¹āĀ
 ½āā,Ōā Ōāñ āā†āĒā†āŠ † āŠÀ¶āā ¹āü|ñŌāāý āā†āĒā†āŠ † āŠĀ|āñ Ōāē
 Ō % āŠāē¶ā ¹āĀ † †āŠ ¹āŠā½āĀ āāPā°ā 13.6 ,ā¾⁄₄āñŌāā āā•āŌā † āŠāñ
 Ýāē†āŠ ¹āÆ†āŠāÀ Ōāñ ¼āĀ¶āā ŌāñŌāāý āā•āŌā½āō fÃ-½āñÊā † †āŠā,,¶
 † āŠā ¾āi•āĀ ,āāfĀŌ |āēŌ † Íāā ¹āāŌā|āĀ Ā Ā ,ā¶¾ā •āā¶ā † āŠāāĀ¾āāü
 ¼āĀāē •āā|āāē Ōōý fŌā † āñŠ °āā† (I Agree) ÍāāÊāā °ā¶ā °āā|āñ Ōāē
 °āāāfĀ Ōā¶āñÍā ,āā •ā¾⁄₄āñŌāāý Êāāñ fÃ-½āñÊā † †āŠā,,¶ °ā¶ā Ōā¾āāý

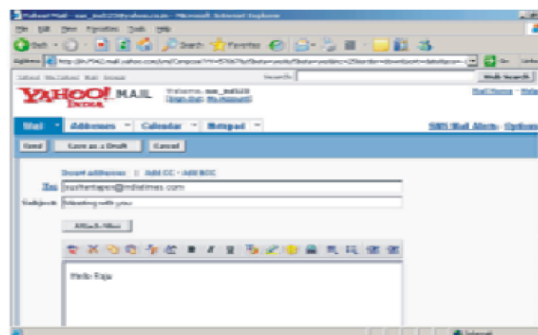


āāPā°ā ŌāāŌ 13.6 fÃ-½āñÊā † †āŠā,,¶ ĒāāñÊā¶āñ † āŠā ¹āŠā½āĀ
 ,ā°ā fÃ-½āñÊā † †āŠā,,¶ Ōāñ fÃ-½āñÊā † āŠÀ¶āñ † āŠāē āāÍāāāĒā °ā|āā|āā
 Ōūíý Ōā°āŌāñ ¹āŌÊāñ Íāñ°āŌāāf> ĒāāñÊā|āñ Ōō •āāñ Ō % āŠāē¶ā (āāPā°ā
 13.5) ¹āĀ āāĒā ÀŌā Ōōý „Ōā†āñŠ ā¾⁄₄āāē ,āāñĀ † †āŠ ½āñÊā °ā¶ā Ōō,

āā•āÔāñ ½āā,,Ôā Ôāñ āā‡ā<Êā‡āŠ ‡āŠÀ|āñ Ôōñý āā‡ā<Êā‡āŠ ‡āŠÀ|āñ Ôāè
 ĩāÖ ¾āî•āÀ ,āāfĀ0;āè0 ‡āĭā 'āāÔāĭā;Ā ½āāāÔā|āā Ôō (13.7)ý ¾āÔāū 'āÀ
 ¾āî•āÀ ,āāfĀ0;āè0 |ā©āā ¶āāèPāñ 'āāÔāĭā;Ā ĩāāÊāñ Ąāā¶āñ ½āò
 'āāÔāĭā;Ā āāÊāĄā¶āā Ôāñ|āā Ôōý¾āÖ 'āāÔāĭā;Ā āā ‡āŠÔāāè ,ā¶¾ā
 ĩ¾āāā ‡ā<|ā ‡āŠāñ ¶āÔāè āāāĄā Ôā ‡āŠ|āā ‡ā<¾āāòāā ‡āŠ ¾āÖ āāā¶ā
 °ā¶ā‡āŠÀ ,āā|āā Ôōý |ā|āĭPāā|ā Ôāāf¶ā f¶ā °ā¶ā ¾āā ‡ā>À °ā¶ā °āā|āñ
 Ôōý ,ā°ā fĀ-½āñÊā ĄāĭÊā •ā¾āñÔāāý ,ā°ā Ôāāñĭā āāÊāĄā¶āñ ‡āñŠ
 āāÊā ‡ā ‡āŠ½'āāñ•ā °ā¶ā 'āÀ āā ‡ā<Êā ‡āŠ ‡āŠÀ¶āā 'āūñÔāāý fÔā½āò
 |āāē¶ā ¼āāÔā Ôāñ|āñ Ôō Ôā°āÔāñ 'āÔÊāñ ĩāāÊāñ ¼āāÔā ½āò ›ĭ (To) ‡āñŠ
 ,āāÔāñ ,,Ôā ĩ¾āāā ‡ā<|ā ‡āŠā fĀ-½āñÊā ‡ā ‡āŠā,ā> āāÊāĄā¶āñ Ôō
 āā•āÔā ‡āŠāñ Ôāāñĭā ¼āñ•ā¶āā Ôō ,,Ôā ‡āñŠ °āā Ôā°āÔāñ āā¶āPāÊāñ
 ¼āāÔā ½āò ,āā¶āā Ôāāñĭā ›āfā ‡ā ‡āŠÀ|āñ Ôōý
 |ā|āĭPāā|āā Ôāñ¶ā; (send) °ā¶ā (āāPāā 13.8) 'āÀ āā ‡ā<Êā ‡āŠ ‡āŠÀ °ñ|āñ
 Ôōý •āōÔāñ Ôāè fĀ-½āñÊā 'āÔĭūPā •āā|āā Ôō fÔā ‡āŠāè ÔāĭPā¶āā
 Ô°āāŠāè¶ā 'āÀ āāāĄā¶āñ ÊāÔā|āāè Ôōý



चित्र सं० 13.7



āāPāā Ôāā0 13.8

fĀ-½āñÊā ‡ā ‡āŠā,ā> ½āò ¾āÖ 'ā|āā ‡āŠÀ¶āā Ôō āā‡āŠ āā‡āŠ|ā¶ā fĀ-
 ½āñÊā ,ā¾āñ Ôō |āāñ inbox 'āÀ āā ‡ā<Êā ‡āŠ ‡āŠÀ¶āā 'āūñÔāāý
 āā‡ā<Êā‡āŠ ‡āŠÀ|āñ Ôāè °ā¾āñā āāÔÔāñ ½āò Ôā¼āāè ,ā¾āāè ÔĭfĀ fĀ-

½āñÊā ‡āŠāē āāÊāÔ, „¶ā‡āŠā āāĭāÓā¼ā, ĩāĀāēĒā ‡ĭāā Ōāāf•ā āāĀĒā¶āñ
 ÊāŌāĭā Ōōý āā•āŌā fĀ-½āñÊā ‡āŠāñ 'āū□¶āā PāāŌĭāāē Ōāñ ½āā,,Ōā Ōāñ
 āā‡āĀĒā‡āŠ ‡āŠĀ‡āñŠ 'āū□ Ōā‡āŠĭāāē Ōāñý
 ,ā°ā ĩāĭ½Ōō ¾āāā^a ,ā'ā¶āā fĀ-½āñÊā °ā¶ā ‡āŠĀ¶āā Ōō ĩāāñ ĩāĭ½ā ...'āĀ
 āāÊāĒāñ Ō%āāŠāē¶ā 'āĀ Ōāāf¶ā ,āā,, (Sign out) 'āĀ āā‡āĀĒā‡āŠ ‡āŠĀĭāñ
 Ōōý āā‡āĀĒā‡āŠ ‡āŠĀ¶āñ 'āĀ fĀ-½āñÊā ‡āŠā,,ā> °ā¶ā Ōāñ •āāĭāā Ōōý
 ,ā°ā ĩā‡āŠ ½āāē¶āā ‡āŠāñ fĀ-½āñÊā °ā¶āā¶āā, ĒāāñÊā¶āā ‡ĭāā 'āū□¶āā ,āā
 Pāĭ ‡āŠā ©āā ,āāŌĀ ĩāŌ •āā¶ā Pāĭ ‡āŠāē ©āāē āā ‡āŠ fĀ-½āñÊā ‡āŠā
 'āĒ¼āāñŌā ‡āŠŌāū-‡āŠŌāū Ōāñāā Ōō ? ¼āāfĀ ¶āñ ‡āŠŌā ½āāē¶āā ,ā°ā
 ĩāĭ½Ōō Ōā½āāā ½āō ,āā Ōā¼āā ŌāñŌāā āā ‡āŠ fĀ-½āñÊā ‡āŠā
 'āĒ¼āāñŌā ‡āŌŌāñ ‡āŠĀĭāñ Ōō ? ½āāē¶āā ¶āñ Āā•āĭ ‡āŠāñ fā¼āĭāā^a
 ‡āŠŌā ,āāŌĀ ,ā'ā¶āñ ¼āāfĀ ‡āñŠ Ōāā©ā ŪĀĀ PāĒāē ,āā¼āāēý
 ,āĒĀ Url
 ,āāfĀ.‡Ōā.'āāē. Internet Service Provider
 f¶āĀ¶āñ Internet
 f¶āĀ¶āñ ‡āĀĀĒāñĀĀ Internet Explorer
 fĀ-½āñÊā Electronic Mail
 „,āŌāĒŌ Satellite
 ‡ĭĒŌā °āāĀ Address Bar
 ŌāĒĀē Receiver
 Ōāĭĭā ‡āŠāñĭ Password
 >āāĒĒā Title Bar
 >ĭĒā °āāĀ Tool Bar
 ĭ°Ēāĭ ĭ°Ēāĭ ĭ°Ēāĭ World Wide Web

ĭā°āĭāĒāē

ĭñ>ā ŌāāPāĀ¥ā Data Transfer
 ¶āñ Ō‡āñŠ'ā ¶āñāĭāŌāñ>Ā Net Escape Navigator
 ½āāf¼ā½ā Medium
 ½āāē¶āĭ °āāĀ Meenu Bar
 'āĒŌā‡āŠ Sender
 °āĒā,•āĀ Browser
 ĭāñ°āŌāf Website
 ¼āāā¶ā'āŠā½āĀ āāĀŌāñŌāĀ Êāñ‡āñŠ>Ā Uniform Resource Locator
 ŌāfĀ'āĀ >ō‡āĀ Hyper Text
 ŌāfĀ'āĀ āāĒā‡āŠ Hyper Link
 Ōāū> āāĒā‡āŠ Hot Link
 Ō>ñŌā °āāĀ Status Bar

,ā¼āāŌā 'āĒĭ¶ā

- āā¶ā½¶āāĒāāĒāĒā 'āĒĭ¶āāō ½āō ŌāŌāē „ĭāĀ 'āĀ ŌāŌāē (□) ‡āŠā
 āā¶āĭā¶āĒā ÊāŌāāf¼āñ -
 (‡āŠ) ¶āñĀĭāā‡āĀŠŌā ‡āŠŌĭāñ Ōō :
 (i) •ā°ā ‡āŠ½¼āĭ>Ā ‡āŠā 'āāĭāĀ ,āāū'āŠ ‡āŠĀĭāñ Ōōý

- (ii) •ã°ã °ãÆã,,•ãÀ ÇããñÊã|ãñ Ööý
- (iii) •ã°ã † ‡ ãŠ ‡ ãŠ^{1/2 13/4}ãî>À Ôãñ °íÔãÀñ ‡ ãŠ^{1/2 13/4}ãî>À 1/2ãò ¡ñ>ã
>ÈããÔããã1/2ãíã¶ã Öãñ|ãã Ööý
- (iv) •ã°ã fÃ-1/2ãñÊã 1ãüç|ãñ Ööý
- (Çã) ‡ãŠã^{3/4}ããÃÊã^{3/4}ããò 1/2ãò Ôãã1/2ãã¶^{3/4}ã|ã: 1ãÆ^{3/4}ããñØã Öãñ|ãã Öö :
- (i) Êããñ‡ãŠÊã †ããÀ^{3/4}ãã ¶ãñ>Ìã‡ãÃŠ (ii) Ìããf¡ †ããÀ^{3/4}ãã ¶ãñ>Ìã‡ãÃŠ
- (iii) 1/2ãñ>Èãñ 1ããããÊã>¶ã †ããÀ^{3/4}ãã ¶ãñ>Ìã‡ãÃŠ (iv) f¶ã1/2ãò Ôãñ Ôã1/4ããè
- (Øã) f¶ã>À¶ãñ> †‡ã<Ôã1ÊããñÀÀ Öãñ|ãã Öö :
- (i) Ìãñ°ãÔããf> (ii) ,ããfÃ.†Ôã.1ããè.
- (iii) °ãÆã,,•ãÀ (iv) Öã¡ÃÌãñ^{3/4}ãÀ
- (Üã) Öãf1ãÀ ããÊãã‡ãŠ 1ãÆ^{3/4}ããñØã Öãñ|ãã Öö :
- (i) f¶ã>À¶ãñ> ÇããñÊã¶ãñ ‡ ãñŠ ããÊã † (ii) ããÌãã¡ãñ•ã ÇããñÊã¶ãñ ‡ ãñŠ
ããÊã†
- (iii) 1ããÔãÌã¡Ã °ñ¶ãñ ‡ ãñŠ ããÊã† (iv) †‡ãŠ 1ãñ•ã Ôãñ °íÔãÀñ 1ãñ•ã ‡ãŠãñ
•ããñü¡¶ãñ ‡ ãñŠ ããÊã†
2. ããÀ ‡ã<|ã Ô©ãã¶ããò ‡ãŠãè 1ãíãã|ãÃ ‡ãŠãñÓÿ ‡ãŠ 1/2ãò ãã^{a3}/4ãñ Øã^{3/4}ãñ
Ìã^{oa}ãò ‡ãŠãè ÔãÖã^{3/4}ã|ãã Ôãñ ‡ãŠãèãã•ã†-
- (‡ãŠ) ¶ãñ> Ô‡ãñŠ1ã ¶ãñããÌãØãñ>À Öãñ|ãã Ööý (°ãÆã,,•ãÀ/
,ããfÃ.†Ôã.1ããè.)
- (Çã) † ¡ÊñÔã °ããÀ 1ãÀ ‡ãŠã ¶ãã1/2ã ããÊãÇã|ãñ Ööý
(Ìãñ°ãÔããf>/‡ãŠ^{1/2 13/4}ãî>À)
- (Øã) f¶ã>À¶ãñ> Ôãñ •ãìü¡¶ãñ ‡ ãñŠ ããÊã † ÇããñÊã¶ãñ Ööý
(°ãÆã,,•ãÀ/¡ã^{3/4}ãÊã ,ã1ã ¶ãñ>Ìã‡ãÃŠ)
- (Üã) fÃ-1/2ãñÊã °ñÇã¶ãñ ‡ ãñŠ ããÊã† 1ãÀ ãã‡ã<Êã‡ãŠ ‡ãŠÀ|ãñ
Ööý (¡ã^{3/4}ãÊã/f¶ã °ãã‡ã<Ôã)
3. ãã¶ã1/2¶ãããÊãããÇã|ã ‡ãŠ©ã¶ããò 1/2ãò ÔãÖãè ‡ãŠ©ã¶ã ‡ãñŠ Ôãã1/2ã¶ãñ
ÔãÖãè(□) |ã©ãã ØãÊã|ã ‡ãŠ©ã¶ã ‡ãñŠ Ôãã1/2ã¶ãñ ØãÊã|ã (‘) ‡ãŠã ããÞã¶Ö
ÊãØããf^{3/4}ãñ -
- (‡ãŠ) fÃ-1/2ãñÊã 1ãÀ ÔããñÍã >ãf1ã ‡ãŠÀ¶ãñ ‡ãñŠ ããÊã† ‡ãŠ1/21ããñ•ã °ã>¶ã
1ãÀ ãã‡ã<Êã‡ãŠ ‡ãŠÀ|ãñ Ööý
- (Çã) fÃ-1/2ãñÊã † ‡ãŠã,,¶ã ÇããñÊã¶ãñ ‡ ãñŠ ããÊã † Ôããf¶ã f¶ã 1ãÀ
ãã‡ã<Êã‡ãŠ ‡ãŠÀ|ãñ Ööý
- (Øã) fÃ-1/2ãñÊã Ôãñ ããÞãã¶ã ¶ãÖãè 1/4ãñ•ãã •ãã Ôã‡ãŠ|ããý
- (Üã) fÃ-1/2ãñÊã Ìãñ°ãÔããf> 1ãÀ ¶ãÖãè Öãñ|ããý
4. Çã¥¡ ` ‡ãŠ` ‡ãñŠ ,ã£ãîÀñ Ìãã ‡ã<^{3/4}ããò ‡ãŠãñ Çã¥¡ `Çã` ‡ãŠãè
ÔãÖã^{3/4}ã|ãã Ôãñ 1ãîÀã ‡ãŠãèãã•ã†ý

Çã¥¡; ‡ãŠ

Çã¥¡; Çã

Îãõ¶ã ½ãò ½ãã£¾ã½ã
 'âîÀñ Ô%ããŠãè¶ã 'ãÀ ããªÆã|ãã Öõ
 ,ããfÃ. † Ôã. 'ããè.
 'ãÆªã¶ã †ãŠÃ|ããè Öõ
 Êãõ¶ã ½ãò ½ãã£¾ã½ã
 'ãÆ¾ããñØã Öãñ|ãã Öõ
 ½ãõãã †ã<Ôã½ããf•ã °ã>¶ã Ôãñ

Ôããù'ã<>Îãñ¾ãÀ
 f¶>À¶ãñ> ÔãñÎãã
 Ôãõ>ñÊããf>
 |ããÀ

Öãñ|ãã Öõ

5. ãã¶ã½¶ãããÊãããÆã|ã 'ãÆÍ¶ããò †ãñŠ „||ãÀ Ôããããñ'ã ½ãò °òý
 (†ãŠ) Îããf| †ããÀ¾ãã ¶ãñ>Îã†ãÃŠ †ã<¾ãã Öãñ|ãã Öõ ?
 (Æã) ãã †ãŠÔã ¾ãìãã †ã<|ã 'ãÀã ãã †ãŠÔããè ÔãîPã¶ãã †ãŠãñ †ãìŠœ
 Ôãñ†ãŠ¥|ãò ½ãò Öãè ãã¶ãããÍPã|ã Ì¾ããã†ã<|ã †ãñŠ 'ããÔã 'ãÖìúPãã¾ãã •ãã
 Ôã†ãŠ|ãã Öõ ?
 (Øã) f¶>À¶ãñ> ††ã<Ôã'ÊããñÀÀ ÆããñÊã¶ãñ †ãŠãè ããÎããã£ã ããÊãããÆã†ý
 (Üã) fÃ-½ãñÊã ¼ãñ•ã¶ãñ †ãŠãè ããÎããã£ã ããÊãããÆã†ý

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fÔã 'làiÔ|ã†ãŠ ½ãð ,ãã'ã¶ãñ †ã<³ãã †ã<³ãã •ãã¶ãã

f†ãŠãfÃ8-18†ãŠã°ãÃ¶ã8ããõÀ8,Ôã†ãŠñ8/ããõãäØã†ãŠ

- Ôã¼ããè Ôã•ããèlããñ ½ãñ †ãŠã°ãÃ¶ã ,ããõÀ „Ôã †ãŠñ ¾ããõãäØã †ãŠ 'ãã¾ãñ •ãã|ãñ Ööây †ãŠice äã¶ã•ããèÃlã 'ãã©ããñÃã ½ãñ †ãŠã°ãÃ¶ã ½ãl†ã<|ã ¾ãã ¾ããõãäØã†ãŠ †ãŠñ Á'ã ½ãñ „'ããÔ©ã|ã Öñ|ãã Ööý
- †ãŠãñ¾ãÊãã, †ãŠãããÊãCã, ØãÆñ'ãŠãf, ÖãèÀã ,ããããããlãã¾ã¶ã :¹ããñ ½ãñ ¼ããè †ãŠã°ãÃ¶ã ½ãl †ã<|ã ,ãlãÔ©ãã ½ãñ 'ãÆã¹|ã Öñ|ãã Öö äã•ã¶Öñã Ö½ã †ãŠã°ãÃ¶ã †ãŠñ ,ã'ãÀ:¹ã †ãŠÖ|ãñ Ööây
- äã †ãÆŠÔ>Êããè¾ã |ã©ãã ,ãããlãÆŠÔ>Êããè¾ã, †ãŠã°ãÃ¶ã †ãŠñ ãñãlãã¾ã¶ã ,ã'ãÀ:¹ã Öñ|ãñ Ööây
- ÖãèÀã †ãŠã°ãÃ¶ã †ãŠã ããlãÆŠÔ>Êããè¾ã ,ã'ãÀ:¹ã Ööý ¾ãÖ †ãŠYãñÀ|ã½ã 'ãÆã†ãŠðãã|ã†ãŠ 'ãã©ãÃ Ööý
- †ãŠã°ãÃ¶ã ¾ããõãäØã†ãŠãñ †ãŠã ,ãf¾ã¾ã¶ã ÀÔãã¾ã¶ã ÍããÔã †ãŠãèãã•ãÔã ÍããCãã ½ãñ äã †ãŠ¾ãã •ãã|ãã Öö lãÖ †ãŠã°ãÃãã¶ã †ãŠ ÀÔãã¾ã¶ã †ãŠÖÊãã|ããè Ööý
- †ãŠã°ãÃ¶ã |ã©ãã ÖãfjÊãñ•ã¶ã |ãlããñ †ãŠñ ÀãÔãã¾ããã¶ã †ãŠ Öãã¾ããñÔã Öñ ã¶ãñ ¾ããõãäØã†ãŠ ÖãfjÊãñ †ãŠã°ãÃ¶ã †ãŠÖÊãã|ãñ Ööãã
- fÃãfã¶ã lãñ 'ãã©ãÃ Ööã äã•ã¶ãÖñã ã¶ã ããlãÆŠ¾ãã 'ãÀã „ŠÓ½ãã 'ãÆã¹|ã Öñ|ããè Ööý
- 'ãñ>ÊãñããÊã¾ã½ã ,ã¶ãñ†ãŠ ÖãfjÊãñ†ãŠã°ãÃ¶ããñ †ãŠã äã½ãÑã¶ã Öö
- äã•ãÔã |ãã¹ã 'ãÀ †ãŠãñfÃ 'ãã©ãÃ Íãã¾ãl †ãŠãè „'ããÔ©ããã|ã ½ãñ •ãÊã¶ãñ ÊãØã|ãã Öö, lãÖ „Ôã†ãŠã •lãÊã¶ã |ãã¹ã †ãŠÖÊãã|ãã Ööý

f†ãŠãfÃ8-28,Š•ããÃ†ãŠñ8ãÆãlãðŠãã|ã†ãŠ8|ããããõ†ãŠããÊ¹ã†ãŠ Öãñ|ã

- Ôã•ããèlããñ †ãŠãè „Š•ããÃ †ãŠã 'ãÆ½ãlCã ¼ããñ•ã¶ã Ööý
- Ôãl¾ãÃ Öñ 'ãÆ†ãŠãlã †ãŠñ Ôãã©ã-Ôãã©ã ...Ó½ããè¾ã „Š•ããÃ ¼ããè 'ãÆã¹|ã Öñ|ããè Ööý
- ÔããõÀ „Š•ããÃ Ôã•ããèlããñ †ãŠñ •ããèlã¶ã †ãŠñ äãÊã † † †ãŠ ,ããã¶ãlãã¾ãÃ ,ããlãl¾ã†ãŠ|ãã Ööý
- Ôã¼ããè 'ãÆ†ãŠãÀ †ãŠñ fãÃfã¶ã „Š•ããÃ †ãŠñ Ôãããñ|ã Ööây
- ãõãã¶ã †ãŠ •ããèlã¶ã †ãŠãè ããlãã¾ã¶ã ,ããlãl¾ã †ãŠ|ãã,ããñã †lããããlãÆŠ¾ãã †ãŠÊãã¹ãñ ½ãñ „Š•ããÃ ,ãã¹ããã|ãÃ †ãŠã 'ãÆ½ãlCã Ôãããñ|ã ããlã²ãlã „Š•ããÃ Ööý
- ½ãÊã½ãlðã, ØããñãÀ ,ããããã ¼ããè „Š•ããÃ †ãŠñ Ôãããñ|ã Ööây

- 'ā|©āÀ †āŠā †āŠāñ³⁄₄āĒā †lāā 'āñ>ĒāñāāĒā³⁄₄ā¹⁄₂ā „'āā •āōŌāñ |āē•āĒā, 'āñ>ĒāñĒā, āā¹⁄₂ā>ā>āē †āŠā |āñĒā, 'āĒālāōšāā|ā†āŠ ŌāōŌā „Š•āāĀ †āŠñ Ōāāēāā¹⁄₂ā|ā Ōāñ|ā Ōōāý ³⁄₄āñ 'āi|ā: |ā 'āĒā¹|ā Ōāñ Ōā†āŠ|āñ lāāĒāñ (lāō†āŠāāĒ¹|ā†āŠ) „Š•āāĀ †āŠā Ōāñ|ā Ōōāý
- lāā³⁄₄āi ,•āĒā, °āā³⁄₄āāñŌāōŌā †lāā Ōāi³⁄₄āĀ „Š•āāĀ †āŠñ ,āŌāāēāā¹⁄₂ā|ā ŌāĒāñ|ā Ōōāý ³⁄₄āñ 'āi|ā: 'āĒā¹|ā Ōāñ Ōā † āŠ|āñ lāāĒāñ (lāō†āŠāāĒ¹|ā†āŠ) „Š•āāĀ ŌāĒāñ|ā Ōōāý
- ŌāāōÀ „Š•āāĀ Ōāñ lāō †āŠāāĒ¹|ā†āŠ „Š•āāĀ †āŠñ Á¹|ā ¹⁄₂āñ ŌāāñĒāÀ †āŠi†āŠĀ, ŌāāōÀ ŌāñĒā ,āāōÀ ŌāāōÀ •āĒā „Ō¹⁄₂ā†āŠ †āŠā „ā³⁄₄āāñŌā āā†āŠ³⁄₄āā •āā|āā Ōōý
- Ōāāā|ā¹⁄₂āā|ā lāā³⁄₄āi ,āāōÀ Ōāāā|ā¹⁄₂āā|ā •āĒā „Š•āāĀ †āŠñ Ōāñ|ā Ōōý f|ā † āŠā „ā³⁄₄āāñŌā •āĒā 'ā¹⁄₂ā ,āāōÀ ,āā>ā Pā † ā< † āŠāē |ā©āā •āĒā āālā²āi|ā Ōāā³⁄₄āā'ā 'āĀā āālā²āi|ā „Š•āāĀ ¹⁄₂āñā °āĒā|āñ ¹⁄₂āñā āā†āŠ³⁄₄āā •āā|āā Ōōý

f†āŠāfĀ83ŌĒāāā|ā•ā8|lāā&āā|āi

- ¹⁄₄āi-¹|āĀ>āē ¹⁄₂āñ 'āĒālāōšāā|ā † āŠ Á¹|ā Ōāñ 'āā³⁄₄āñ •āā|āñ lāāĒāñ ,ā†āŠā°āĀā|ā†āŠ |ā|lā ,ā©ālāā ³⁄₄āāōāāŌā†āŠ †āŠāñ Ēāāā|ā•ā †āŠŌ|āñ Ōōāý
- †ñŌāñ Ēāāā|ā•ā āā•ā|āŌāñ fāā|āi † āŠā āā|āŌ † āŠŌāĀŲā ,āāāfā † āŠ ¹⁄₂āāā ¹⁄₂āñā ŌāĒāĒā Ōāñ †lāā †āŠ¹⁄₂ā ĒāāŌā|ā ¹⁄₂āñā Ōāñ •āā|āā Ōō, ,ā³⁄₄āŌ†āŠ †āŠŌĒāā|āñ Ōōāý
- ,ā³⁄₄āŌ † āŠ Ōāñ ,ālālāā® † āŠāñ °lā † āŠĀ † āŠñ fāā|āi † āŠāñ āā|ā †āŠāĒā|āñ |ā©āā lāi® †āŠĀ|āñ †āŠā 'āĒāĒāĒ¹⁄₂ā fāā|āi †āŠ¹⁄₂āĀ †āŠŌĒāā|āā Ōōý
- Ōāā|āĒā, āā|āŌ|āā¹|ā, ¹⁄₄ā•āĀ|ā, 'āĒāŌāĒā|ā |ā©āā lāāñfā|ā, fāā|āi †āŠ¹⁄₂āĀ 'āĒā†āŠ¹⁄₂ā †āŠñ āālāāā¹⁄₄ā|ā PāĀŲā Ōōāý
- ŌāĒ¹|āŠāf| ,ā³⁄₄āŌ † āŠ † āŠā Ōāā|āĒā 'āŠñ|ā 'ĒāĒā|ā āālāāāfā 'āĀā āā†āŠ³⁄₄āā •āā|āā Ōōý
- •āĀ¹⁄₂āñāā|ā³⁄₄ā¹⁄₂āā ,āāŌāñĀāā|ā † āŠ |ā©āā † |ā>āē¹⁄₂ā|āāē †ñŌāñ |ā|lā Ōōā āā•ā|ā¹⁄₂āñ fāā|āi |ā©āā ,āfāā|āi °āñ|āāñā †āŠñ Ōāē ŌāiŲā 'āā³⁄₄āñ •āā|āñ Ōōāý f|ā |ā|lāñ †āŠāñ „āfāā|āi †āŠŌ|āñ Ōōāý
- fāā|āi †āŠāē Ōā|āŌ 'āĀ „Ōā†āŠā ³⁄₄āāōāāŌā†āŠ °ā|ā†āŠĀ fāā|āi †āŠāē † † āŠ 'āĀ|ā † āŠñ Á¹|ā ¹⁄₂āñā „lāĀ|āñ Ōāñ fāā|āi † āŠā |āŌ> Ōāñ|āā ŌāāāāĀŲā †āŠŌĒāā|āā Ōōý
- fāā|āi ¹⁄₂āāñ ,ā|³⁄₄ā fāā|āi,āāñā ,ā©ālāā ,āfāā|āi,āāñ † āŠāē „āāPā|ā ¹⁄₂āāāā āā¹⁄₂āĒāā † āŠĀ „Ōā¹⁄₂āñā lāāāāāā|ā ŌāiŲā fā¹⁄₂āĀ 'āĒā¹|ā

ãã † ãŠ³⁄⁴ãñ •ãã Ôã † ãŠ|ãñ Ööý † ñÔãñ ãã¹⁄²ãÑãŸã † ãŠãñ ãã¹⁄²ãÑã ãã|ãì
† ãŠÖ|ãñ Ööý

f†ãŠãfÃ848½ãã¶ãìããã¶ããã½ãÃ|ãðãÔ|ãì†ù

- ½ã¶ãìÓ³⁄⁴ã † ãŠãè ,ããìãì³⁄⁴ã † ãŠ|ãã,ããñã † ãŠãè 'ãìãã|ãÃ † ãŠñìãÊã
'ãÆãìãðŠãã|ã † ãŠ ÔããÔãããã¶ããñã 'ãÀã † ãŠÃ¶ãã Ôã¹⁄²¹⁄⁴ãìã ¶ãÖãèã Ööý
,ã'ã¶ããè ,ããìãì³⁄⁴ã † ãŠ|ãã,ããñã † ãŠãè 'ãìãã|ãÃ † ãŠñ ããÊã † ½ã¶ãìÓ³⁄⁴ã
'ãÆãìãðŠãã|ã ½ãð „ãÊã°ã ÔããÔãããã¶ããñã 'ãÀã ,ã¶ãñ † ãŠ ìãÔ|ãì,ããð
|ã©ãã Ôãã½ãðãÆãè † ãŠã ãã¶ã½ããŸã † ãŠÃ|ãã Ööý
- ÔããìÊãñããÔã|ã Æñìãñ „Þã ,ãŸãì¹⁄⁴ããÀ ìããÊãñ °ãÖìÊã†ãŠ ³⁄⁴ããðããðã†ãŠ
Öãñ|ãñ Öðãý
- ÆãÔãã³⁄⁴ããã¶ã † ãŠ :¹ã ½ãñã ,ãÔãã|ãð¹|ã ÖãfìÊãñ † ãŠã°ãÃ¶ããñã •ãðÔãñ
† ãã©ãÊããè¶ã, † ããÔã>Êããè¶ã ,ããããª † ãŠñ „Þã ,ãŸãì¹⁄⁴ããÀ † ãŠñ
°ãÖìÊã†ãŠ 'ÊããããÔ>†ãŠ 'ãªã©ãÃ Öãñ|ãñ Öðãý
- † ãŠãùÞã ãã|ãì,ããñã † ãŠñ ããÔãããÊã † ãŠñ>ãñã † ãŠã ããìãÊã³⁄⁴ã¶ã
(ãã¹⁄²ãÑãŸã) Öãñ|ãã Ööý Õã¹⁄²ãÃ † ãŠÃ¶ãñ 'ãÀ † ãŠãùÞã ¶ã¹⁄²ãÃ Öãñ
•ãã|ãã Öð ,ããðã Æìã ½ãñã °ãÊã†ãŠ Æã°ãñ Êãðã|ãã Öð fÔã † ãŠãŸã † ãŠãùÞã
† ãŠãñ ŸãñÔã ¶ã † ãŠÖ†ãŠ ,ããã|ãìãããã|ã Æìã † ãŠÖ|ãñ Ööý
- ÆãÔãã³⁄⁴ããã¶ã † ãŠ :¹ã ½ãð Ôãã°ãì¶ã „Þã ìãÔããè³⁄⁴ã ,ã¹⁄²Êããñ † ãŠñ
Ôããñããj³⁄⁴ã¹⁄²ã |ã©ãã 'ããñ>ðããìã³⁄⁴ã¹⁄²ã ÊãìãŸã Öãñ|ãñ Öðãý
- ,ã'ã¹⁄²ãã•ãÃ † ãŠ † ãŠŸãñÀ •ãÊã † ãŠñ Ôãã©ã ¼ããè ¢ããðã °ñ¶ãñ ìããÊãã
ÆãÔãã³⁄⁴ããã¶ã†ãŠ 'ãªã©ãÃ Öãñ|ãã Ööý
- ¼ãìãã¹⁄²ã ½ãñã ,ããìãì³⁄⁴ã † ãŠ |ãìããñã † ãŠãè |ã † ãŠãÊã 'ãìãã|ãÃ † ãŠñ
ããÊã † ããìããã¹⁄⁴ã¶ã ÆãÔãã³⁄⁴ããã¶ã † ãŠ Æããª „ã³⁄⁴ããñðã † ãŠãè •ãã|ããè
Öðã, ãã•ã¶Öñã „ìãÃÀ†ãŠ † ãŠÖ|ãñ Öðãý

f†ãŠãfÃ858ãÊããã©ããªã°ã

- °ãÊã ½ãñã 'ãããÀ¹⁄²ããŸã ,ããðã ããªìãã °ãñ¶ããñã Öãñ|ããè Ööý °ãÊã † ãŠã
½ããªã†ãŠ ¶³⁄⁴ãì¶ã Ööý
- Ôã¹⁄²ãã¶ã °ãÊã Êãðã¶ãñ 'ãÀ Ôã¹⁄²¹ã † ãŠÃ |ãÊã † ãŠã ããñª¹ãŠÊã † ãŠ¹⁄²ã
Öãñ¶ãñ Ôãñ °ãÊã † ãŠã 'ãÆ¹⁄⁴ããìã °ãüª •ãã|ãã Öð |ã©ãã Ôã¹⁄²¹ã†ãŠÃ |ãÊã
† ãŠã ããñª¹ãŠÊã ,ããããã†ãŠ Öãñ¶ãñ Ôãñ °ãÊã † ãŠã 'ãÆ¹⁄⁴ããìã Ùã •ãã|ãã
Ööý
- † † ãŠãã † ãŠ ããñª¹ãŠÊã 'ãÀ Êãðã¶ãñ ìããÊãñ ,ããã¼ãÊã¹⁄²°ãìã|ã °ãÊã
† ãŠãñ °ãª † ãŠÖ|ãñ Öðãý
- ìãã³⁄⁴ãì ½ããjÊã † ãŠñ † ãŠãŸã 'ãð©ìããè † ãŠãè Ôã|ãÖ 'ãÀ •ããñ °ãª
Êãðã|ãã Öð „Ôãñ ìãã³⁄⁴ãì ½ãŸjÊããè³⁄⁴ã °ãª † ãŠÖ|ãñ Öðãý Ôã¹⁄²ã¹ãÆ |ãÊã
'ãÀ ìãã³⁄⁴ãì¹⁄²ããjÊã † ãŠã °ãª 'ããÀñ † ãŠñ 76 Ôãñ¹⁄²ããè „ŠùãÞãñ Ô|ã¹⁄²¹⁄⁴ã
† ãŠñ °ãª † ãŠñ °ãÃªãÀ Öãñ|ãã Ööý

- •āÊā'ā^{1/2}'ā, Ôāāfāā‡āŜÊā 'ā^{1/2}'ā, 'āŜî>°āāÊā 'ā^{1/2}'ā ,āāāā° ‡āŜāē ‡āŜā^{3/4}āĀ āāīāāāfā īāā^{3/4}āī °ā°ā 'āĀ ,āāāāāāĀ|ā Ööý
- āā‡āŜÔāāē īāÔ|āī ‡āŜāñ 'āā¶āāē 1/2āñ 3/4āā °ĀĪā 1/2āñ 'āīŷāĀ|ā: ĵī°āā¶āñ 'āĀ īāÖ ,ā'ā¶āñ ,āā^{3/4}ā|ā¶ā ‡āŜñ °āĀā°āĀ °ĀĪā āāīāÔ©āāāā'ā|ā ‡āŜĀ|āāē Ööý
- īāÔ|āī 'āĀ ÊāØā¶āñ īāāÊāā „ĪĒāāīā¶ā °āÊā „Ôā‡āŜāē ,āāīāðŜāā|ā †īāā ,āā‡āŜāĀ 'āĀ āā¶ā'ā^{1/4}āĀĀ ‡āŜĀ|āā Ööý
- īāÔ|āī ‡āŜā 1/4āāĀ „ĪĒāāīā¶ā °āÊā ‡āŜñ °āĀā°āĀ 3/4āā fÔāÔāñ ‡āŜ^{1/2}ā Ôāñ¶āñ 'āĀ īāÔ|āī |āōĀ|āāē ĀÔ|āāē Ööý
- °ĀĪā Ôā^{1/4}āāē āā°īāā,āāñ 1/2āñā °ā°ā ĵāÊā|āā Ööý
- °ĀĪā °ā°ā ØāÔĀāfĀ ‡āŜñ Ôāā©ā °āĒĒā|āā Ööý

f‡āŜāfĀ8-68āĒĒāĒāīā8āĒĒāĒāīā‡āŜ8/āā°ā

- 'āĒ ‡āŜāīā ‡āŜāē āā‡āŜĀŷā •ā°ā †‡āŜ 'āāĀ°īāāĀē 1/2āāf^{3/4}ā^{1/2}ā 1/2āñā 'āĒīāñīā ‡āŜĀ|āāē Öö, |āāñ īāÖ ,ā'ā¶āñ 1/2āāØāĀ 1/2āñ āāīāĒāāāĒāĒā Ôāñ •āā|āāē Ööý fÔā Ūā,¶āā ‡āŜāñ 'āĒ‡āŜāīā ,ā'āīā|āĀ¶ā ‡āŜÔ|āñ Ööý
- 'āĒ‡āŜāīā ‡āŜāē āā‡āŜĀŷā •ā°ā āāīāĒāĒā Ôāñ ÔāŪā¶ā 1/2āāf^{3/4}ā^{1/2}ā 1/2āñā 'āĒīāñīā ‡āŜĀ|āāē Öö, |āāñ īāÖ ,āāā^{1/4}āĒā^{1/2}°ā ‡āŜāē ,āāñĀ ċāī‡āŜ|āāē Öö |ā©āā Ôāfā¶ā Ôāñ āāīāĒāĒā 1/2āāf^{3/4}ā^{1/2}ā 1/2āñ 'āĒīāñīā ‡āŜĀ¶āñ 'āĀ 'āĒ‡āŜāīā ‡āŜāē āā‡āŜĀŷā ,āāā^{1/4}āĒā^{1/2}°ā Ôāñ °īĀ Ō|āāē Ööý
- āā•āÔā Êāñ¶Ôā ‡āŜñ 1/2āf^{3/4}ā ‡āŜā 1/4āāØā 1/2āāñ>ā |ā©āā āā‡āŜ¶āāĀñ 'ā|āĒāā Öö, „Ôā Êāñ¶Ôā ‡āŜāñ „ĪĒāĒā Êāñ¶Ôā ‡āŜÔ|āñ Ööý āā•āÔā Êāñ¶Ôā ‡āŜñ 1/2āf^{3/4}ā ‡āŜā 1/4āāØā 'ā|āĒāā |ā©āā āā‡āŜ¶āāĀñ 'āĀ 1/2āāñ>ā Öö, „Ôāñ ,āīā|āĒāĒā Êāñ¶Ôā ‡āŜÔ|āñ Ööây
- „ĪĒāĒā Êāñ¶Ôā 'āĒ ‡āŜāīā ‡āŜāē āā‡āŜĀŷāāñā ‡āŜāñ 1/2āīĒĒ^{3/4}ā ,āāā ‡āŜāē ,āāñĀ 1/2āāñū|āā Öö, fÔāāāĒā† fÔāñ ,āāā^{1/4}āÔāāĀē Êāñ¶Ôā |ā©āā ,āīā|āĒāĒā Êāñ¶Ôā 'āĒ‡āŜāīā ‡āŜāē āā‡āŜĀŷāāñā ‡āŜāñ 1/2āīĒĒ^{3/4}ā ,āāā Ôāñ °īĀ 'āŜÔĒāā|āā Öö, fÔā āāĒā† fÔāñ ,ā'āÔāāĀē Êāñ¶Ôā ‡āŜÔ|āñ Ööây
- 1/2āīĒĒ^{3/4}ā ,āāā ‡āŜñ Ôā1/2āā¶āā¶āĀ 'āĒ‡āŜāīā āā‡āŜĀŷāāñā Êāñ¶Ôā Ôāñ ,ā'āīā|āĀ¶ā ‡āŜñ 'āīĒāā|ā āā•āÔā āā°ā¶āī 'āĀ ‡āŜñāā¶āĒā Ōāñ|āāē Ōōā 3/4āā āā•āÔā āā°ā¶āī Ōāñ ,āā|āāē 'āĒ|āāē|ā Ōāñ|āāē Ōōā,'āŜāñ ‡āŜÔā ‡āŜÔĒāā|āā Ööý
- īāāÔ|āāāīā‡āŜ 'āĒāā|āāā°ā^{1/2}°āāñā ‡āŜāñ 'āāñĀ 'āĀ 'āĒā'ā|ā āā‡āŜ^{3/4}āā •āā|āā Ööý •ā°ā āā‡āŜ ‡āŜāĒāāā¶ā‡āŜ (,āā^{1/4}āāÔāāē) 'āĒāā|āāā°ā^{1/2}°āāñā ‡āŜāñ 'āāñĀ 'āĀ ¶āÔāēā 'āĒā'ā|ā āā‡āŜ^{3/4}āā •āā Ôā‡āŜ|āā Ööý

f‡āŜāfĀ8-78āī1/2°ā‡āŜ|ā

- † ñÔañ 'ãã©ãÃ, •ãñ ÊãñÕñ ¾ãã ÊãñÕñ Ôãñ °ãããè ìãÔ|ãì,ããñã †ãŠãñ ,ã'ãããè ,ãñÃ Æããèãã|ãñ Õõã, ðãì½°ã †ãŠ †ãŠÕÊãã|ãñ Õõãý
- ÌãðŠãã'ã½ã ðãì½°ã †ãŠãñã †ãŠñ ¶ãã½ã „¶ã †ãŠñ ,ããìãðŠãã|ã ,ããõÀ ,ãã †ãŠãÀ †ãŠñ ,ã¶ãìÔããÀ ¶ããÊã ðãì½°ã †ãŠ, °ã; ðãì½°ã †ãŠ, ðãì½°ã †ãŠãè¾ã ÔãìfÃ, ðãì½°ã †ãŠãè¾ã †ãŠ½¹ããÔã (†ãŠ½¹ããÔã ÔãìfÃ) •ãã¶ãñ •ãã|ãñ Õõý
- ½ãf¾ã ããã¶ã (ÔãìÁ|ã †ãŠñ¶ã) Ôãñ Ôìããã'ããã 'ãìãÃ †ãŠ Êã †ãŠ¾ãñ Õã¾ãñ ðãì½°ã †ãŠ †ãŠñ ããÔãÀñ Ôããõìã „||ãÀ-ãããããããããããããã ½ãñã ããÔãÀ Õãñ •ãã|ãñ Õõý ¾ãÕ ðãì½°ã †ãŠ †ãŠñ ãã¹ãã °ããã¶ãñ ÌããÊãã Õãìãã Õõý
- ðãì½°ã †ãŠ †ãŠñ ,ãÔã½ãã¶ã ìãìÊìããñã ½ãõ ,ãã†ãŠÕãÃãã †ìãã Ôã½ãã¶ã ìãìÊìããñã ½ãñã 'ãÊãã|ã†ãŠÕãÃãã Õãñ|ãã Õõý
- ðãì½°ã †ãŠ †ãŠñ ðããÀãñã ,ããñÀ †ãŠã ÌãÕ ããñ'ã ãã•ãÔã½ãñã ðãì½°ã †ãŠãè¾ã 'ãÊ¹ããìã †ãŠã ,ã¶ãì¼ãìã Õãñ|ãã Õõ, ðãì½°ã †ãŠãè¾ã ããñ'ã †ãŠÕÊãã|ãã Õõý
- ðãì½°ã †ãŠ †ãŠã ðãì½°ã †ãŠãè¾ã ããñ'ã „Ôã †ãŠñ ìãìÊìããõ †ãŠãè 'ãÊ°ãÊããã †ìãã 'ãÊñãã†ãŠ †ãŠãè °ìÀãè 'ãÀ ãã¶ã¼ãÃÀ †ãŠÀ|ãã Õõý
- ãã†ãŠÕããè ðããÊãã†ãŠ |ããÀ ½ãñã ããìã²ãì|ã ìããÀã 'ãÊìããããÕ|ã †ãŠÀ¶ãñ 'ãÀ fÔã†ãŠñ ðããÀãñã ,ããñÀ ðãì½°ã †ãŠãè¾ã ããñ'ã „¹ã¶ã Õãñ •ãã|ãã Õõý

f†ãŠãfÃ88Ôãìã½ãããèìããñããããŠãè¶ìãã¶ã¾ããú

- ãã•ã¶ã •ããèìããñã †ãŠãñ °ñÆã¶ãñ †ãŠñ ããÊã† Ôãìã½ã¹ããèÃ ¾ã¶ãã †ãŠãè ,ããìã¹¾ã†ãŠãã 'ãü|ããè Õõ „¶Õõ Ôãìã½ã •ããèìã (Microbe) †ãŠÕ|ãñ Õõý
- ,ã°ã |ã †ãŠ —ãã|ã Ôãìã½ã •ããèìããñã †ãŠñ 'ããúðã Ôã½ãìÕ Õõ- 'ãÊãñãñã•ãì,ãã, ÌãõìããÊã, †ãŠìã†ãŠ, •ããèìããããì |ã©ãã ããìãÔããããìý
- Ôãìã½ã •ããèìã ÔãìãÀì¾ãã¹ããè Õõý ¾ãñ ½ã¶ãìÓ¾ããñã, •ã¶ãì,ããñã |ã©ãã 'ããõìããñã ½ãõ ÀãñÕã „¹ã¶ã †ãŠÀ¶ãñ †ãŠãè ãã½ã|ãã ÀÆã|ãñ Õõã, ããõÀ |ã°ã ÀãñÕãããããì †ãŠÕÊãã|ãñ Õõãý
- †ãŠìœ Ôãìã½ã •ããèìã Êãã¹ãã¾ã¾ã†ãŠ ¼ããè Õãñ|ãñ Õõãý

f†ãŠãfÃ89ããìã²ãì|ããããÀã

- ,ããìãñã †ãŠñ 'ãÊìããÕ †ãŠãè °À †ãŠñ ããìã²ãì|ã ìããÀã †ãŠÕ|ãñ Õõý
- ìããÀã °ãñ 'ãÊ †ãŠãÀ †ãŠãè Õãñ|ããè Õõý 'ãÊ©ã½ã 'ãÊ †ãŠãÀ †ãŠãè ìããÀã †ãŠñ ãã¹Ó ìããÀã ¾ãã ÔãÀÊã ìããÀã ,ããõÀ °ìÔãÀãè 'ãÊ†ãŠãÀ †ãŠãè ìããÀã †ãŠñ 'ãÊ¾ããìã|ããèÃ ìããÀã †ãŠÕã •ãã|ãã Õõã
- ããìã²ãì|ã ìããÀã †ãŠñ ããìãã¹ã¶ã Ôãããñ|ã, ÔãñÊã ,ããõÀ •ããã¶ãã (•ã¶ãÀñ>À) Õõãý ÔãñÊã °ãñ 'ãÊ †ãŠãÀ †ãŠñ Õãñ|ãñ Õõã -1. 'ãÊã©ããã½ã†ãŠ ÔãñÊã 2. ãã'ããè¾ã†ãŠ ÔãñÊãý

- ÔãnÊã, °ãõ>Àãè ,ããããª Ôãn ããªÓ> £ããÀã 'ãÆã¹|ã Öãn|ããè Öõ ÜãÀããã
|ã©ãã ‡ ãŠÊã- ‡ ãŠãÀÆãã¶ãããã ½ããñ ½ãñ¶Ôã Ôãn 'ãÆ¹³⁄⁴ããlã|ããèÃ
£ããÀã 'ãÆã¹|ã Öãn|ããè Öõý
- ãã ‡ ãŠÔããè ÞããÊã ‡ ãŠ ‡ ãŠñ ããÔãÀããã ‡ ãŠã ããlã¹⁄⁴ãlãã¶|ãÀ 1 lããñÊ>
ÖãnØãã ¾ãããª ÞããÊã‡ãŠ ‡ãŠñ ‡‡ãŠ ããÔãÀñ Ôãn °iÔãÀñ ããÔãÀñ |ã‡ãŠ
1 ‡ãŠiÊããù¹⁄²ã ,ããlãñlã Êãã¶ãñ ½ããñ 1 •ãiÊã ‡ãŠã³⁄⁴ãÃ ‡ãŠÀ¶ãã 'ãüjñý
- ããlã²ãi|ã ÔãnÊã ‡ãŠñ Ôã¹⁄²ãi¥ãÃ 'ãããÀ¹ã©ã ½ããñ ‡‡ãŠ ‡ãŠiÊããù¹⁄²ã
,ããlãñlã 'ãÆlããããÖ|ã Öãn¶ãñ ‡ãŠñ ããÊã ‡ ÔãnÊã Ôãn •ããñ „Š•ããÃ
'ãÆã¹|ã Öãn|ããè Öõ „Ôãn ÔãnÊã ‡ãŠã ããlã²ãi|ã lããÖ‡ãŠ °ãÊã ‡ãŠÖ|ãñ
Öõý
- ÞããÊã‡ãŠ ‡ãŠã lãÖ Øãi¥ã ãã•ãÔã‡ãŠñ ‡ãŠãÀ¥ã „Ôã¹⁄²ããñ 'ãÆlããããÖ|ã
Öãn¶ãñ lããÊããè £ããÀã ‡ãŠñ 'ãÆlããÖ ½ããñ ,ãlãÀãñ£ã „¹ã¶¶ã Öãn|ãã
Öõ, 'ãÆãã|ãÀãñ£ã ‡ãŠÖÊãã|ãã Öõý
- ãã ‡ ãŠÔããè ÞããÊã ‡ãŠ ‡ãŠñ ããÔãÀããã 'ãÀ 1 lããñÊ> ããlã¹⁄⁴ãlãã¶|ãÀ
'ãÆlããããÖ|ã Öãn, |ããñ ÞããÊã ‡ãŠ ‡ãŠã 'ãÆãã|ãÀãñ£ã 1 ,ããñ¹⁄²ã
ÖãnØããý
- ‡ñÔãn ¾ãilãã ‡ã<|ã ‡ãŠãñ ãã•ãÔã¹⁄²ãñ ÔããõÀ „Š•ããÃ Ôãn ããlã²ãi|ã
„Š•ããÃ 'ãÆã¹|ã Öãn|ããè Öõ ÔããñÊãÀ ÔãnÊã ‡ãŠÖ|ãñ Öõý

f‡ãŠãfÃ8108ã¶ãi‡ãŠiÊã¶ã8lãã8ãõlãããlã‡ãŠãÔã

- 'ãÆ¹³⁄⁴ãñ ‡ãŠ •ããèlã£ããÀãè ‡‡ãŠ ããlãlãñÓã 'ãÆ ‡ãŠãÀ ‡ãŠñ
'ã³⁄⁴ããÃlãÀ¥ã ½ããñ ÀÖ|ãã Öõã
- 'ã³⁄⁴ããÃlãÀ¥ã ‡ãŠñ ,ã¶ãiÔããÀ •ããèlã£ããÀãè ½ããñ lãÀãèÀ ‡ãŠñ
ããÊã¶ãñ ‡ãŠãè ãã¹⁄²ã|ãã ‡ãŠñ ,ã¶ãi‡ãŠiÊã¶ã ‡ãŠÖ|ãñ Öõãý
- ,ã¶ãi ‡ãŠiÊã¶ã ‡ãŠãè ãã¹⁄²ã|ãã ‡ãŠñ ‡ãŠãÀ¥ã ‡ãŠãÊãã¶|ãÀ ½ããñ
,ã¶ãñ ‡ãŠ 'ãÆ•ãããã|ã³⁄⁴ããü ããlãÊãi¹|ã ÖifÃ lã ,ã¶ãñ ‡ãŠ ¶ãfÃ
•ãããã|ã³⁄⁴ãããñ ‡ãŠãè „¹ããã||ã ÖifÃ Öõý
- ‡ãŠãÊãã¶|ãÀ ½ããñ •ããèlãããñ ‡ãŠãè ÀÞã¶ãã |ã©ãã ‡ãŠã³⁄⁴ãÃ¹ãÆ¥ããÊããè
½ããñ Öi‡ 'ãããÀlã|ãÃ¶ã ‡ãŠñ •ãõlã ããlã‡ãŠãÔã ‡ãŠÖ|ãñ Öõý
- •ãõlã ããlã‡ãŠãÔã ‡ãŠñ ,ã¶ãñ‡ãŠ 'ãÆ¹⁄²ãã¥ã Öõý
- •ãõlã ããlã ‡ãŠãÔã ‡ãŠñ l³⁄⁴ããããÆã|ã ‡ãŠÀ¶ãñ Ôãn •ãüjñ Öõ
`|ãããlãÃ¶ãlããª" |ã©ãã `Êãõ½ãã‡ãŠlããª"

f‡ãŠãfÃ8118ããèlã¶ã‡ãŠãè8ãÆããlãÆŠ³⁄⁴ãã‡ã

- Ôã¹⁄⁴ããè •ããèlã£ããããÀ³⁄⁴ãããñ ‡ãŠñ •ããèlã¶ã ‡ãŠãè ,ãã£ããÀ¹⁄⁴ãi|ã
'ãÆããlãÆŠ³⁄⁴ãã‡ú Öõ-¹ããñÓã¥ã, lãÔã¶ã, „lÔã•ãÃ¶ã, 'ãããÀÔããÞãÀ¥ã
(¹ãããÀlãÖ¶ã) ãã¶ã³⁄⁴ããã¥ã |ã©ãã Ôã¹⁄²ã¶lã³⁄⁴ã¶ã, lãðãã® ,ããõÀ
'ãÆ•ã¶ã¶ãý

- 'āð©lāāē ‡āšñ •āāēlāāñâ ‡āšñ āāĒā† ¼āāñ•ā¶ā ‡āšñ 'āĒā©āāā½ā ‡āšñ ,¼āā†āš ŌĀñ 'āñüj 'āāðfāñ Ōö, |ā©āā ,š•āāĀ ‡āšā 'āĒā©ā½ā Ō•āñ|ā Ōāñ¾āĀ Ōöý
- ŌĀñ 'āñüj 'āāðfāñ Ōlā'āāñŌāāē Ōāñ|āñ Ōöāý Ōā½āŌ|ā •ā¶āi lā ‡āšioē 'āāðfāñ 'āĀ'āāñŌāāē Ōāñ|āñ Ōöāý
- 'āĀ'āāñŌāāē •ā¶āi ‡āšŌĒāā|āñ Ōöā- Íāā ‡āšāŌāĀāē, ½āāüŌāāŌāĀāē ,ā©ālāā ŌālāāĀŌāĀāēý
- 'āĀ'āāñŌāāē lā¶āŌ'āāā|ā¾āāü Ōāā½āā¶¾ā|ā: 'āĀ•āāēlāāē, ,ā'āÜā ‡āšñ ,ā©ālāā ½āð|ā•āāēlāāē Ōāñ|āāē Ōöāý

f‡āšāfĀ8128†ā<|ā&†āšāēŌāāĀĀā¶ā¶āā88†ā<|ā&āŌāĀqā©āā Ā†ā<|ā&āāēāā¶ā

- Ā†ā<|ā ½āñ 'Ēāā•½āā |ā©āā Ā†ā<|ā ‡āšāāŸā†āšā†ü Ōāñ|āāē Ōöāý Ā†ā<|ā ‡āšāāŸā†āšā†ü |āāē¶ā 'āĒā†āšāĀ ‡āšāē - ĒāāĒā Ā†ā<|ā ‡āšāāŸā†āšā†ü, Īāñ|ā Ā†ā<|ā ‡āšāāŸā†āšā†ü |ā©āā 'Ēāñ>Ēāñ>áŌā Ōāñ|āāē Ōöý
- ÍāĀāēĀ ½āñ ĒāāĒā ĀāāfāĀ ‡āšāāŸā ‡āšā†ü ,āāü ‡ā<Ōāāē•ā¶ā ‡āšā 'āāāĀlāŌ¶ā, Īāñ|ā ĀāāfāĀ ‡āšāāŸā ‡āšā†ü ĀāñŌāāŸāi,āāñâ ‡āšā ¼āāāŸā |ā©āā 'Ēāñ>áĒāñ>áŌā Ā ‡ā<|ā Ōāālā ‡āñš •ā½ā¶āñ ½āð ŌāŌā¾ā†āš Ōāñ|āāē Ōöý
- ĀāāfāĀ lāŌāĀ ĤāāĀ 'āĒā†āšāĀ ‡āšñ Ōāñ|āñ Ōöā- ĀāāfāĀ lāŌāĀ A,B, AB |ā©āā Ōý
- ÍāĀāēĀ ½āñ ĀāāfāĀ ‡āšāē ‡āš½āāē Ōāñ¶āñ ‡āšñ ‡āšāĀŸā ‡āāēāā½ā¾āā ¶āā½ā†āš ĀāñŌā Ōāñ|āā Ōöý fŌā†āšñ ,āĒāālāā ‡āĀŌā, Ōñ'āñ>āfāā>Ōā B, ½āĒāñāāĀ¾āā, jñāŌāi, f¶Ōāñ'āšñĒāāfāā>Ōā ,āāāā Ā†ā<|ā ½āñâ ŌāālāĒēš½āŸā Ōāñ 'āšŌĒā¶āñ lāāĒāñ ĀāñŌā Ōöý

f‡āšāfĀ8138†āš½½āi>Ā,¶āñ>lāāā†āĀšŌā&lāā&¶ā¶āñ>

- ‡āš½½āi>Ā ¶āñ>lā ‡āĀš ,āā'āŌā ½āð •āiüjñ Ōi† ‡āš½½āi>Āāð ‡āšā ‡āš •āāĒā Ōö •āāñ ¼āāðŌāāñāāĒā†āš Ā'ā Ōāñ ,āĒāŌā-,āĒāŌā ĀĒāñ Ōi† Ōāñ|āñ Ōöý
- f¶Ā¶āñ> āñlā āālāāñlā ½āð ĀĒāñ ‡āš½½āi>Āāð ‡āšāē ¶āñ>lāāā ‡āšŌā Ōö •āāñ Ōāñ>ñĒāāf> ‡āñš ½āāf¾ā½ā Ōāñ •āiüjñ Ōāñ|āñ Ōöý
- ŌālāĀĀ ‡āš½½āi>Ā ¾āā 'āĒāñŌāĒā½ā, ¶āñ>lā ‡āĀš ½āð āāŌ©ā|ā āā ‡āšŌāāē ,ā¶¾ā ‡āš½½āi>Ā ¾āā 'āĒāñŌāĒā½ā ‡āšāñ Ōāñlāā 'āĒā¶ā ‡āšĀ|āā Ōöý
- ‡āš½½āi>Ā ‡āñš ½āāf¾ā½ā Ōāñ ŌāiĤā¶āā,āāð ‡āšā ,āāā¶ā -'āĒā¶ā fĀ-½āñĒā ‡āšŌĒāā|āā Ōöý

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