CBSE Sample Paper-01
SUMMATIVE ASSESSMENT –II
SCIENCE (Theory)
Class – X

Time allowed: 3 hours Maximum Marks: 90

General Instructions:

a) All questions are compulsory.
b) The question paper comprises of two sections, A and B. You are to attempt both the sections.
c) Questions 1 to 3 in section A are one mark questions. These are to be answered in one word or in one sentence.
d) Questions 4 to 6 in section A are two marks questions. These are to be answered in about 30 words each.
e) Questions 7 to 18 in section A are three marks questions. These are to be answered in about 50 words each.
f) Questions 19 to 24 in section A are five marks questions. These are to be answered in about 70 words each.
g) Questions 25 to 27 in section B are 2 marks questions and Questions 28 to 36 are multiple choice questions based on practical skills. Each question of multiple choice questions is a one mark question. You are to select one most appropriate response out of the four provided to you.

Section A

1. Define afforestation.
2. Name the following compounds.

   (i) $H-\overset{H}{\overset{|}{C}}=O$ (ii) CH_3-CH_2-Cl
3. What are the values of (i) Angle of incidence and (ii) Angle of reflection for normal incidence on a plane surface?
4. Describe 'Total internal reflection of light'. What is the essential condition for it occurance?
5. Why does Silicon have valency 4 and Chlorine 1?
6. Use the mirror formula to show that an object lying between the pole and focus of a concave mirror, the image formed is always virtual in nature.
7. What do you understand by periodicity? Are the properties of elements placed in a group same? Illustrate.
8. What was Dobereiner's basis of classification of elements?
9. Explain double fertilization in plants.
10. What is vegetative propagation? When is it used? Name thee methods of vegetative propagation.
11. Explain how sexual reproduction gives rise to more viable variations than asexual reproduction. How does this affect the evolution of those organisms that reproduce sexually?

12. What is fossilization? How are fossils formed?
13. The radius of curvature of a convex mirror used on a moving automobile is 2.0 m. A truck is coming behind it at a constant distance of 3.5 m. Calculate (i) the position and (ii) the size of image relative to the size of truck. What will be the nature of image?
14. Define (i) regular reflection and (ii) diffused reflection. List the differences between them.
15. Pankaj is a student of class 7. He is very passionate about doing Science experiments. Recently he visited Delhi with his parents to witness Science fair. He purchased different types of lenses, mirror and other articles. One day, during games period, a student of same class fell down and his lips started bleeding.

    On observation, it was found by physical education teacher that very fine pieces of glass, difficult to observe, stranded over there. Pankaj immediately rushed to Physical Lab and brought a Lens. The bigger image of stranded glass pieces eased the first aid job.

    Read the above passage and answer the following questions:

    (a) Name the lens or mirror brought by Pankaj.

    (b) Draw the ray diagram showing formation of very big image of object by lens. What should be the position of object to get such image?

    (c) What values are shown by Pankaj
16. How do we see colours? Explain the role of cells to respond (i) intensity, (ii) colour.

    What is colour blindness?
17. What is ten percent law? Explain with an example how energy flows through different trophic levels?
18. Replenishment of forests is essential. Justify the statement by giving any three reasons.
19. (a) Describe asexual reproduction in Amoeba.

    (b) How does sexual reproduction in plants takes place?

    Or

    How do Mendel's experiments show that traits are inherited independently?
20. Draw a ray diagram to show the formation of image of an object placed between the pole and focus of a concave mirror. Obtain the relation between u, v and f for a given concave mirror. State clearly the assumption involved and sign convention used.

    Or

    One half of a convex les is covered with a black paper. Will this lens produce a complete image of the object? Verify your answer experimentally. Explain your observations.
21. Draw a ray diagram in each case to show the position and nature of the image formed when the object is places:

    (i) At the centre of curvature of a concave mirror.

    (ii) Between the pole P and focus F of a concave mirror.

    (iii) In front of a convex mirror.

    (iv) At 2F of a convex lens.

    (v) In front of a concave lens.

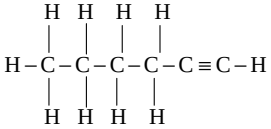
    Or

(i) During its passages from one medium to another, when does a light ray change its path?
(ii) Define the term absolute refractive index of a medium.
(iii) With the help of a ray diagram, explain the term 'critical angle'.
(iv) What is the value of refractive index of the medium if the critical angle of incident in a denser-rarer interface is equal to 45°?

22. (a) Name the gas evolved during fermentation process?
(b) What role is played by yeast in the conversion of cane sugar ($C_{12}H_{22}O_{11}$) to ethanol?
(c) How may the following be obtained from pure ethanol? Express chemical reactions by the chemical equations.
(i) Sodium ethoxide (ii) Ethyl ethanoate (iii) Ethanal

Or

(a) Why does carbon form largest number of compounds?
(b) Why are some of these are called saturated and other unsaturated compounds?
(c) Which of these two is more reactive?
(d) Write the names of the compounds:

(i) $CH_3 - CH_2 - Br$ (ii) 

23. (a) Draw an electron dot structure of (i) N_2, (ii) O_2, (iii) $CaCl_2$, (iv) Na_2O
(b) Write IUPAC name of (i) CH_3COCH_3, (ii) $CH_3CH_2CH_2CHO$
(c) How will you test the presence of carboxylic acid?
(d) Complete the following reaction:

$CH_3CH_2OH + Na \longrightarrow$

Or

(a) Give electron dot structure of (i) CO_2, (ii) H_2S, (iii) $CaCl_2$, (iv) AlF_3
(b) How will you differentiate between Ethane and Ethene by a suitable chemical test? Give chemical reactions involved.
(c) Why are detergents preferred over soaps? Give two reasons.

24. Trace the events that would take place in a flower from the time the pollen grains of the same species fall on the stigma up to the completion of fertilization.

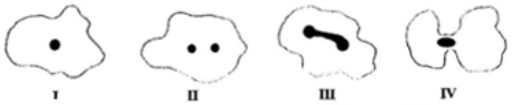
Or

Discuss briefly the different types of reproduction.

Section B

25. (i) Which of the following reagents gives brisk effervescene with ethanoic acid and why?
(a) Calcium hydroxide (b) Sodium chloride
(c) Sodium bicarbonate (d) Ammonium chloride
(ii) Write the chemical equation.

26. (i) Which is the correct diagram showing an Amoeba undergoing binary fission?



(ii) Justify your answer.

27. Who among the following uses a concave mirror and why?
    (a) Automobile rider (b) Shopkeeper (c) Dentist (d) All of these
28. The functional group present in acetic acid:
    (a) Carboxylic (b) Alcohol (c) Aldehyde (d) Ketone
29. The physical state of pure acetic acid is:
    (a) Solid (b) Liquid (c) Aq. Solution (d) Gaseous state
30. The figure given below shows:

    (a) Amoeba undergoing binary fission (b) Yeast undergoing binary fission
    (c) Yeast undergoing budding (d) Amoeba undergoing budding
31. Fission of two types of gamete known as:
    (a) Fertilization (b) Zygote (c) Binary fission (d) Cytokinesis
32. In binary fission:
    (a) The identity of the parent body is maintained after reproduction.
    (b) The parent body is lost after reproduction.
    (c) The parent body enlarges.
    (d) None of these
33. A yeast cell in which budding occurs, it can have:
    (a) One bud cell (b) Two bud cells
    (c) Three bud cells (d) A chain of bud cells
34. The point at the centre of a lens is called as:
    (a) Pole (b) Optical centre (c) Focus (d) Aperture
35. A lens of focal length f is cut into two equal parts without affecting its curvature. The two pieces will have equal focal length of:
    (a) f (b) $2f$ (c) $\frac{f}{2}$ (d) $\frac{f}{3}$
36. Vinita took 20 grams of seeds and placed them in distilled water in a petridish. She weighted the seeds kept in water at regular interval of two hours. She performed this activity four times continuous. In which interval of time she found more water had been imbibed by them:
    (a) Two hours (b) Four hours (c) Six hours (d) Eight hours

CBSE Sample Paper-01
SUMMATIVE ASSESSMENT –II
SCIENCE (Theory)
Class – X

(Solutions)

SECTION-A

1. Planting of trees is called afforestation.
2. (a) Methanol
   (b) Chloroethane
3. $(0°)$ $\angle i = \angle r$
4. **Total internal reflection**: When a ray of light passes from a denser to rarer medium in such a way that its angle is incident exceeds the critical angle, it undergoes reflection instead of refraction. This phenomenon is called total internal reflection.
   Essential conditions for total internal reflection:
   (i) Light should pass from denser to rarer medium.
   (ii) Angle of incident should be greater than the critical angle for the pair of media in contact.
5. Si has 4 valence electrons, it needs four electrons to complete its octet so its valency is 4.
   Cl has 7 valence electrons, it needs 1 electron to complete its octet so its valency is 1.
6. Mirror formula is, $\frac{1}{f}=\frac{1}{v}+\frac{1}{u}$ where u, v and f are object distance, image distance and focal length respectively.

   $\Rightarrow \quad \frac{1}{v}=\frac{1}{f}-\frac{1}{u}$

   Focal length and object distance are both negative for concave mirror and it is given that $u < f$,

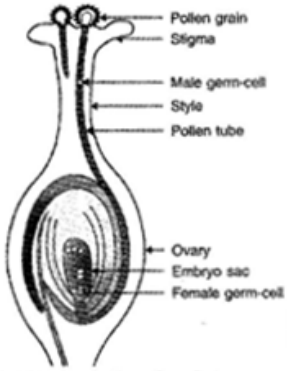
   $\therefore \quad \frac{1}{v}$ becomes $\frac{-1}{f}+\frac{1}{u}$ and is positive.

   $\therefore \quad v$ becoming positive denotes a virtual image.
7. The repetition of similar properties after a definite interval of time is called periodicity ofproperty. Yes the properties of elements placed in a group are similar e.g.
   (i) Group I elements form monopositive ions. Li^+, Na^+, K^+ etc.
   (ii) Group I elements are soft metals.
   (iii) Group I elements form basic oxides.
   (iv) They are highly electropositive and most reactive.
8. Dobereiner classified elements in triads such that atomic mass of middle element was average ofatomic mass of first and third element. e.g.

Li	Na	K
7	23	39

Average atomic mass of Li and K = $\frac{7+39}{2}$ = 23 which is atomic mass of Na.

9. **Double Fertilization in plants**. Pollination is followed by fertilization in plants.
    - After the pollen lands on a suitable stigma, it has no reach the female germ cells in the ovary.
    - The pollen tube grows out of the pollen grain through the style to reach the ovary.
    - After fertilization the zygote divides several times to form an embryo within the ovule.
    - The ovule then develops a tough coat and gets converted into a seed.
    - The seeds contain the future embryo which develops into seedling.
    - The ovary develops and ripens to form a fruit.
    - The process of double fertilization occurs inside each embryo sac, in which two fusions, syngamy and triple fusion take place.
    - When one male gamete fuses with the egg contained in the embryo sac of the ovule, this fusion of male and female gametes is called syngamy and its product is the zygote.
    - The other male gamete fuses with the two polar nuclei and this process is called triple fusion, where three nuclei are involved in the fusion process, one male gamete and two polar nuclei.



Fertilisation in flowering plant

10. The method of developing new plants from the vegetative parts of a plant, such as root, stem of leaf is called **Vegetative propagation**.

    Vegetative propagation can be classified into natural and artificial methods.

    (i) By natural method from
    Leaves – e.g. Bryophyllum
    Stems – e.g. Ginger
    Roots – e.g. Guava

    (ii) By artificial method of-
    Cutting of stem, root, leaf, bulb scale
    Layering of stem
    Grafting
    Parthenogenesis

    The method of vegetative propagation is used when some plants like banana, orange, rose and jasmine have lost the capacity to produce seeds.

    The three methods of vegetative propagation which have developed by artificial methods of vegetative propagation are cutting, layering and grafting.

11. The sexual reproduction gives rise to more viable variations than asexual reproduction. In asexual reproduction, the offsprings are almost identical **to** their parents because they have the same genes as of their parents. Thus, much genetic variation is not possible and thus further evolution of the organism is inhibited.

    In sexual reproduction, the offsprings although similar to their parents, are not identical to them or to one another. This is because the offsprings receive some genes from the mother and some from the father. Because of the mixing of genes of mother and father in various different combinations, all the offsprings will exhibit genetic variations. In this way, sexual reproduction leads to a greater variations in the population.

    Thus, genetic variation leads to the continuous evolution of various species to form better and still better organisms.

12. The process of fossils formation is called fossilization. Fossils are formed when organisms die; their bodies get decomposed and lost. Sometimes the body or a part of it may be in such an environment that it does not let it decompose completely. The mud will eventually harden and retain the impression of the body parts of the organism. This mud with the impression will be called fossil of the organism.

13. For convex mirror, Given: R = 2.0 m, $u = -3.5$ m

    (i) $\dfrac{1}{f} = \dfrac{1}{u} + \dfrac{1}{v} \quad \Rightarrow \quad \dfrac{2}{\mathrm{R}} = \dfrac{1}{u} + \dfrac{1}{v} \quad \left[\because f = \dfrac{\mathrm{R}}{2}\right]$

    $\Rightarrow \dfrac{1}{v} = \dfrac{2}{\mathrm{R}} - \dfrac{1}{u} = \dfrac{2}{2} - \dfrac{1}{(-3.5)} = 1 + \dfrac{10}{35} = \dfrac{9}{7}$

    $\Rightarrow v = +\dfrac{7}{9}\,\mathrm{m}$

    Since v is positive so image is formed behind the mirror and it is virtual.

    (ii) Magnification $(m) = \dfrac{h'}{h} = \dfrac{-v}{u} \quad \Rightarrow \quad h' = \dfrac{-v}{u} \times h = \dfrac{-\left(\frac{7}{9}\right)}{(-3.5)} \times h = \dfrac{2}{9}h < 1$

    $\therefore$ Size of image is $\dfrac{2}{9}$ times the size of object i.e. diminished in size.

14. (i) **Regular reflection**: When the beam of light falls on any polished or smooth surface, it gets reflected in only one direction. This phenomenon is known as regular reflection.

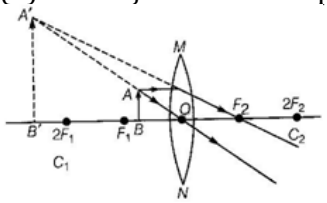
    (ii) **Diffused reflection**: When the light falls on any uneven surface, it gets scattered back in all the directions. This phenomenon is known as diffused reflection.

    Difference between Regular and Diffused reflection:

Regular Reflection	Diffused Reflection
(a) $\angle i = \angle r$	(a) $\angle i \neq \angle r$
(b) Reflection takes place from smooth surface.	(b) Reflection takes place from uneven surface.
(c) Reflected rays are parallel to each other.	(c) Reflected rays are not parallel to each other.

15. (a) Pankaj brought the double convex lens because it forms the magnified image of the object thus it helps to see the fine pieces of glass.

(b) The object should be placed between optical centre and focus of lens.



(c) Values shown by Pankaj are sincerity, friendship, concern for others and learning attitude.

16. Colours are seen associated with an object, if it reflects that colour when light falls on it.

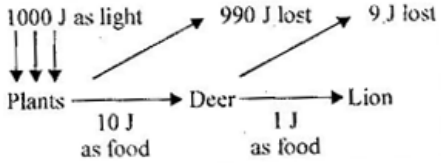
(i) Intensity of light is responded by the rod-shaped cells on the retina.

(ii) Cones in the retina are special cells which respond and distinguish various colours.

Role: The cells generate the electrical nerve pulse.

If the person ahs less of no cone cells, then he will not be able to distinguish between the colours. This is called colour blindness.

17. Energy available at each successive trophic level of food chain is 10 percent of the previous level. This is called 10 percent law. This is due to the fact that 90% energy is lost to the environment at each trophic level.



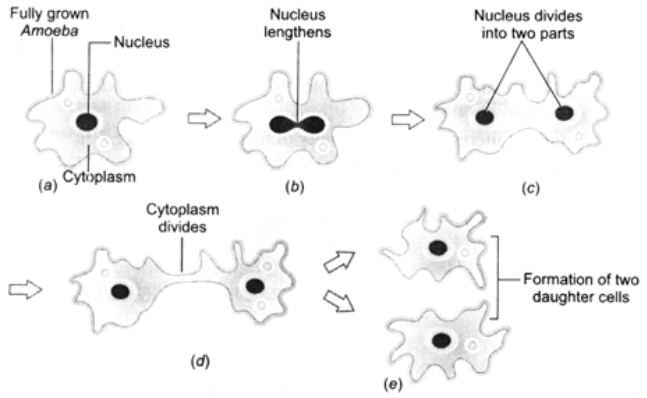
18. Replenishment of forests is essential because of the following reasons:

(i) Trees give out enormous amounts of water by the process of transpiration. This helps in the rain clouds.

(ii) Plants prevent the washing away of top soil which is rich in organic matter. It prevents soil erosion.

(iii) Forests provide raw materials for many industries and form a natural habitat for wildlife.

19. (a) In Amoeba, asexual reproduction occurs by fission (binary and multiple). In Amoeba, nucleus first divides into two daughter nuclei by mitosis and then body along with the cytoplasm constricts from the middle, which gradually deepens and eventually divides into two individual parts, each part has one nucleus. Thus, two daughter Amoebae develop from one. This is called binary fission. In multiple fission, nucleus repeatedly divides to form a large number of nuclei, which reach at the periphery. Later cytoplasm gathers around each nucleus to form a daughter Amoeba. In this process, several individuals (equal to number of nuclei) develop from a single Amoeba.



(b) Sexual reproduction in plants takes place in the following steps:

(i) The male reproductive organ 'stamen' makes the male gametes.

(ii) The female reproductive organ carpel' makes the female gametes.

(iii) The male gametes fertilise the female gametes.

(iv) The fertilised ovules grow and become seeds.

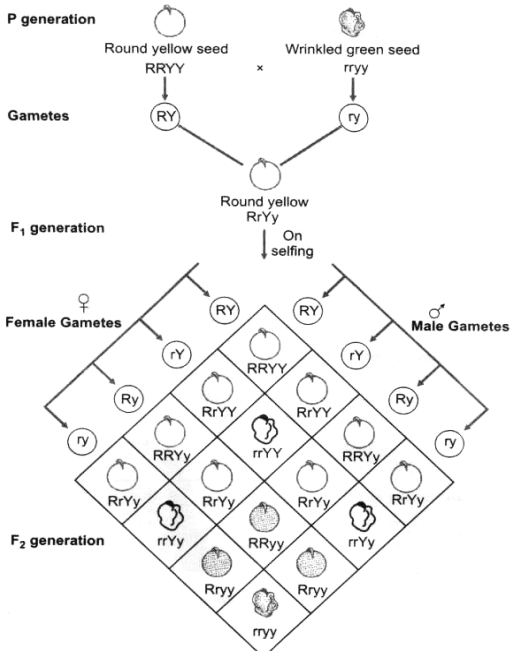
The seeds produce new plants under favourable conditions like presence of water, warmth, air, light, etc.

Or

When Mendel first crossed pure-breed pea plants having round-yellow seeds with pure-breed pea plants having wrinkled-green seeds, he found that only round-yellow seeds were produced in the first-generation. No wrinkled-green seeds were obtained in the F_t generation. From this, it was concluded that round shape and yellow colour of the seeds were dominant traits over the wrinkled shape and green colour of the seeds.

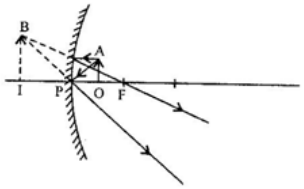
When the F *i* generation pea plants having round-yellow seeds were cross-bred by self-pollination, then four types of seeds having different combinations of shape and colour were obtained in second generation (F_2). These were round-yellow, round-green, wrinkled-yellow and wrinkled-green seeds.

Such a cross is known as dihybrid cross as two sets of corresponding characters are considered.

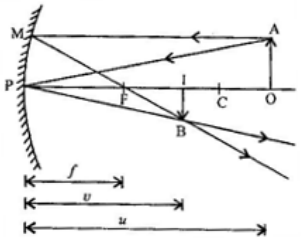


Phenotypic ratio-Round yellow : Round green : Wrinkled yellow : Wrinkled green
i.e. 9 : 3 : 3 : 1
Genotypic ratio- 1:2:2:4:1:2:1:2:1
Mendel observed that along with round-yellow and wrinkled-green, two new combinations of characteristics, round-green and wrinkled-yellow, had appeared in the F_2 generation. On the basis of this observation, Mendel concluded that though the two pairs of original characteristics (seed colour and shape) combine in the F_t generation, they get separated and behave independently in the subsequent generation.

20. Image formed by concave mirror when object is placed between the pole and the focus of the mirror.
Image is erect and enlarged.



Consider a concave mirror. Light from object OA placed beyond C will form a real, inverted and diminished image between F and C.



From similar triangles OAP and IBP, we get, $\frac{OA}{IB} = \frac{PO}{PI} = \frac{u}{v}$

From similar triangles, MPF and IBF, we get $\frac{MP}{IB}=\frac{OA}{IB}=\frac{PF}{FI}=\frac{f}{v-f}$

$\therefore \quad \frac{u}{v}=\frac{f}{v-f}$

Cross-multiplying and then dividing all terms by uvf, we get $\frac{1}{f}-\frac{1}{v}=\frac{1}{u}$

$\Rightarrow \quad \frac{1}{f}=\frac{1}{u}+\frac{1}{v}$ This is required mirror formula.

Assumption:

(i) Aperture of mirror is small.

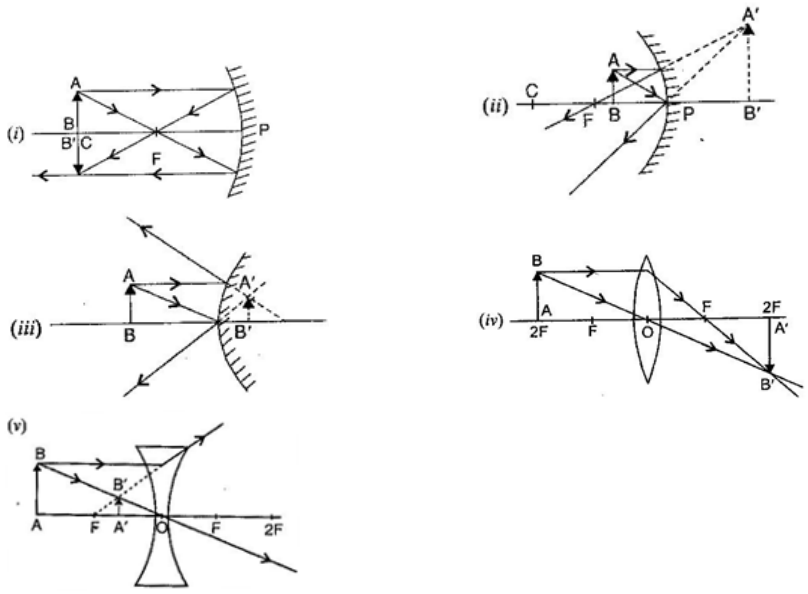
(ii) Rays fall close to the principal axis.

Sign convention:

(i) All distances are measured from the pole.

(ii) Length in the direction of incident ray are positive, while in the opposite direction are negative.

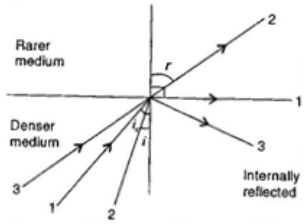
21.



Or

(i) Light ray changes its path at the interface or boundary separating two media.

(ii) Absolute refractive index of a medium: The refractive index of a medium with respect to the vacuum or air is called the absolute refractive index of a medium.



(iii) Critical angle: The angle of incident in the denser medium for which the angle of refraction in rarer medium is 90°, called critical angle for the given pair of contact.

$1 \rightarrow i = i_c \rightarrow r = 90^\circ$

$2 \rightarrow i < i_c \rightarrow$ Refraction

$3 \rightarrow i > i_c \rightarrow$ Total internal reflection

As shown in figure, if the incident angle is less than the critical angle, the ray is partially refracted and partially reflected in the denser medium. But when angle of incident increases and equal to an angle for which the refracted ray travels along the interface and makes refracting angle 90° and light cannot escape the denser medium. So angle is the critical angle. From Snell's law, $i = i_c, r = 90^\circ$

$$\frac{\sin i}{\sin 90^\circ} = n_{21} = \frac{1}{n_{12}} \quad \Rightarrow \quad n_{12} = \frac{1}{\sin i_c}$$

Where n_{12} is refractive index of denser medium with respect to rarer medium and i_c is called critical angle.

(iv) Given $i_c = 45^\circ$

$$\therefore \; n_{12} = \frac{1}{\sin 45^\circ} = \frac{1}{1/\sqrt{2}} = \sqrt{2} = 1.41$$

$\therefore$ Refractive index of a denser medium with respect to air is 1.41.

22. (a) CO_2 gas is evolved accompanied by brisk effervescence.

(b) Yeast is the source of enzymes invertase and zymase needed for fermentation.

(c) (i) $2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2$

(ii) $C_2H_5OH + CH_3COOH \xrightarrow{H_2SO_4} CH_3COOC_2H_5 + H_2O$

(Ethyl ethanoate)

(iii) $C_2H_5OH + \frac{1}{2}O_2 \xrightarrow[Ch_3COOH]{CrO_3 \; is} CH_3CHO + H_2O$

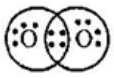
Or

(a) Carbon forms large number of compounds due to its tetravalency as well as property of catenation.

(b) Those compounds in which valency of carbon is satisfied by single bonds only are saturated whereas those compounds in which valency of carbon is satisfied by double or triple bonds are called unsaturated compounds.

(c) Unsaturated compounds are more reactive than saturated compounds.

(d) (i) Bromoethane (ii) Hex – 1 – yne

23. (a) (i)  :N≡N: (ii)  :Ö=Ö:

(iii) $(Ca^{2+})(:\ddot{Cl}:^-)_2$ (iv) $(Na^+)_2(:\ddot{O}:^{2-})$

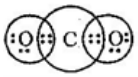
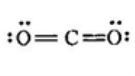
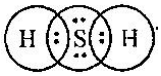
(b) IUPAC name (i) Propanone, (ii) Butanal.

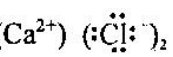
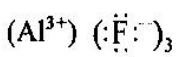
(c) Add sodium bicarbonate solution, If there is brisk effervescence due to evolution of CO2, the presence of carboxylic acid is confirmed.

$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2$

(d) $2CH_3CH_2OH + 2Na \longrightarrow 2CH_3CH_2ONa + H_2$ (g)

Or

(a) (i)   (ii) 

(iii)  (iv) 

(b) Add Bromine water. Ethene will decolourise bromine water whereas ethane does not.

$$CH_2 = CH_2\ (g) + Br_2\ (aq) \longrightarrow \underset{\text{(Colourless)}}{\begin{matrix} CH_2Br \\ | \\ CH_2Br \end{matrix}}$$

(d) (i) Detergents are more effective than soaps.

(ii) They can work well even with hard water whereas soap does not.

24. The events that would take place in a flower from the time the pollen grains of the same species fall on the stigma up to the completion of fertilization are as follows:
    (i) The pollen grains deposited on the stigma are held by the sticky secretion of stigma and start their germination.
    (ii) A short cytoplasmic outgrowth called germ tube emerges through a germ pore and continuous to grow as a pollen tube.
    (iii) The vegetable nucleus first move to the tip of the tube followed by the generative nucleus.
    (iv) The pollen tube secretes enzymes that hydrolyze the reserved food materials in the tissues of stigma and style and utilize them.
    (v) The generative nucleus divides mitotically into two male nuclei.
    (vi) The pollen tube enters the ovule through the micropyle and discharges the two male gametes into the embryo sac.
    (vii) One of the male gametes fuses with the egg nucleus to form a zygote and the other fuses with the secondary nucleus (triple fusion) primary endosperm nucleus; the two fusions are termed as double fertilization.

Section B

25. (i) Sodium bicarbonate reacts with ethanoic to give brisk effervescene due to evolution of CO_2.

    (ii) $NaHCO_3 + CH_3COOH \longrightarrow CH_3COONa + H_2O + CO_2\uparrow$
26. (i) Figure III is showing the correct binary fission in Amoeba.

    (ii) Because the nucleus of Amoeba divides first.
27. Dentist uses the concave mirror to focus light on the spot required to be seen clearly.
28. (a)

29. (b)
30. (c)
31. (b)
32. (b)
33. (d)
34. (b)
35. (a)
36. (d)