

# Assignment

## Reflection of light at plane surface

### Basic Level

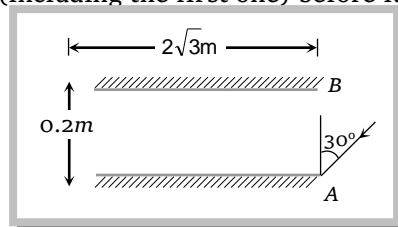
1. A light bulb is placed between two mirrors (plane) inclined at an angle of  $60^\circ$ . Number of images formed are  
[NCERT 1980; CPMT 1996, 97; SCRA 1994; AIIMS 1997; RPMT 1999; AIEEE 2002; Orissa JEE 2003; MP PET 2004]  
(a) 2 (b) 4 (c) 5 (d) 6
2. Two plane mirrors are inclined at an angle of  $72^\circ$ . The number of images of a point object placed between them will be  
[KCET (Engg. & Med.) 1999; BCECE 2003]  
(a) 2 (b) 3 (c) 4 (d) 5
3. To get three images of a single object, one should have two plane mirrors at an angle of  
(a)  $30^\circ$  (b)  $60^\circ$  (c)  $90^\circ$  (d)  $120^\circ$
4. A man of length  $h$  requires a mirror of length at least equal to, to see his own complete image  
(a)  $\frac{h}{4}$  (b)  $\frac{h}{3}$  (c)  $\frac{h}{2}$  (d)  $h$
5. Two plane mirrors are at  $45^\circ$  to each other. If an object is placed between them then the number of images will be [MP PMT 2003]  
(a) 5 (b) 9 (c) 7 (d) 8
6. An object is at a distance of  $0.5\text{ m}$  in front of a plane mirror. Distance between the object and image is  
(a)  $0.5\text{ m}$  (b)  $1\text{ m}$  (c)  $0.25\text{ m}$  (d)  $1.5\text{ m}$
7. A man runs towards a mirror at a speed  $15\text{ m/s}$ . The speed of the image relative to the man is [RPMT 1999; Kerala PET 2002]  
(a)  $15\text{ ms}^{-1}$  (b)  $30\text{ ms}^{-1}$  (c)  $35\text{ ms}^{-1}$  (d)  $20\text{ ms}^{-1}$
8. The light reflected by a plane mirror may form a real image  
(a) If the rays incident on the mirror are diverging (b) If the rays incident on the mirror are converging  
(c) If the object is placed very close to the mirror (d) Under no circumstances
9. A man is  $180\text{ cm}$  tall and his eyes are  $10\text{ cm}$  below the top of his head. In order to see his entire height right from toe to head, he uses a plane mirror kept at a distance of  $1\text{ m}$  from him. The minimum length of the plane mirror required is [MP PMT 1993; DPMT 2001]  
(a)  $180\text{ cm}$  (b)  $90\text{ cm}$  (c)  $85\text{ cm}$  (d)  $170\text{ cm}$
10. A small object is placed  $10\text{ cm}$  in front of a plane mirror. If you stand behind the object  $30\text{ cm}$  from the object and look at its image, the distance focused for your eye will be  
(a)  $60\text{ cm}$  (b)  $20\text{ cm}$  (c)  $40\text{ cm}$  (d)  $80\text{ cm}$
11. Two plane mirrors are at right angles to each other. A man stands between them and combs his hair with his right hand. In how many of the images will he be seen using his right hand  
(a) None (b) 1 (c) 2 (d) 3
12. A man runs towards mirror at a speed of  $15\text{ m/s}$ . What is the speed of his image [CBSE PMT 2000]

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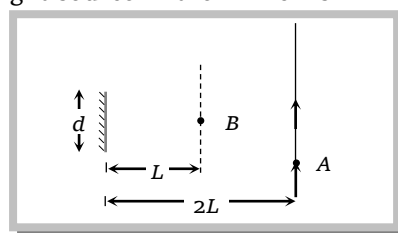
- (a) 7.5 m/s                      (b) 15 m/s                      (c) 30 m/s                      (d) 45 m/s
13. A ray of light is incident normally on a plane mirror. The angle of reflection will be  
(a)  $0^\circ$                       (b)  $90^\circ$                       (c) Will not be reflected                      (d) None of these
14. A plane mirror produces a magnification of [MP PMT/PET 1997]  
(a) -1                      (b) +1                      (c) Zero                      (d) Between 0 and  $+\infty$
15. When a plane mirror is rotated through an angle  $\theta$ , then the reflected ray turns through the angle  $2\theta$ , then the size of the image [MP PAT 1996]  
(a) Is doubled                      (b) Is halved                      (c) Remains the same                      (d) Becomes infinite
16. What should be the angle between two plane mirrors so that whatever be the angle of incidence, the incident ray and the reflected ray from the two mirrors be parallel to each other  
(a)  $60^\circ$                       (b)  $90^\circ$                       (c)  $120^\circ$                       (d)  $175^\circ$
17. Ray optics is valid, when characteristic dimensions are [CBSE PMT 1994]  
(a) Of the same order as the wavelength of light                      (b) Much smaller than the wavelength of light  
(c) Of the order of one millimeter                      (d) Much larger than the wavelength of light
18. It is desired to photograph the image of an object placed at a distance of 3 m from the plane mirror. The camera which is at a distance of 4.5 m from the mirror should be focussed for a distance of  
(a) 3 m                      (b) 4.5 m                      (c) 6 m                      (d) 7.5 m
19. Two plane mirrors are parallel to each other and spaced 20 cm apart. An object is kept in between them at 15 cm from A. Out of the following at which point an image is not formed in mirror A (distance measured from mirror A)  
(a) 15 cm                      (b) 25 cm                      (c) 45 cm                      (d) 55 cm

### Advance Level

20. Two plane mirrors A and B are aligned parallel to each other, as shown in the figure. A light ray is incident at an angle of  $30^\circ$  at a point just inside one end of A. The plane of incidence coincides with the plane of the figure. The maximum number of times the ray undergoes reflections (including the first one) before it emerges out is

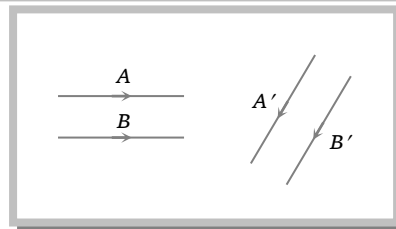


- (a) 28  
(b) 30  
(c) 32  
(d) 34
21. A point source of light B is placed at a distance  $L$  in front of the centre of a mirror of width  $d$  hung vertically on a wall. A man walks in front of the mirror along a line parallel to the mirror at a distance  $2L$  from it as shown. The greatest distance over which he can see the image of the light source in the mirror is



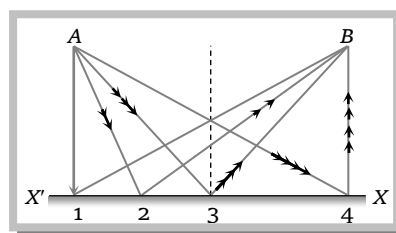
22. The figure shows two rays A and B being reflected by a mirror and going as A' and B'. The mirror is

- (a) Plane  
(b) Concave  
(c) Convex  
(d) May be any spherical mirror



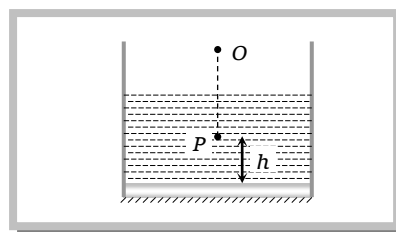
23. An object is initially at a distance of 100 cm from a plane mirror. If the mirror approaches the object at a speed of 5 cm/s, then after 6 s the distance between the object and its image will be
- (a) 60 cm (b) 140 cm (c) 170 cm (d) 150 cm
24. An object placed in front of a plane mirror is displaced by 0.4 m along a straight line at an angle of  $30^\circ$  to mirror plane. The change in the distance between the object and its image is
- (a) 0.20 m (b) 0.40 m (c) 0.25 m (d) 0.80 m
25. A ray of light travels from A to B with uniform speed. On its way it is reflected by the surface XX'. The path followed by the ray to take least time is

- (a) 1  
(b) 2  
(c) 3  
(d) 4



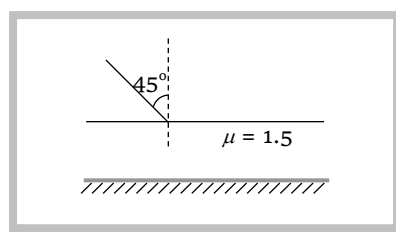
26. A point object O is placed between two plan mirrors as shown in fig. The distance of the first three images formed by mirror  $M_2$  from it are
- (a) 2 mm, 8 mm, 18 mm  
(b) 2 mm, 18 mm, 28 mm  
(c) 2 mm, 18 mm, 22 mm  
(d) 2 mm, 18 mm, 58 mm
27. A plane mirror is placed at the bottom of the tank containing a liquid of refractive index  $\mu$ . P is a small object at a height h above the mirror. An observer O vertically above P outside the liquid see P and its image in the mirror. The apparent distance between these two will be

- (a)  $2\mu h$   
(b)  $\frac{2h}{\mu}$   
(c)  $\frac{2h}{\mu - 1}$   
(d)  $h\left(1 + \frac{1}{\mu}\right)$



28. One side of a glass slab is silvered as shown. A ray of light is incident on the other side at angle of incidence  $i = 45^\circ$ . Refractive index of glass is given as 1.5. The deviation of the ray of light from its initial path when it comes out of the slab is

- (a)  $90^\circ$   
(b)  $180^\circ$



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(c)  $120^\circ$

(d)  $45^\circ$

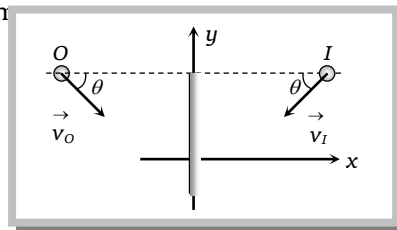
29. If an object moves towards a plane mirror with a speed  $v$  at an angle  $\theta$  to the perpendicular to the plane of the mirror, find the relative velocity between the object and the image.

(a)  $v$

(b)  $2v$

(c)  $2v \cos \theta$

(d)  $2v \sin \theta$



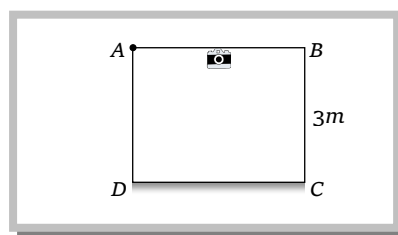
30. Figure shows a cubical room  $ABCD$  with the wall  $CD$  as a plane mirror. Each side of the room is  $3m$ . We place a camera at the midpoint of the wall  $AB$ . At what distance should the camera be focussed to photograph an object placed at  $A$

(a)  $1.5 m$

(b)  $3 m$

(c)  $6 m$

(d) More than  $6 m$



## Reflection of light at spherical surface

### Basic Level

31. A man having height  $6 m$ , want to see full height in mirror. They observe image of  $2m$  height erect, then used mirror is [J & K CET 2004]

(a) Concave

(b) Convex

(c) Plane

(d) None of these

32. An object of length  $6cm$  is placed on the principal axis of a concave mirror of focal length  $f$  at a distance of  $4 f$ . The length of the image will be

(a)  $2 cm$

(b)  $12 cm$

(c)  $4 cm$

(d)  $1.2 cm$

33. Convergence of concave mirror can be decreased by dipping in

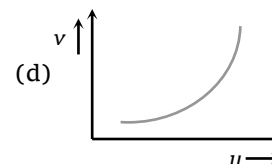
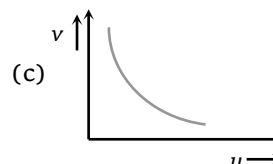
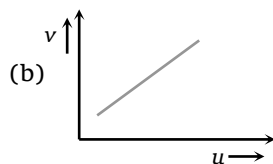
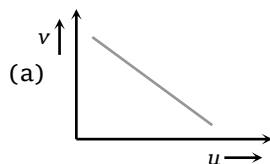
(a) Water

(b) Oil

(c) Both

(d) None of these

34. In an experiment of find the focal length of a concave mirror a graph is drawn between the magnitudes of  $u$  and  $v$ . The graph looks like



35. An object  $2.5 cm$  high is placed at a distance of  $10 cm$  from a concave mirror of radius of curvature  $30 cm$ . The size of the image is

[BVP 2003]

(a)  $9.2 cm$

(b)  $10.5 cm$

(c)  $5.6 cm$

(d)  $7.5 cm$

36. A diminished virtual image can be formed only in

[MP PMT 2002]

(a) Plane mirror

(b) A concave mirror

(c) A convex mirror

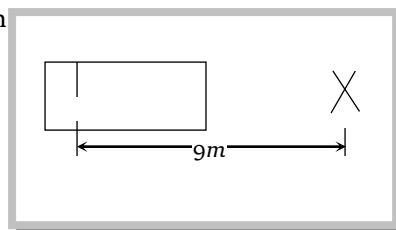
(d) Concave-parabolic mirror

37. A point object is placed at a distance of 30 cm from a convex mirror of focal length 30 cm. The image will form at [JIPMER 2002]  
 (a) Infinity (b) Focus (c) Pole (d) 15 cm behind the mirror
38. The focal length of a convex mirror is 20 cm its radius of curvature will be [MP PMT 2001]  
 (a) 10 cm (b) 20 cm (c) 30 cm (d) 40 cm
39. A concave mirror of focal length 15 cm forms an image having twice the linear dimensions of the object. The position of the object when the image is virtual will be  
 (a) 22.5 cm (b) 7.5 cm (c) 30 cm (d) 45 cm
40. Under which of the following conditions will a convex mirror of focal length  $f$  produce an image that is erect, diminished and virtual [AMU (Engg.) 2001]  
 (a) Only when  $2f > u > f$  (b) Only when  $u = f$  (c) Only when  $u < f$  (d) Always
41. A concave mirror gives an image three times as large as the object placed at a distance of 20 cm from it. For the image to be real, the focal length should be [SCRA 1998; JIPMER 2000]  
 (a) 10 cm (b) 15 cm (c) 20 cm (d) 30 cm
42. A point object is placed at a distance of 10 cm and its real image is formed at a distance of 20 cm from a concave mirror. If the object is moved by 0.1 cm towards the mirror, the image will shift by about  
 (a) 0.4 cm away from the mirror (b) 0.4 cm towards the mirror  
 (c) 0.8 cm away from the mirror (d) 0.8 cm towards the mirror
43. The minimum distance between the object and its real image for concave mirror is [RPMT 1999]  
 (a)  $f$  (b)  $2f$  (c)  $4f$  (d) Zero
44. An object is placed at 20 cm from a convex mirror of focal length 10 cm. The image formed by the mirror is [JIPMER 1999]  
 (a) Real and at 20 cm from the mirror (b) Virtual and at 20 cm from the mirror  
 (c) Virtual and at  $20/3$  cm from the mirror (d) Real and at  $20/3$  cm from the mirror
45. An object is placed 40 cm from a concave mirror of focal length 20 cm. The image formed is [MP PET 1986; MP PMT, 1999]  
 (a) Real, inverted and same in size (b) Real, inverted and smaller  
 (c) Virtual, erect and larger (d) Virtual, erect and smaller
46. Match List I with List II and select the correct answer using the codes given below the lists
- | List I  | List II                        |
|---|--------------------------------|
| (Position of the object)  | (Magnification)                |
| (I) An object is placed at focus before a convex mirror                 | (A) Magnification is $-\infty$ |
| (II) An object is placed at centre of curvature before a concave mirror | (B) Magnification is 0.5       |
| (III) An object is placed at focus before a concave mirror              | (C) Magnification is $+1$      |
| (IV) An object is placed at centre of curvature before a convex mirror  | (D) Magnification is $-1$      |
|   | (E) Magnification is 0.33      |
- Codes :**
- (a) I-B, II-D, III-A, IV-E (b) I-A, II-D, III-C, IV-B (c) I-C, II-B, III-A, IV-E (d) I-B, II-E, III-D, IV-C
47. In a concave mirror experiment, an object is placed at a distance  $x_1$  from the focus and the image is formed at a distance  $x_2$  from the focus. The focal length of the mirror would be  
 (a)  $x_1 x_2$  (b)  $\sqrt{x_1 x_2}$  (c)  $\frac{x_1 + x_2}{2}$  (d)  $\sqrt{\frac{x_1}{x_2}}$
48. Which of the following forms a virtual and erect image for all positions of the object  
 (a) Convex lens (b) Concave lens (c) Convex mirror (d) Concave mirror
49. A convex mirror has a focal length  $f$ . A real object is placed at a distance  $f$  in front of it from the pole produces an image at [MP PAT 1996]  
 (a) Infinity (b)  $f$  (c)  $f/2$  (d)  $2f$

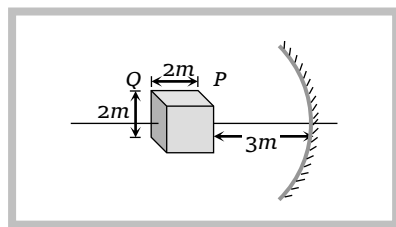
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50. Radius of curvature of concave mirror is 40 cm and the size of image is twice as that of object, then the object distance is [AFMC 1995]  
(a) 60 cm (b) 20 cm (c) 40 cm (d) 30 cm
51. All of the following statements are correct except [Manipal MEE 1995]  
(a) The magnification produced by a convex mirror is always less than one  
(b) A virtual, erect, same-sized image can be obtained using a plane mirror  
(c) A virtual, erect, magnified image can be formed using a concave mirror  
(d) A real, inverted, same-sized image can be formed using a convex mirror
52. Radius of curvature of convex mirror is 40 cm and the size of object is twice as that of image, then the image distance is [AFMC 1995]  
(a) 10 cm (b) 20 cm (c) 40 cm (d) 30 cm
53. If an object is placed 10 cm in front of a concave mirror of focal length 20 cm, the image will be  
(a) Diminished, upright, virtual (b) Enlarged, upright, virtual (c) Diminished, inverted, real
54. An object 1 cm tall is placed 4 cm in front of a mirror. In order to produce an upright image of 3 cm height one needs a [SCRA 1994]  
(a) Convex mirror of radius of curvature 12 cm (b) Concave mirror of radius of curvature 12 cm  
(c) Concave mirror of radius of curvature 4 cm (d) Plane mirror of height 12 cm
55. The image formed by a convex mirror of a real object is larger than the object [CPMT 1994]  
(a) When  $u < 2f$  (b) When  $u > 2f$  (c) For all values of  $u$  (d) For no value of  $u$
56. An object 5 cm tall is placed 1 m from a concave spherical mirror which has a radius of curvature of 20 cm. The size of the image is [MP PET 1993]  
(a) 0.11 cm (b) 0.50 cm (c) 0.55 cm (d) 0.60 cm
57. A virtual image three times the size of the object is obtained with a concave mirror of radius of curvature 36 cm. The distance of the object from the mirror is  
(a) 5 cm (b) 12 cm (c) 10 cm (d) 20 cm
58. Given a point source of light, which of the following can produce a parallel beam of light  
(a) Convex mirror (b) Concave mirror  
(c) Concave lens (d) Two plane mirrors inclined at an angle of  $90^\circ$
59. A convex mirror is used to form the image of an object. Then which of the following statements is wrong  
(a) The image lies between the pole and the focus (b) The image is diminished in size  
(c) The image is erect (d) The image is real
60. A boy stands straight in front of a mirror at a distance of 30 cm away from it. He sees his erect image whose height is  $\frac{1}{5}$ th of his real height. The mirror he is using is  
(a) Plane mirror (b) Convex mirror (c) Concave mirror (d) Plano-convex mirror
61. For the largest distance of the image from a concave mirror of focal length 10 cm, the object should be kept at  
(a) 10 cm (b) Infinite (c) 40 cm (d) 60 cm
62. A dentist uses a small mirror that gives a magnification of 4 when it is held 0.60 cm from a tooth. The radius of curvature of the mirror is  
(a) 1.60 cm (convex) (b) 0.8 cm (concave) (c) 1.60 cm (concave) (d) 0.8 cm (convex)
63. A dice is placed with its one edge parallel to the principal axis between the principal focus and the centre of the curvature of a concave mirror. Then the image has the shape of  
(a) Cube (b) Cuboid (c) Barrel shaped (d) Spherical

64. A short linear object of length  $l$  lies along the axis of a concave mirror of focal length  $f$  at a distance  $u$  from the pole of the mirror. The size of the image is approximately equal to
- (a)  $l\left(\frac{u-f}{f}\right)^{1/2}$  (b)  $l\left(\frac{u-f}{f}\right)^2$  (c)  $l\left(\frac{f}{u-f}\right)^{1/2}$  (d)  $l\left(\frac{f}{u-f}\right)^2$
65. A point object is moving on the principal axis of a concave mirror of focal length  $24\text{ cm}$  towards the mirror. When it is at a distance of  $60\text{ cm}$  from the mirror, its velocity is  $9\text{ cm/sec}$ . What is the velocity of the image at that instant  
[MP PMT 1997]
- (a)  $5\text{ cm/sec}$  towards the mirror (b)  $4\text{ cm/sec}$  towards the mirror  
(c)  $4\text{ cm/sec}$  away from the mirror (d)  $9\text{ cm/sec}$  away from the mirror
66. A convex mirror of focal length  $10\text{ cm}$  forms an image which is half of the size of the object. The distance of the object from the mirror is
- (a)  $10\text{ cm}$  (b)  $20\text{ cm}$  (c)  $5\text{ cm}$  (d)  $15\text{ cm}$
67. A concave mirror is used to focus the image of a flower on a nearby wall  $120\text{ cm}$  from the flower. If a lateral magnification of  $16$  is desired, the distance of the flower from the mirror should be
- (a)  $8\text{ cm}$  (b)  $12\text{ cm}$  (c)  $80\text{ cm}$  (d)  $120\text{ cm}$
68. A thin rod of  $5\text{ cm}$  length is kept along the axis of a concave mirror of  $10\text{ cm}$  focal length such that its image is real and magnified and one end touches the rod. Its magnification will be
- (a)  $1$  (b)  $2$  (c)  $3$  (d)  $4$
69. A luminous object is placed  $20\text{ cm}$  from surface of a convex mirror and a plane mirror is set so that virtual images formed in two mirrors coincide. If plane mirror is at a distance of  $12\text{ cm}$  from object, then focal length of convex mirror, is
- (a)  $5\text{ cm}$  (b)  $10\text{ cm}$  (c)  $20\text{ cm}$  (d)  $40\text{ cm}$
70. A rear mirror of a vehicle is cylindrical having radius of curvature  $10\text{ cm}$ . The length of arc of curved surface is also  $10\text{ cm}$ . If the eye of driver is assumed to be at large distance, from the mirror, then the field of view in radian is
- (a)  $0.5$  (b)  $1$  (c)  $2$  (d)  $4$
71. A vehicle has a driving mirror of focal length  $30\text{ cm}$ . Another vehicle of dimension  $2 \times 4 \times 1.75\text{ m}^3$  is  $9\text{ m}$  away from the mirror of first vehicle. Position of the second vehicle as seen



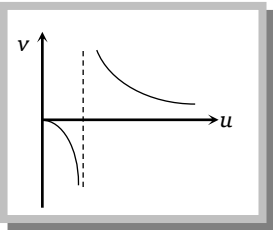
- (a)  $30\text{ cm}$   
(b)  $60\text{ cm}$   
(c)  $90\text{ cm}$   
(d)  $9\text{ cm}$
72. A cube of side  $2\text{ m}$  is placed in front of a concave mirror focal length  $1\text{ m}$  with its face  $P$  at a distance of  $3\text{ m}$  and face  $Q$  at a distance of  $5\text{ m}$  from the mirror. The distance between the images of face  $P$  and  $Q$  and height of images of  $P$  and  $Q$  are



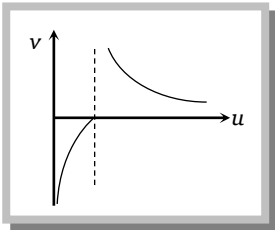
- (a)  $1\text{ m}, 0.5\text{ m}, 0.25\text{ m}$   
(b)  $0.5\text{ m}, 1\text{ m}, 0.25\text{ m}$

## 24 Reflection of Light

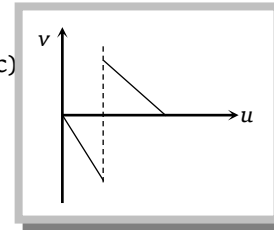
- (c) 0.5 m, 0.25 m, 1m  
(d) 0.25 m, 1m, 0.5 m
73. A concave mirror of radius of curvature 60 cm is placed at the bottom of tank containing water upto a height of 20 cm. The mirror faces upwards with its axis vertical. Solar light falls normally on the surface of water and the image of the sun is formed. If  ${}_a\mu_w = \frac{4}{3}$  then with the observer in air, the distance of the image from the surface of water is  
(a) 30 cm (b) 10 cm (c) 7.5 cm above (d) 7.5 cm below
74. A concave mirror forms an image of the sun at a distance of 12 cm from it  
(a) The radius of curvature of this mirror is 6 cm  
(b) To use it as a shaving mirror, it must be held at a distance of 8-10 cm from the face  
(c) If an object is kept at a distance of 12 cm from it, the image formed will be of the same size as the object  
(d) All the above alternatives are correct
75. A small piece of wire bent into an L shape with upright and horizontal portions of equal lengths, is placed with the horizontal portion along the axis of the concave mirror whose radius of curvature is 10 cm. If the bend is 20 cm from the pole of the mirror, then the ratio of the lengths of the images of the upright and horizontal portions of the wire is  
(a) 1 : 2 (b) 3 : 1 (c) 1 : 3 (d) 2 : 1
76. As the position of an object ( $u$ ) reflected from a concave mirror is varied, the position of the image ( $v$ ) also varies. By letting the  $u$  changes from 0 to  $+\infty$  the graph between  $v$  versus  $u$  will be
- (a)



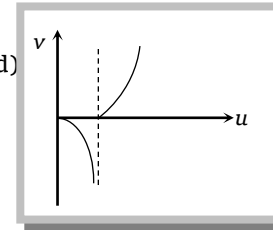
(b)



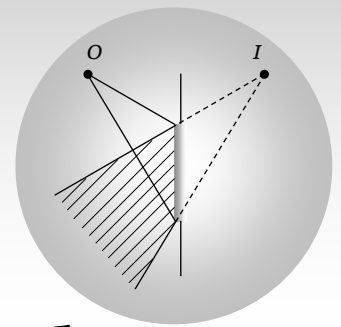
(c)



(d)


77. A concave mirror has a focal length 20 cm. The distance between the two positions of the object for which the image size is double of the object size is  
(a) 20 cm (b) 40 cm (c) 30 cm (d) 60 cm
78. A concave mirror of focal length 10 cm and a convex mirror of focal length 15 cm are placed facing each other 40 cm apart. A point object is placed between the mirrors, on their common axis and 15 cm from the concave mirror. Find the position and nature of the image produced by the successive reflections, first at concave mirror and then at convex mirror  
(a) 2 cm (b) 4 cm (c) 6 cm (d) 8 cm





## Answer Sheet

### Assignments

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
c	c	c	c	c	b	b	b	b	c	b	b	a	b	c	b	d	d	c	b
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
d	a	b	b	c	c	b	a	c	d	b	a	d	c	d	c	d	d	b	d
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
b	a	d	c	a	a	b	b, c	c	d	d	a	b	b	d	c	b	b	d	b
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78		
a	c	b	d	c	a	a	a	a	b	a	d	c	b	b	a	a	c		

