CHAPTER 6

Reflection and Refraction

6.1 LIGHT

Light is that form of energy which produces the sensation of sight. Light energy travels through vacuum well as different transparent media in the form of electromagnetic waves. In vacuum as well as in air, light travels with a constant speed of $3 \times 10^8\,\text{ms}^{-1}$.

Light travels from one point to other along a straight path. This is called rectilinear propagation of light. A bundle of rays constitutes a light beam.

6.2 REFLECTION OF LIGHT

It is the phenomenon of bouncing back of light to the same medium after striking a surface. A glass sheet having a uniform thin coating of silver on one side acts as a reflector and is called a mirror.

6.2.1 Laws of Reflection

Two important laws of reflection are as follows:

1. The incident ray, the reflected ray and the normal to the reflecting surface at the point of incidence, all lie in the same plane.
2. The angle of incidence and angle of reflection are equal and they lie on opposite sides of normal.

6.3 IMAGE

When rays of light starting from a point object, after reflection from a mirror, actually meet or appear to meet at a point, then this second point is called the image of that object point.

6.3.1 Real and Virtual Images

If light rays from an object, after reflection or refraction, actually meet at a point, then the image is called a real image. A real image is always inverted and can be obtained on a screen.

If light rays from an object, after reflection or refraction, do not meet but appear to meet at a point, then the image is called a virtual image. A virtual image is always erect and cannot be obtained on a screen.

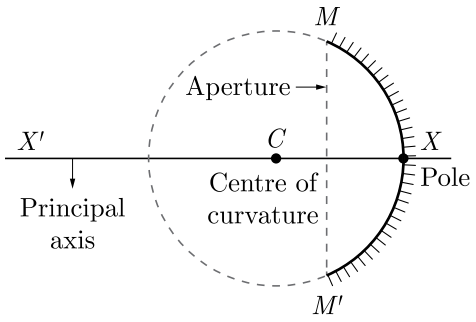
Image of an object formed by a plane mirror is virtual and erect, same size as the object, as much behind the mirror as the object is placed in front of it and is laterally inverted.

6.4 SPHERICAL MIRROR

It is a mirror whose reflecting surface is a part of a hollow sphere of the glass. A spherical mirror whose reflecting surface is curved inwards is called a concave mirror. A spherical mirror whose reflecting surface is curved outwards is called a concave mirror.

A spherical mirror whose reflecting surface is curved outwards is called a convex mirror.

1. In a spherical mirror, the centre point of the reflecting surface is 'pole' (P).
2. The centre of curvature (C) of a spherical mirror is the centre of hollow glass sphere, of which the given mirror is a part. The radius of curvature ($R = PC$) of the given mirror is defined as the radius of the sphere, of which the reflecting surface of the mirror forms a part.



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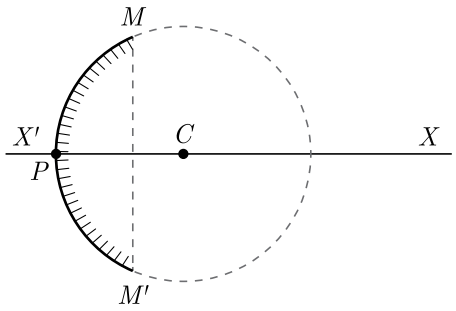

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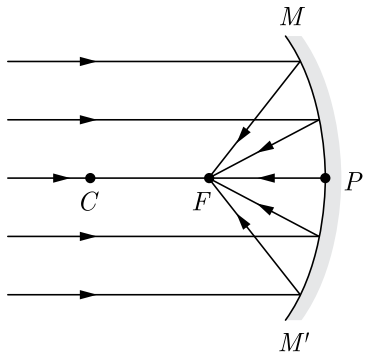
3. Principal axis is the line passing through pole P and centre of curvature C of a mirror. The diameter of reflecting surface of a spherical mirror is called its aperture.
4. The principal focus (F) of a spherical mirror is a point on its principal axis where light rays travelling parallel to the principal axis of the mirror, after reflection, actually meet (in concave mirror) or appear to meet (in convex mirror). Principal focus of a concave mirror is a real point situated in front of the mirror and of a convex mirror is a virtual point situated behind it.
5. The distance between pole P and principal focus F of a spherical mirror is focal length (f), i.e., $PF = f$. For a spherical mirror,

$$f = \frac{R}{2}$$
$$R = 2f$$



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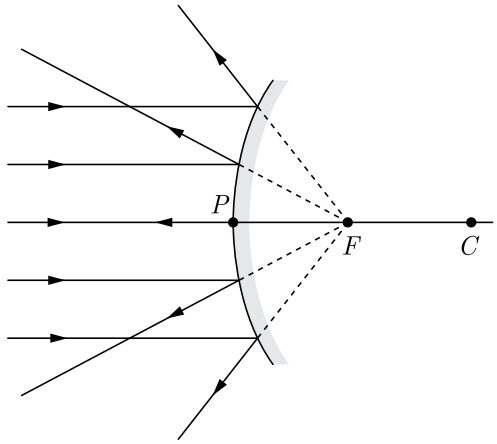

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6. Focal plane is a plane passing through principal focus and normal to the principal axis of a mirror.
7. The position, nature and relative size of image formed by a concave mirror depend upon the position of the object situated in front of the mirror as shown in the following table.

Formation of image by a concave mirror for different positions of the object

	Position of the object	Position of the image	Relative size of the image	Nature of the image
1.	At infinity	At the focus (F)	Highly diminished (point-sized)	Real and inverted
2.	Beyond C	Between F and C	Diminished	Real and inverted

	Position of the object	Position of the image	Relative size of the image	Nature of the image
3.	At C	At C	Same size as the object	Real and inverted
4.	Between C and F	Beyond C	Enlarged	Real and inverted
5.	At F	At infinity	Highly enlarged	Real and inverted
6.	Between P and F	Behind the mirror	Enlarged	Virtual and erect

8. A convex mirror forms a virtual, erect and diminished image of an object situated in front of it as shown in the following table.

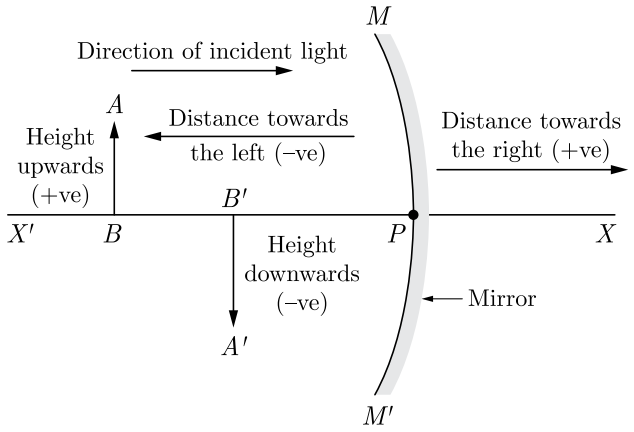
Formation of image by a convex mirror for different positions of the object

	Position of the object	Position of the image	Relative size of the image	Nature of the image
1.	An infinity	Behind the mirror at the focus F	Highly diminished (point-sized)	Virtual and erect
2.	Between infinity and pole P of the mirror	Behind the mirror between P and F	Diminished	Virtual and erect

9. Concave mirrors are used as shaving and make-up mirrors to see a large-sized erect image of the face. They are used as reflectors in torches, searchlights and headlights of vehicles to get powerful parallel beam of light. They are used by dentists to see large images of a patient's teeth. Eye and ENT specialists also use these mirrors to focus light coming from a lamp onto the eye, ear, nose, throat, etc., of a patient in order to examine better. They are used to concentrate the sun's radiation to a point in a solar furnace.
10. Convex mirrors are used as driver's mirrors in vehicles in order to have a wider field of view for traffic coming from behind. They are also used as reflectors in hilly areas at sharp turns and as shop security mirrors in large shopping halls and malls.

6.5 SIGN CONVENTION

According to new Cartesian sign convention for mirrors, all distances are measured from the pole of the mirror and object is always situated to the left of the mirror. Pole is considered as origin for measuring distances along principal axis. All distances measured to the right of origin along the principal axis are taken positive and to the left of origin are taken negative.



Along a direction perpendicular to principal axis, distances measured above the principal axis are taken positive but below the principle axis are taken negative.

6.6 MIRROR FORMULA

If object distance $= u$, image distance $= v$ and focal length $= f$, then according to mirror formula, we have

$\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$ or $\frac{2}{R}$, where $R=$ Radius of curvature of the mirror

On putting numerical values of $u, v\, f$ or R, proper sign must be used according to sign convention.

6.7 LINEAR MAGNIFICATION

The ratio of height of the image (h') to the height of the object (h) is linear magnification

of an object, i.e.,

$$m = \frac{h'}{h} = \frac{v}{u}$$

Linear magnification is negative for real image but positive for virtual image. If image is magnified, $m > 1$ and if diminished, $m < 1$.

For plane mirror, $m = +1$.

6.8 REFRACTION OF LIGHT

It is the phenomenon of the change in direction/ bending of a ray of light incident obliquely at the interface of two different transparent media.

1. When light travels from optically denser medium to rarer medium, it bends away from normal.
2. When light travels from optically rarer medium to denser medium, it bends towards the normal.

6.8.1 Laws of Refraction

Two important laws of refraction are as follows:

1. The incident ray, the refracted ray and the normal to the interface of two media at the point of incidence, all lie in the same plane.
2. The ratio of sine of angle of incidence ($\sin i$) to the sine of angle of refraction($\sin r$) is a constant for light of a given colour or wavelength and for a given pair of media. This law is called Snell's law of refraction.
   As per the law,

$$\frac{\sin i}{\sin r} = \text{a constant} = (n_{21}) \text{ (Refractive index of med. 2 w.r.t. med. 1)}$$

6.9 REFRACTIVE INDEX OF A MEDIUM

The ratio of speed of light in vacuum (or air) to speed of light in the given medium is called refractive index of a medium.

Refractive index,

$$n = \frac{\text{Speed of light in vacuum (air)}}{\text{Speed of light in the given medium}} = \frac{c}{v}$$

It is a unit-less quantity and its numerical value is 1 or greater than 1. For vacuum and air, $n = 1$.

1. If a light ray is refracted from medium 1 to medium 2, then refractive index of medium 2 w.r.t. medium 1 (n_{21}) is defined as the ratio of speed of light in medium 1 (v_1) to speed of light in medium 2 (v_2).
   So, refractive index of medium 2 w.r.t. medium 1,

$$n_{21} = \frac{v_1}{v_2}$$

   or $$n_{21} = \frac{v_1}{v_2} = \frac{n_2}{n_1}$$

   Therefore, $$n_{12} = \frac{1}{n_{21}}$$

2. Relative refractive index of one medium w.r.t. another medium too is a unit-less quantity and its numerical value may be equal to 1 or greater than 1 or even less than 1.
3. The refractive index of vacuum is called absolute refractive index.
4. If a ray of light is refracted through a rectangular glass slab, the angle of emergence is same as angle of incidence. Hence, emergent ray travels in a direction parallel to that of incident ray.
   But, the ray suffers a lateral displacement whose value is based on (i) thickness of the glass slab, (ii) refractive index of the glass slab, and (iii) angle of incidence. For angle of incidence ($\angle i$) $= 0^\circ$, the lateral displacement is also zero (0).
5. Due to refraction of light, a pencil immersed in water in a glass tumbler appears to be displaced at water-air interface. When a glass slab is placed over some printed matter, words appear raised up when observed or seen through the glass slab.
6. If a coin is placed at the bottom of a tumbler filled with water, the apparent depth of the coin appears to be less than its true depth because of refraction of light.
   Therefore,

$$\frac{\text{Real depth } (h)}{\text{Apparent depth } (h')} = \text{Refractive index}$$

of water (n_w)

For similar reason, a pond of water appears to be shallower.

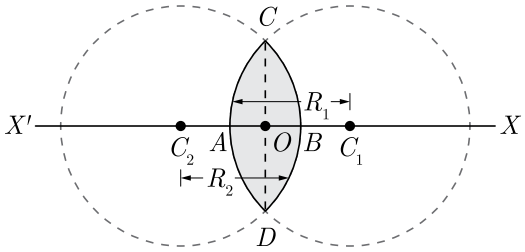
6.10 LENS

Is is a part of refracting material, i.e., glass, bound by two non-parallel surfaces, of which either both or one surface is spherical.

A lens thicker at the middle and thinner at the edges is known as a convex (converging) lens.

A lens thicker at the edges and thinner at the middle is known as a concave (diverging) lens.

1. A lens contains two centres of curvature and two radii of curvature as shown in the figure.



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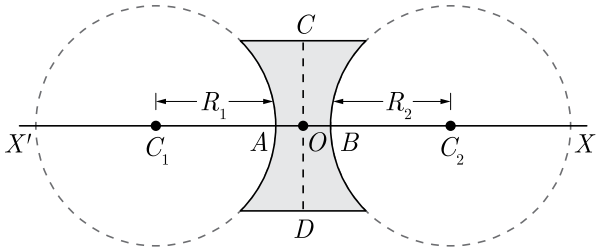

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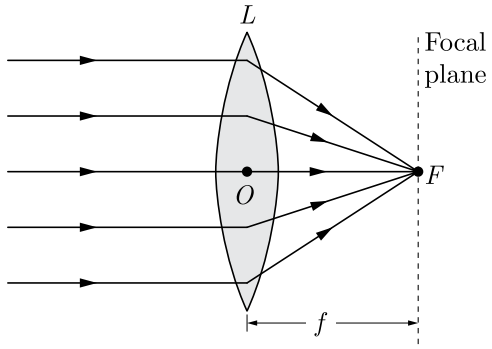
2. Principal axis is a line passing through two centres of curvature of a lens.
3. The optical centre of a lens is the point on its principal axis, a ray of light passing through which goes undeviated. It is the centre of the lens.
4. A point where a light beam travelling parallel to the principal axis of the lens, after refraction, actually meets in convex lens or appears to be diverged from in concave lens is called principal focus (F) of the lens. As, in a lens, parallel beam of light may be incident on any of its two surfaces having two principal foci F_1 and F_2, placed symmetrically on two sides of a lens.



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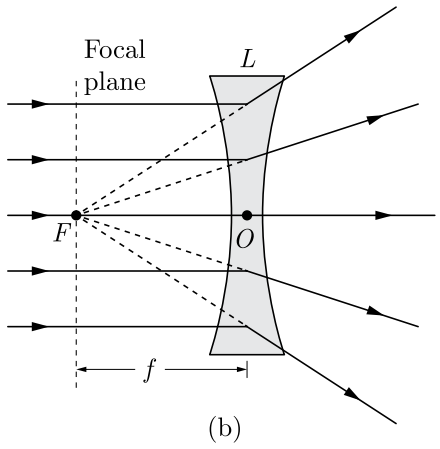


(b)

5. Focal length (f) is the distance of principal focus from optical centre of a lens.
6. Focal plane is a plane passing through principal focus and perpendicular to the principal axis of a lens.

The position, nature and size of the image formed by a convex lens are based upon the position of the object placed in front of the lens as mentioned in the following table.

Formation of image by a convex lens for different positions of the object

	Position of the object	Position of the image	Relative size of the image	Nature of the image
1.	At infinity	At focus F_2	Highly diminished (point-sized)	Real and inverted
2.	Beyond $2F_1$	Between F_2 and $2F_2$	Diminished	Real and inverted
3.	At $2F_1$	At $2F_2$	Same size as the object	Real and inverted
4.	Between F_1 and $2F_1$	Beyond $2F_2$	Enlarged	Real and inverted
5.	At focus F_1	At infinity	Infinitely large (highly enlarged)	Real and inverted
6.	Between focus F_1 and optical centre O	On the same side of the lens as the object	Enlarged	Virtual and erect

7. A concave lens always forms a virtual, erect and diminished image of the object on the same side of the lens as mentioned in the following table:

Formation of image by a concave lens for different positions of the object

	Position of the object	Position of the image	Relative size of the image	Nature of the image
1.	An infinity	At focus F_1	Highly diminished (point-sized)	Virtual and erect
2.	Between infinity and optical O of the lens	Behind focus F_1 and optical centre O	Diminished	Virtual and erect

8. Lenses are used in spectacles, different optical instruments such as microscope, telescope, photographic camera, film projector, etc.

The sign convention for lenses is same as that for mirrors except the optical centre of the lens which is taken to be the origin point. If object distance $= u$, image distance $= v$ and focal length $= f$, then from the lens formula, we have

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

9. For a linear object placed normal to the principal axis of a spherical lens, linear magnification of a lens is stated as follows:

Linear magnification of a lens,

$$m = \frac{\text{Height of the } (h')}{\text{Height of the object } (h)}$$

$$= \frac{\text{Distance of the image } (v)}{\text{Distance of the object } (u)}$$

Linear magnification is negative for a real image but positive for a virtual image.

6.11 POWER OF A LENS

It is a measure of its degree of convergence or divergence of light rays incident on it. It is also defined as reciprocal of its focal length.

Power of a lens,

$$(P) = \frac{1}{\text{Focal length of the lens (in metre)}}$$

$$= \frac{1}{f(\text{in m})}$$

The SI unit of power of a lens is dioptre (D), where $1\,\text{D} = 1\,\text{m}^{-1}$.

The power of convex lens is taken positive but power of concave lens is taken negative.

1. When two or more thin lenses of powers $P_1, P_2, P_3, ...$ are brought in contact, then

Combined power,

$$P = P_1 + P_2 + P_3 + ...$$

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3} + ...$$

□□□□□□□

MULITIPLE CHOICE QUESTIONS

1. What is the frequency of violet colour of wavelength 4000 Å?
(a) 7.5×10^{10} Hz
(b) 7.5×10^{12} Hz
(c) 7.5×10^{14} Hz
(d) 3.75×10^{16} Hz

Sol : www.cbse.site/sc/gm101

2. What is the frequency of red colour of wavelength 8000 Å?
(a) 3.75×10^{14} Hz
(b) 3.75×10^{12} Hz
(c) 3.75×10^{16} Hz
(d) none of these

Sol : www.cbse.site/sc/gm102

3. The refractive index of glass is 3/2. The velocity of light in glass is
(a) 3×10^8 m/s
(b) 2×10^8 m/s
(c) 10^8 m/s
(d) 1.33×10^8 m/s

Sol : www.cbse.site/sc/gm103

4. The radius of curvature of a spherical mirror is 20 cm. the focal length of mirror is-
(a) 10 cm
(b) 20 cm
(c) 30 cm
(d) 40 cm

Sol : www.cbse.site/sc/gm104

5. A concave mirror produces three times magnified (enlarged) real image of an object placed at 10 cm in front of it. Where is the image located?
(a) 30 cm
(b) 40 cm
(c) −30 cm
(d) −40 cm

Sol : www.cbse.site/sc/gm105

6. Light enters from air to glass having refractive index 1.50. The speed of light in vacuum is 3×10^8 ms^{-1}. The speed of light in the glass is-
(a) 2×10^8ms^{-1}
(b) 3×10^8ms^{-1}
(c) 4×10^4ms^{-1}
(d) 5×10^5ms^{-1}

Sol : www.cbse.site/sc/gm106

7. A convex lens forms a real and inverted image of a needle at a distance of 50 cm from it. Where is the needle placed in front of the convex lens if the image is equal to the size of the object?
(a) 0.25 m
(b) 0.30 m
(c) 0.35 m
(d) 0.40 m

Sol : www.cbse.site/sc/gm107

8. The power of a concave lens of focal length

of 2 m is-
(a) 0.5 D
(b) −0.5 D
(c) 1 D
(d) −1 D

Sol : www.cbse.site/sc/gm108

9. Which one of the following materials cannot be used to make a lens?
(a) Water
(b) Glass
(c) Plastic
(d) Clay

Sol : www.cbse.site/sc/gm109

10. The image formed by a concave mirror is observed to be virtual, erect and larger than the object. Where should be the position of the object?
(a) Between the principal focus and the centre of curvature
(b) At the centre of curvature
(c) Beyond the centre of curvature
(d) Between the pole of the mirror and its principal focus.

Sol : www.cbse.site/sc/gm110

11. Where should an object is placed in front of a convex lens to get a real image of the size of the object?
(a) At the principal focus of the lens
(b) At twice the focal length
(c) At infinity
(d) Between the optical centre of the lens and its principal focus.

Sol : www.cbse.site/sc/gm111

12. A spherical mirror and a thin spherical lens have each a focal length of −15 cm. The mirror and the lens are likely to be-
(a) both concave
(b) both convex
(c) the mirror is concave and the lens is convex
(d) the mirror is convex, but the lens is concave

Sol : www.cbse.site/sc/gm112

13. No matter how far you stand from a mirror, your image appears erect. The mirror is likely to be-
(a) Plane
(b) Concave
(c) Convex
(d) Either plane or convex

Sol : www.cbse.site/sc/gm113

14. Which of the following lenses would you prefer to use while reading small letters found in a dictionary?
(a) A convex lens of focal length 50 cm.
(b) A convex lens of focal length 50 cm.
(c) A convex lens of focal length 5 cm.
(d) A concave lens of focal length 5 cm.

Sol : www.cbse.site/sc/gm114

15. A concave lens of focal length 15 cm forms as image 10 cm from the lens. How far is the object placed from the lens?
(a) −20 cm
(b) 40 cm
(c) −30 cm
(d) −40 cm

Sol : www.cbse.site/sc/gm115

16. An object is placed at a distance of 10 cm

from a convex mirror of focal length 15 cm. the position of the image is-

(a) 6 cm
(b) 9 cm
(c) 8 cm
(d) 7 cm

Sol : www.cbse.site/sc/gm116

17. An object 5.0 cm in length is placed at a distance of 20 cm in front of a convex mirror or radius of curvature 30 cm. The position of the image is-

(a) 8.57 cm
(b) 9.10 cm
(c) 8.15 cm
(d) 7.15 cm

Sol : www.cbse.site/sc/gm117

18. An object of size 7.0 cm is placed at 27 cm in front of a concave mirror of focal length 18 cm. At what distance from the mirror should a screen be placed, so that a sharp focussed image can be obtained?

(a) 54 cm
(b) 60 cm
(c) -54 cm
(d) -60 cm

Sol : www.cbse.site/sc/gm118

19. The focal length of a lens of power -2.0 D is-

(a) -50 cm
(b) 40 cm
(c) 50 cm
(d) -40 cm

Sol : www.cbse.site/sc/gm119

20. A doctor has prescribed a corrective lens of power $+1.5$ D. The focal length of the lens is-

(a) 67 cm
(b) 70 cm
(c) 40 cm
(d) 65 cm

Sol : www.cbse.site/sc/gm120

21. The angle between incident ray and reflected ray is 60°. What is the angle of incidence?

(a) 30°
(b) 40°
(c) 60°
(d) 50°

Sol : www.cbse.site/sc/gm121

22. When an incident ray makes an angle of 40° with a normal to the air glass interface of the rectangular glass slab. The value of angle of emergence is-

(a) 30°
(b) 60°
(c) 90°
(d) 40°

Sol : www.cbse.site/sc/gm122

23. The speed of light in a transparent medium is 0.6 times that of its speed in vacuum. The refractive index of the medium is:

(a) 1.66
(b) 1.96
(c) 1.26
(d) 1.29

Sol : www.cbse.site/sc/gm123

24. The focal length of a convex mirror is 12.5 cm. How far is its centre of curvature

from the pole?
(a) 25 cm
(b) 30 cm
(c) 40 cm
(d) 50 cm

Sol : www.cbse.site/sc/gm124

25. An object is placed at a distance of 30 cm from a convex mirror, the magnification produced is $\frac{1}{2}$. Where should the object be placed to get the magnification of $\frac{1}{3}$?
(a) -60 cm
(b) 40 cm
(c) 50 cm
(d) 60 cm

Sol : www.cbse.site/sc/gm125

26. An object is kept in front of a concave mirror of focal length 20 cm. The image is three times the size of the object. The possible distances of the object from the mirror is-
(a) $\frac{-80}{3}$
(b) $\frac{-40}{3}$
(c) $\frac{-50}{3}$
(d) $\frac{-10}{3}$

Sol : www.cbse.site/sc/gm126

27. A ray of light falls normally on the surface of a transparent glass slab. The angle of emergence is-
(a) 0°
(b) 90°
(c) 45°
(d) 70°

Sol : www.cbse.site/sc/gm127

28. A ray of light is refracted as per the following diagram. Which of the following medium is optically denser?
(a) Medium A
(b) Medium B
(c) Cannot be identify
(d) Both medium are denser

Sol : www.cbse.site/sc/gm128

29. In an experiment with a rectangular glass slab, a student observed that a ray of light incident at an angle of 55° with the normal on one face of the slab, after refraction strikes the opposite face of the slab before merging out into air making an angle of 40° with the normal. What value would you assign to the angle of refraction and angle of emergence?
(a) 40°, 55°
(b) 55°, 40°
(c) 10°, 20°
(d) 40°, 90°

Sol : www.cbse.site/sc/gm129

30. With respect to air, the refractive index of ice is 1.31 and that of rock salt is 1.54. the refractive index of rock salt with respect to ice is-
(a) 1.25
(b) 1.18
(c) 1.90
(d) 1.40

Sol : www.cbse.site/sc/gm130

31. The refractive index of a medium 'x' with respect to 'y' is $\frac{2}{3}$ and the refractive index of medium 'y' with respect to 'z' is $\frac{4}{3}$. The refractive index of medium 'z' with respect of 'x' is-

(a) $\frac{2}{9}$
(b) $\frac{9}{8}$
(c) $\frac{1}{3}$
(d) $\frac{5}{6}$

Sol : www.cbse.site/sc/gm131

32. For the same angle of incidence in media P, Q and R, the angles of refraction are 45°, 35° and 15° respectively. In which medium will the velocity of light be minimum?
(a) P
(b) Q
(c) R
(d) Q and R

Sol : www.cbse.site/sc/gm132

33. When light enters from air to glass, the angles of incidence and refraction in air and glass are 45° and 30° respectively. The refractive index of glass is (Given that $\sin 45^\circ = \frac{1}{\sqrt{2}}$, $\sin 30^\circ = \frac{1}{2}$)
(a) 1.90
(b) 1.41
(c) 1.20
(d) 1.55

Sol : www.cbse.site/sc/gm133

34. Two thin lenses of power $+3.5\,\text{D}$ and $-2.5\,\text{D}$ are placed in contact. The power of the lens combination is-
(a) $+1\,\text{D}$
(b) $+1.5\,\text{D}$
(c) $+2.5\,\text{D}$
(d) $+2\,\text{D}$

Sol : www.cbse.site/sc/gm134

35. A convex lens of focal length 25 cm and a concave lens of focal length 10 cm are placed in close contact with each other. The power of this combination is-
(a) 2 D
(b) 6 D
(c) $-6\,\text{D}$
(d) 9 D

Sol : www.cbse.site/sc/gm135

36. The power of a combination of two lenses XY is 5 D if the focal length of lens X is 15 cm. The focal length of lens Y is-
(a) 60 cm
(b) -60 cm
(c) 50 cm
(d) -10 cm

Sol : www.cbse.site/sc/gm136

37. A student wants to project the image of a candle flame on a screen 80 cm in front of a mirror by keeping the candle flame at a distance of 20 cm from its pole. The magnification of the image produced is-
(a) -4
(b) -2
(c) -6
(d) -1

Sol : www.cbse.site/sc/gm137

38. A 4.5 cm needle is placed 12 cm away from a convex mirror of focal length 15 cm. The location of the image is-
(a) 6.7 cm
(b) 4.5 cm
(c) 9.2 cm
(d) 5 cm

Sol : www.cbse.site/sc/gm138

39. If the speed of light in vacuum is 3×10^8 m/s, the absolute refractive index of a medium in which light travels with a speed of 1.4×10^8 m/s is
(a) 2.14
(b) 3.14
(c) 4.15
(d) 1.14

Sol : www.cbse.site/sc/gm139

40. An object of height 6 cm is placed perpendicular to the principal axis of a concave lens of focal length 5 cm. If the distance of the object from the lens is 10 cm. The position of image is:
(a) $\frac{10}{3}$ cm
(b) $\frac{-10}{3}$ cm
(c) $\frac{20}{3}$ cm
(d) $\frac{-20}{3}$ cm

Sol : www.cbse.site/sc/gm140

41. An object of height 5 cm is placed perpendicular to the principal axis of a concave lens of focal length 10 cm. If the distance of the object from the optical centre of the lens is 20 cm, the size of the image is-
(a) 1.66 cm
(b) 2.16 cm
(c) 1.69 cm
(d) 2.91 cm

Sol : www.cbse.site/sc/gm141

42. The image of a candle flame placed at a distance of 30 cm from a spherical lens is formed on a screen placed on the other side of the lens at distance of 60 cm from the optical centre of the lens. The focal length of lens is-
(a) 40 cm
(b) 30 cm
(c) 50 cm
(d) 20 cm

Sol : www.cbse.site/sc/gm142

43. A 6 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 15 cm. The distance of the object from the lens is 10 cm. The position, of the image is-
(a) 20 cm
(b) 30 cm
(c) −30 cm
(d) 50 cm

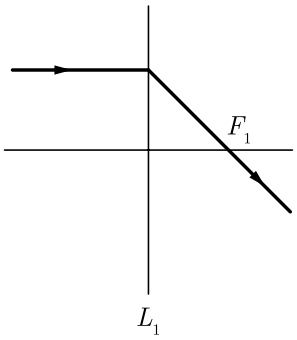
Sol : www.cbse.site/sc/gm143

44. A convex lens has a focal length of 10 cm. At what distance from the lens should the object be placed so that it forms a real and inverted image 20 cm away from the lens?
(a) −20 cm
(b) −40 cm
(c) −60 cm
(d) −80 cm

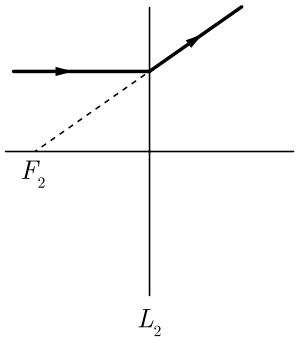
Sol : www.cbse.site/sc/gm144

45. The following figures show the path of light rays through three lenses marked L_1, L_2 and L_3 and their focal points F_1, F_2 and F_3 respectively.

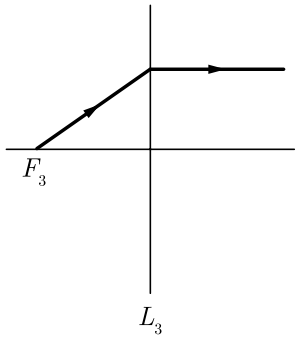
(i)



(ii)



(iii)



Which of the following diagram shows the concave lens properties?

(a) (i)
(b) (ii)
(c) (iii)
(d) (i), (ii)

Sol : www.cbse.site/sc/gm145

46. Consider the following statements about refraction of light :

1. The incident ray, refracted ray and the normal ray lie in the same plane.
2. The angle of incidence is equal to the angle of refraction.

Choose the correct option from the codes given below:

(a) Only 1
(b) Only 2
(c) Both 1 and 2
(d) Neither 1 nor 2

Sol : www.cbse.site/sc/gm146

Ans : (a) Only 1

According to the first laws of refraction of light are :
"The incident ray, the refracted ray and the normal to the interface of two transparent media at the point of incidence, all lie in the same plane".
According to the law of refraction the ratio of sine of angle of incidence to the sine of angle of refraction is constant, for the light of a given colour and for the given pair of media. This law is also known as Snell's law of refraction.

47. Which of the following are correctly matched for the concave mirror?

	Object	**Image**
1.	Between P and F	at infinity
2.	At C	at C
3.	Beyond C	between F and C
4.	At infinity	at focus

Choose the correct option from the codes given below :

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

Sol : www.cbse.site/sc/gm147

48. As light travels from a rarer to a denser medium it will have
(a) increased velocity
(b) decreased velocity
(c) decreased wavelength
(d) both (b) and (c)

Sol : www.cbse.site/sc/gm148

49. The correct order of refractive index of various materials is :
(a) Diamond > Ice > Alcohol > Rock salt
(b) Ice > Diamond > Rock salt > Alcohol
(c) Diamond > Rock salt > Alcohol > Ice
(d) Rock salt > Alcohol > Ice > Diamond

Sol : www.cbse.site/sc/gm149

50. A full length of a distant tall building can definitely be seen by using
(a) a concave mirror
(b) a convex mirror
(c) a plane mirror
(d) both concave as well as plane mirror

Sol : www.cbse.site/sc/gm150

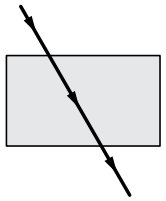
51. In torches, search light and headlights of vehicles the bulb is placed
(a) Between the pole and focus of the reflector
(b) Very near to the focus of the reflector
(c) Between the focus and centre of curvature of the reflector
(d) At the centre of curvature of the reflector

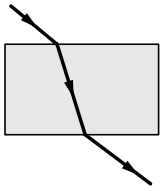
Sol : www.cbse.site/sc/gm151

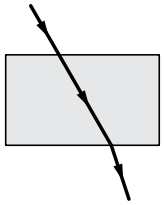
52. The laws of reflection hold good for:
(a) plane mirror only
(b) concave mirror only
(c) convex mirror only
(d) All mirrors irrespective of their shape.

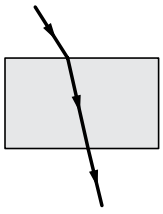
Sol : www.cbse.site/sc/gm152

53. The path of a ray of light coming from air passing through a rectangular glass slab traced by four students are shown in figure. Which one of them is correct?

(a) 

(b) 

(c) 

(d) 

Sol : www.cbse.site/sc/gm153

54. You are given water, mustard oil, glycerine and kerosene. In which of these media, a ray of light incident obliquely at same angle

would bend the most?

(a) Kerosene

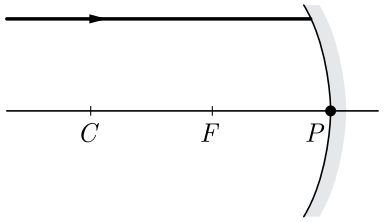
(b) Water

(c) Mustard oil

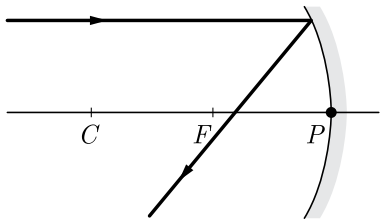
(d) Glycerine

Sol : www.cbse.site/sc/gm154

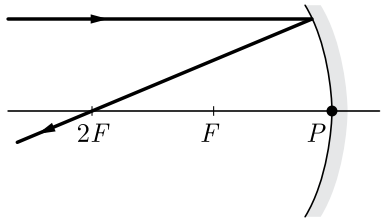
55. Which of the following ray diagrams is correct for the ray of light incident on a concave mirror as shown in Figure?



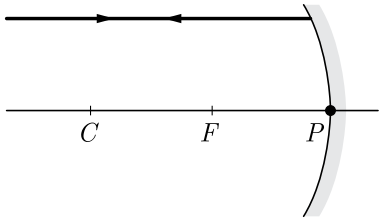
(a)



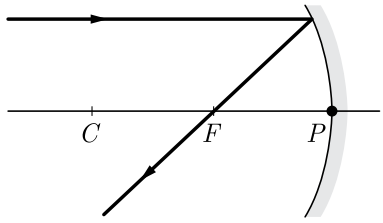
(b)



(c)

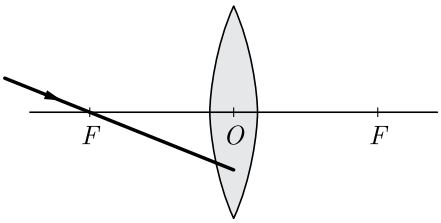


(d)

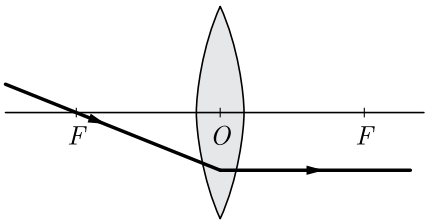


Sol : www.cbse.site/sc/gm155

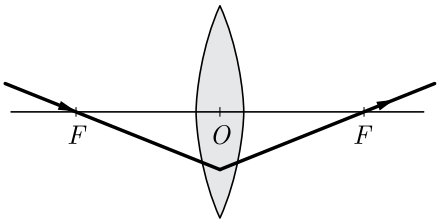
56. Which of the following ray diagrams is correct for the ray of light incident on a lens shown in Figure?



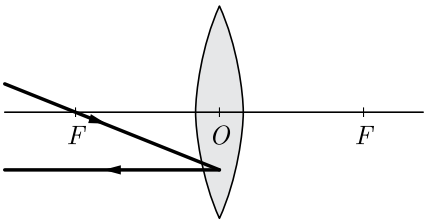
(a)



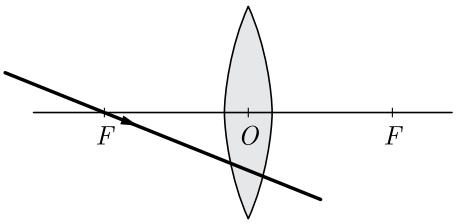
(b)



(c)



(d)



Sol : www.cbse.site/sc/gm156

57. A child standing in front of a magic mirror.

She finds the image of her head bigger, the middle portion of her body of the same size and that of the legs smaller. The following is the order of combinations for the magic mirror from the top.

(a) Plane, convex and concave
(b) Convex, concave and plane
(c) Concave, plane and convex
(d) Convex, plane and concave

Sol : www.cbse.site/sc/gm157

58. In which of the following, the image of an object placed at infinity will be highly diminished and point sized?

(a) Concave mirror only
(b) Convex mirror only
(c) Convex lens only
(d) Concave mirror, convex mirror, concave lens and convex lens

Sol : www.cbse.site/sc/gm158

59. A thin layer of water is transparent but a very thick layer of water is:

(a) translucent
(b) opaque
(c) most transparent
(d) none of these

Sol : www.cbse.site/sc/gm159

60. Air is not visible because it

(a) is nearly a perfectly transparent
(b) neither absorbs nor reflects light
(c) transmits whole of light
(d) all of the above are correct

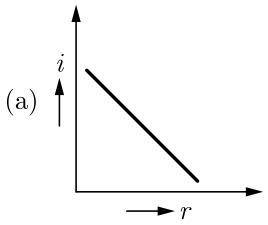
Sol : www.cbse.site/sc/gm160

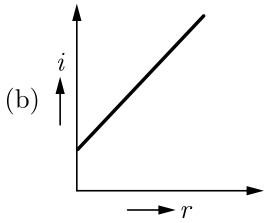
61. According to laws of reflection of light

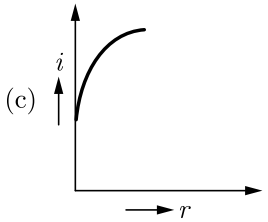
(a) Angle of incidence is equal to the angle of reflection
(b) Angle of incidence is less than the angle of reflection
(c) Angle of incidence is greater than the angle of reflection
(d) None of these

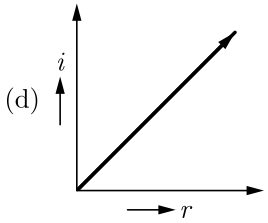
Sol : www.cbse.site/sc/gm161

62. Which of the following correctly represents graphical relation between angle of incidence (i) and angle of reflection (r)?

(a) 

(b) 

(c) 

(d) 

Sol : www.cbse.site/sc/gm162

63. A concave mirror of focal length f (in air)

is immersed in water ($\mu = 4/3$). The focal length of the mirror in water will be-

(a) f

(b) $\frac{4}{3}f$

(c) $\frac{3}{4}f$

(d) $\frac{7}{3}f$

Sol : www.cbse.site/sc/gm163

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

(a) Water

(b) Oil

(c) Both

(d) None of these

Sol : www.cbse.site/sc/gm164

65. For a real object, which of the following can produce a real image

(a) Plane mirror

(b) Concave lens

(c) Convex mirror

(d) Concave mirror

Sol : www.cbse.site/sc/gm165

66. If an object is placed 10 cm infront 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

(d) Enlarged, upright, real

Sol : www.cbse.site/sc/gm166

67. While using an electric bulb, the reflection for street lighting should be from

(a) Concave mirror

(b) Convex mirror

(c) Cylindrical mirror

(d) Parabolic mirror

Sol : www.cbse.site/sc/gm167

68. A convex mirror is used to form the image of an object. Then which of the following statement 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

Sol : www.cbse.site/sc/gm168

69. Image formed by convex mirror is-

(a) Virtual

(b) Real

(c) Enlarged

(d) Inverted

Sol : www.cbse.site/sc/gm169

70. The field of view is maximum for

(a) Plane mirror

(b) Concave mirror

(c) Convex mirror

(d) Cylindrical mirror

Sol : www.cbse.site/sc/gm170

71. The image of the moon is formed by a concave mirror whose radius of curvature is 4.8 m at a time when distance from the moon is 2.4×10^8 m. If the diameter of the image is 2.2 cm, the diameter of the moon is-

(a) 1.1×10^6 m

(b) 2.2×10^6 m

(c) 2.2×10^8 m
(d) 2.2×10^{10} m

Sol : www.cbse.site/sc/gm171

72. The focal length of a concave mirror is f and the distance of the object from the principal focus is a. The magnitude of magnification obtained will be-
(a) $(f+a)/f$
(b) f/a
(c) $\sqrt{f}/\sqrt{a}$
(d) f^2/a^2

Sol : www.cbse.site/sc/gm172

73. The magnification produced by a concave mirror-
(a) is always more than one
(b) is always less than one
(c) is always equal to one
(d) may be less than or greater than one

Sol : www.cbse.site/sc/gm173

74. The ratio of the refractive index of red light to blue light in air is-
(a) Less than unity
(b) Equal to unity
(c) Greater than unity
(d) Less as well as greater than unity depending upon the experimental arrangement

Sol : www.cbse.site/sc/gm174

75. When light travels from one medium to the other of which the refractive index is different, then which of the following will change
(a) Frequency, wavelength and velocity
(b) Frequency and wavelength
(c) Frequency and velocity
(d) Wavelength and velocity

Sol : www.cbse.site/sc/gm175

76. A beam of light propagating in medium A with index of reflection $n(A)$ passes across an interface into medium B with index of refraction $n(B)$. The angle of incidence is greater than the angle of refraction; $v(A)$ and $v(B)$ denotes the speed of light in A and B. Then which of the following is true
(a) $v(A) > v(B)$ and $n(A) > n(B)$
(b) $v(A) > v(B)$ and $n(A) < n(B)$
(c) $v(A) < v(B)$ and $n(A) > n(B)$
(d) $v(A) < v(B)$ and $n(A) < n(B)$

Sol : www.cbse.site/sc/gm176

77. The refractive indices of glass and water w.r.t. air are $\frac{3}{2}$ and $\frac{4}{3}$ respectively. the refractive index of glass w.r.t. water will be :
(a) $\frac{8}{9}$
(b) $\frac{9}{8}$
(c) $\frac{7}{6}$
(d) None of these

Sol : www.cbse.site/sc/gm177

78. An object is immersed in a fluid. In order that the object becomes invisible, it should
(a) Behave as a perfect reflector
(b) Absorb all light falling on it
(c) Have refractive index one
(d) Have refractive index exactly matching with that of the surrounding fluid

Sol : www.cbse.site/sc/gm178

79. When light travels from glass to air, the incident angle is θ_1 and the refracted angle is θ_2. True relation is-

(a) $\theta_1 = \theta_2$

(b) $\theta_1 < \theta_2$

(c) $\theta_1 > \theta_2$

(d) Not predictable

Sol : www.cbse.site/sc/gm179

80. In vacuum the speed of light depends upon

(a) Frequency

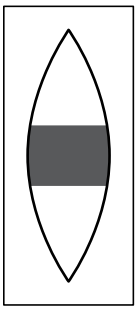
(b) Wavelength

(c) Velocity of the source of light

(d) None of these

Sol : www.cbse.site/sc/gm180

81. If the central portion of a convex lens is wrapped in black paper as shown in the figure



(a) No image will be formed by the remaining portion of the lens

(b) The full image will be formed but it will be less bright

(c) The central portion of the image will be missing

(d) There will be two images each produced by one of the exposed portions of the lens

Sol : www.cbse.site/sc/gm181

82. A boy is standing in front of a plane mirror at a distance of 3 m from it. What is the distance between the boy and his image?

(a) 3 m

(b) 4.5 m

(c) 6 m

(d) None of these

Sol : www.cbse.site/sc/gm182

83. Choose the correct relation between u, v and R for spherical mirrors.

(a) $R = \dfrac{2uv}{u+v}$

(b) $R = \dfrac{2}{u+v}$

(c) $R = \dfrac{2(u+v)}{(uv)}$

(d) None of these

Sol : www.cbse.site/sc/gm183

84. The image formed by a concave mirror is real, inverted and of the same size as that of the object. the position of the object should be :

(a) Beyond C

(b) Between C and F

(c) At C

(d) At F

Sol : www.cbse.site/sc/gm184

85. A lens of focal power 0.5 D is:

(a) A convex lens of focal length 0.5 m

(b) A concave lens of focal length 0.5 m

(c) A convex lens of focal length 2 m

(d) A concave lens of focal length 2 m

Sol : www.cbse.site/sc/gm185

86. Where should an object be placed in front

of a convex lens to get a real image of the size of the object?

(a) At the principle focus of the lens
(b) At twice focal length
(c) At infinity
(d) Between the optical centre of the lens and its principle focus

Sol : www.cbse.site/sc/gm186

87. A spherical mirror and a thin spherical lens each has a focal length of $-15\,\text{cm}$. The mirror and the lens are likely to be-

(a) Both concave
(b) Both convex
(c) The mirror is concave and lens is convex
(d) The mirror is convex, but the lens is concave

Sol : www.cbse.site/sc/gm187

88. A ray of light incident on a plane mirror makes an angle of 20° with the mirror. Then the angle between the incident ray and the reflected ray is-

(a) 70°
(b) 90°
(c) 120°
(d) 140°

Sol : www.cbse.site/sc/gm188

89. A ray of light incident normally on the mirror, retraces its path on reflection. Which of the following is true?

(a) $\angle i = \angle r = 90^\circ$
(b) $\angle i + \angle r = 90^\circ$
(c) $\angle i - \angle r = 0^\circ$
(d) $\angle i = \angle r = 0^\circ$

Sol : www.cbse.site/sc/gm189

90. The inner shining surface of a steel spoon serves as a

(a) Plane mirror
(b) Concave mirror
(c) Convex mirror
(d) Any one of the above

Sol : www.cbse.site/sc/gm190

91. Which type of mirror is used by ENT specialists as a 'head mirror'?

(a) Plane mirror
(b) Convex mirror
(c) Concave mirror
(d) None of these

Sol : www.cbse.site/sc/gm191

92. When linear magnification is negative, the image formed by a concave mirror must be-

(a) erect
(b) virtual
(c) real or virtual
(d) real and inverted

Sol : www.cbse.site/sc/gm192

93. In a convex mirror, focus (F) and centre of curvature (C) of the mirror lie

(a) behind the mirror
(b) in front of the mirror
(c) on the mirror
(d) nothing can be decided

Sol : www.cbse.site/sc/gm193

94. A ray of light falls on a plane mirror making an angle of 30° with normal. On deviation, the ray of light deviates through an angle of

(a) 120°

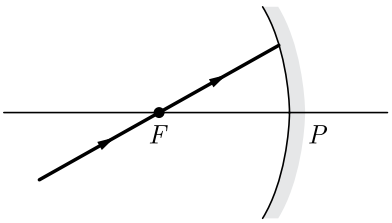
(b) 140°
(c) 160°
(d) 180°

Sol : www.cbse.site/sc/gm194

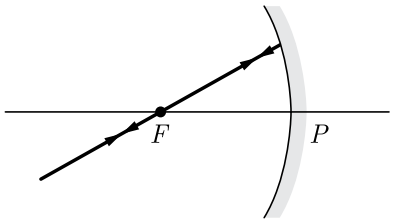
95. The magnification of a concave mirror is -1. it implies that
(a) the object must be at the focus of the concave mirror
(b) the image formed is virtual
(c) the image formed is erect
(d) none of these

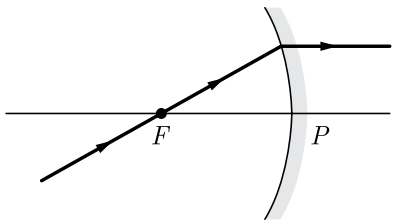
Sol : www.cbse.site/sc/gm195

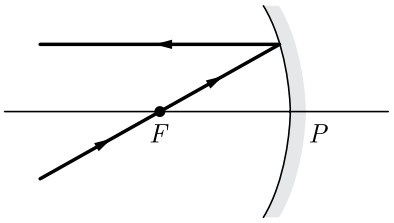
96. An incident ray strikes a concave mirror after passing through the focus (F) as shown in the figure.

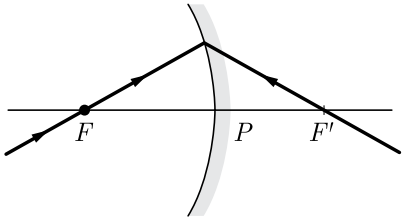


Which of the following shows the correct path of reflected rays?

(a)


(b)


(c)


(d)


Sol : www.cbse.site/sc/gm196

97. The magnification of a spherical mirror is ± 2. Then the mirror must be
(a) Plane
(b) Concave
(c) Convex
(d) Any one of these

Sol : www.cbse.site/sc/gm197

98. A full length image of a distant tall building can definitely be seen by using
(a) a concave mirror
(b) a convex mirror
(c) a plane mirror
(d) both concave as well as plane mirror

Sol : www.cbse.site/sc/gm198

99. Magnification produced by a rear view mirror fitted in vehicles
(a) is less than one
(b) is more than one
(c) is equal to one
(d) can be more than or less than one depending upon the position of the object in front of it.

Sol : www.cbse.site/sc/gm199

100. SI unit of radius of curvature of a concave mirror is

(a) $-m$

(b) m^{-1}

(c) m

(d) None of these

Sol : www.cbse.site/sc/gm200

101. The rays from the sun converge at a point 25 cm in front of a concave mirror. Where should an object be kept so that size of its image is equal to size of the object?

(a) 12.5 cm in front of the mirror

(b) 25 cm in front of the mirror

(c) 50 cm in front of the mirror

(d) between 25 cm and 30 cm in front of the mirror

Sol : www.cbse.site/sc/gm201

102. A student has to do the experiment on finding the focal length of a given concave mirror by using a distant object. Out of the following set ups 1, 2, 3, 4 available to her.

1. a screen, a mirror holder and a scale.
2. a mirror holder, a screen holder and a scale.
3. a screen holder and a scale.
4. a mirror holder and a screen holder.

The set up that is likely to give her the best result is the set-up labelled as:

(a) 1

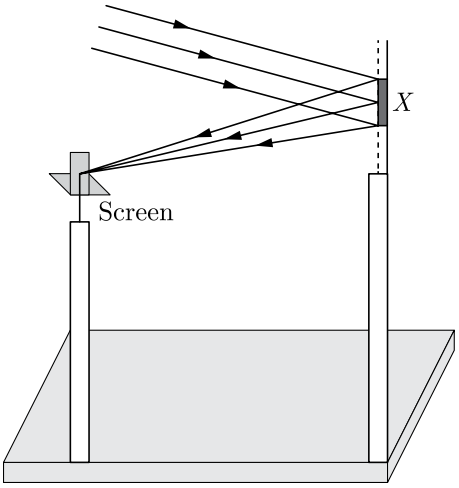
(b) 2

(c) 3

(d) 4

Sol : www.cbse.site/sc/gm202

103. A student determines the focal length of a device X, by focusing the image of a far off object on the screen positioned as shown in figure The device X is a



(a) Convex lens

(b) Concave lens

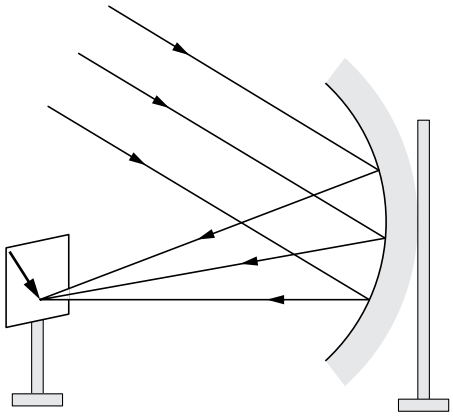
(c) Convex mirror

(d) Concave mirror

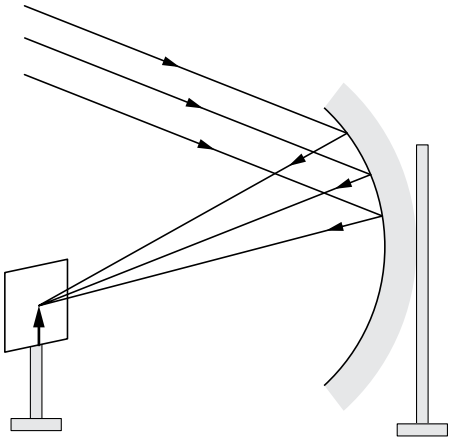
Sol : www.cbse.site/sc/gm203

104. Parallel rays from the top of a distant object, incident on a concave mirror form an image on the screen. The diagram correctly showing the image of the object on the screen in figure is:

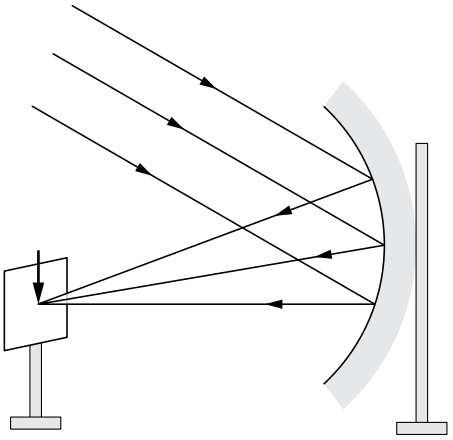
(a)



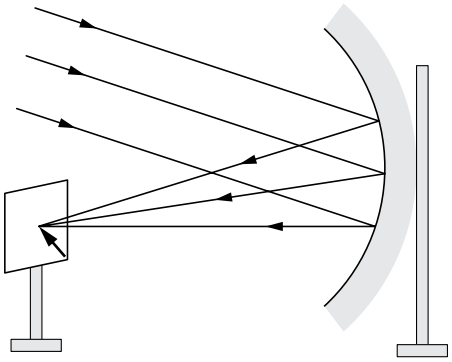
(b)



(c)



(d)



Sol : www.cbse.site/sc/gm204

105. Hold a concave mirror with its shining surface towards the sun. Take a sheet of paper and hold it in front of the mirror. Take the sheet of paper away from the mirror gradually till a sharp, bright spot appears on the paper. The sharp, bright spot is due to-

(a) reflection of light
(b) refraction of light
(c) scattering of light
(d) diffraction of light

Sol : www.cbse.site/sc/gm205

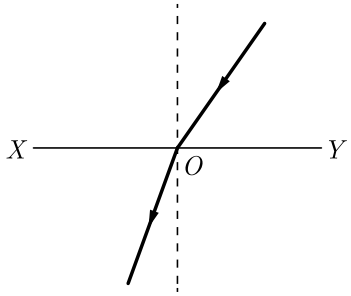
106. A convex lens of focal length 20 cm is placed in contact with a concave lens of focal length 10 cm. The power of the combination is-

(a) 10 dioptre
(b) -10 dioptre
(c) -5 dioptre
(d) 5 dioptre

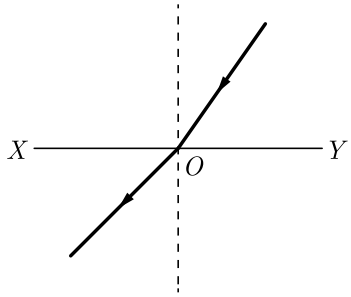
Sol : www.cbse.site/sc/gm206

107. Which of the following figures shows refraction of light while going from denser to rarer medium?

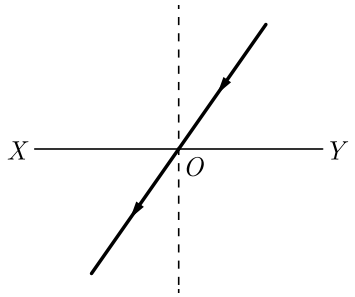
(a)



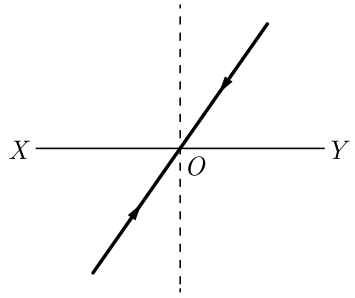
(b)



(c)

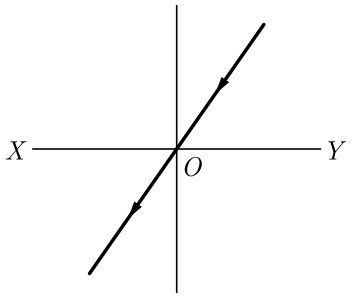


(d)

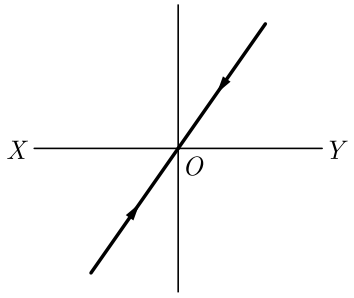


Sol : www.cbse.site/sc/gm207

(c)



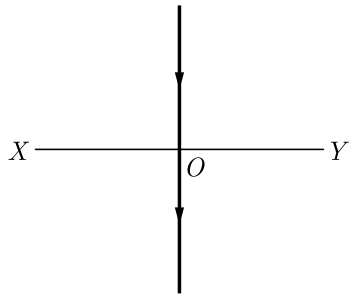
(d)



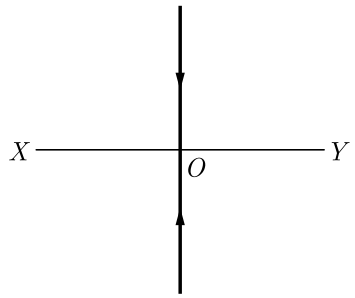
Sol : www.cbse.site/sc/gm208

108. Which of the following figures shows no refraction of light when it is incident normally on a boundary of two media?

(a)

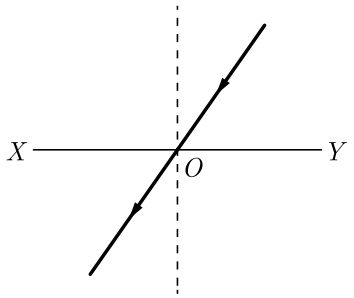


(b)

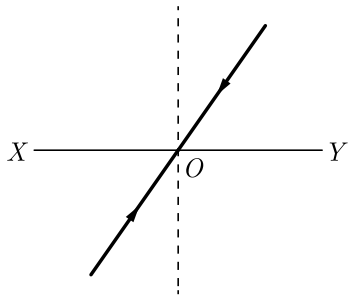


109. No refraction occurs at the boundary that separates two media of equal refractive indices. Which of the following figures shows such type of refraction?

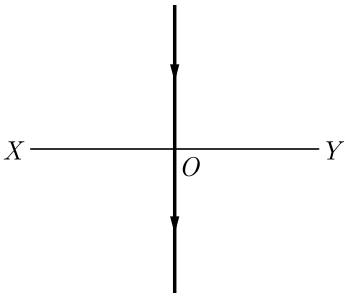
(a)



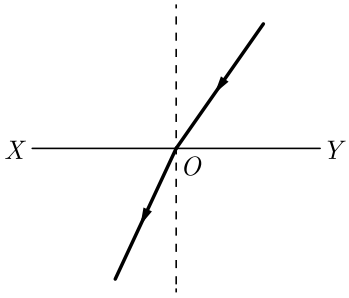
(b)



(c)



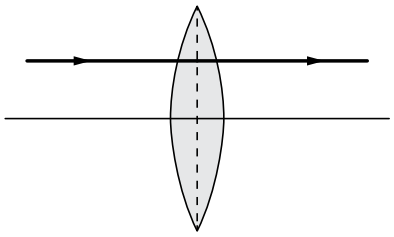
(d)



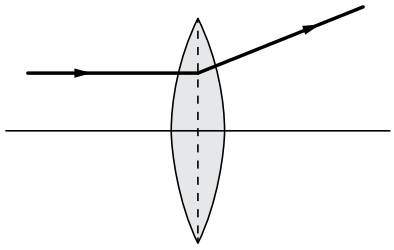
Sol : www.cbse.site/sc/gm209

110. Which of the following correctly shows refraction of a ray of light from a convex lens?

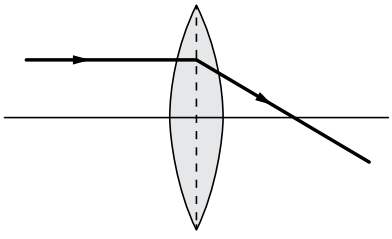
(a)



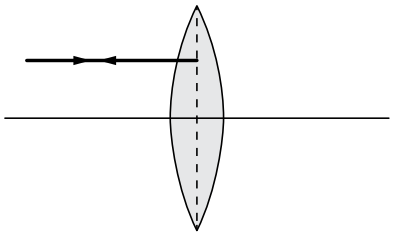
(b)



(c)



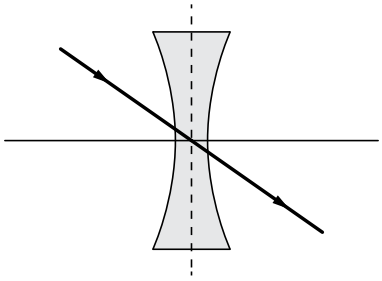
(d)



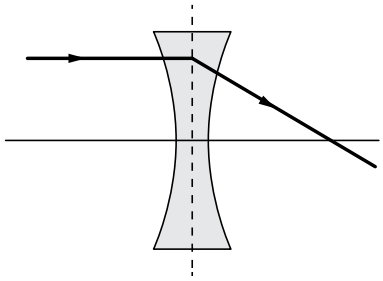
Sol : www.cbse.site/sc/gm210

111. Which of the following correctly shows refraction of a ray of light from a concave lens?

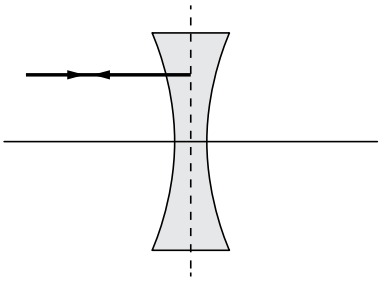
(a)



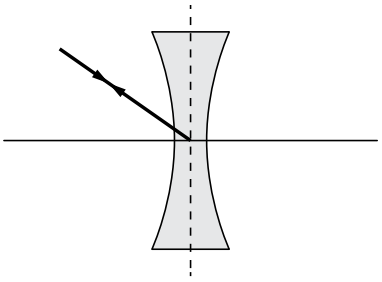
(b)



(c)



(d)



Sol : www.cbse.site/sc/gm211

112. The focal length of a combination of convex lens of power 1 D and concave lens of power -1.5 D is-

(a) -2 m
(b) 2 m
(c) 2.5 m
(d) 0.5 m

Sol : www.cbse.site/sc/gm212

113. SI unit of power is-

(a) metre
(b) watt
(c) kilowatt
(d) dioptre

Sol : www.cbse.site/sc/gm213

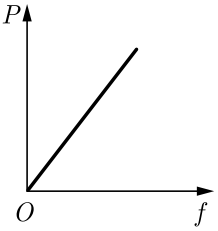
114. Does the focal length of a lens change on changing the object distance?

(a) Yes, always
(b) Yes, sometimes
(c) No, never
(d) Cannot say

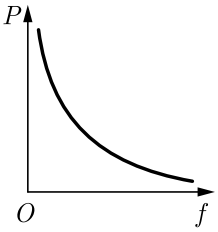
Sol : www.cbse.site/sc/gm214

115. Which of the following graphs shows correct variation between the power (P) of a converging lens and its focal length (f)?

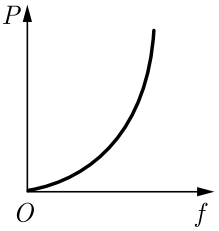
(a)



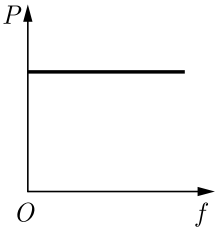
(b)



(c)



(d)



Sol : www.cbse.site/sc/gm215

116. Given below are a few steps (not in proper sequence) followed in the determination of focal length of a given convex lens by obtaining a sharp image of a distant object-

A. Measure the distance between the lens and screen.
B. Adjust the position of the lens to form a sharp image.
C. Select a suitable distant object.
D. Hold the lens between the object and the screen with its faces parallel to the screen the correct sequence of steps for determination of focal length is:

(a) C, A, D, B
(b) C, D, B, A
(c) C, A, B, D
(d) A, B, C, D

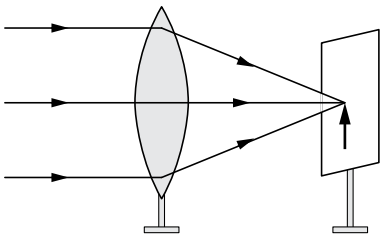
Sol : www.cbse.site/sc/gm216

117. A student obtains a blurred image of an object on a screen by using a convex lens. In order to obtain a sharp image of the same object on the screen, he will have to shift the lens
(a) to a position very far away from the screen.
(b) little away from the screen.
(c) towards the screen.
(d) either towards or away from the screen depending upon the position of the object.

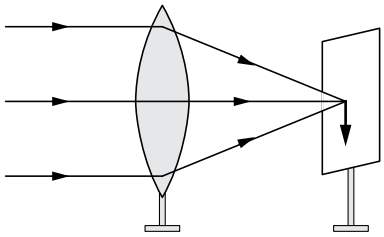
Sol : www.cbse.site/sc/gm217

118. Parallel rays from a distant object incident on a convex lens form an image on the screen. The diagram showing correctly the image of the object on the screen in figure is :

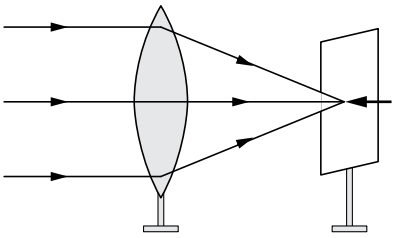
(a)



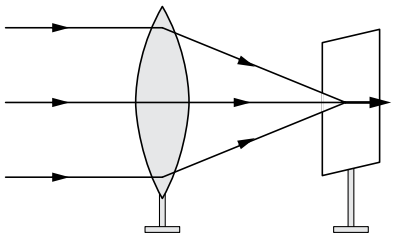
(b)



(c)



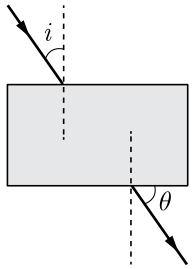
(d)



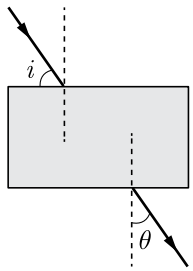
Sol : www.cbse.site/sc/gm218

119. A student does the experiment on tracing the path of a ray of light passing through a rectangular glass slab for different angles of incidence. He can get a correct measure of the angles of incidence and the angle of emergence by following the labelling indicated in figure.

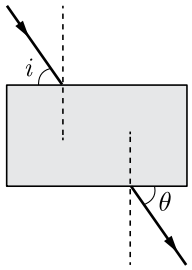
(a)



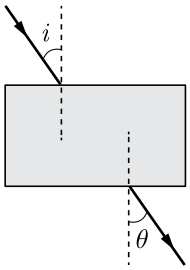
(b)



(c)

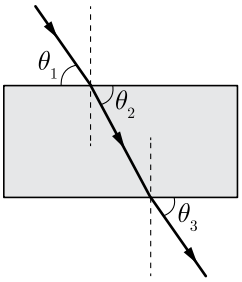


(d)



Sol : www.cbse.site/sc/gm219

120. A student, while doing the experiment on tracing the path of ray of light passing through a rectangular glass slab, measured the three angles marked as θ_1, θ_2 and θ_3 in figure. His measurements could be correct if he were to find :

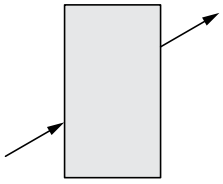


(a) $\theta_1 < \theta_2 < \theta_3$
(b) $\theta_1 < \theta_2$, but $\theta_1 = \theta_3$
(c) $\theta_1 > \theta_2 > 3$
(d) $\theta_1 > \theta_2$ but $\theta_2 = \theta_3$

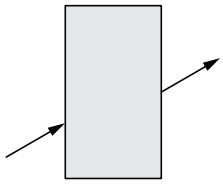
Sol : www.cbse.site/sc/gm220

121. Four students showed the following traces of the path of a ray of light passing through a rectangular glass slab.
The trace most likely to be correct is that of student :

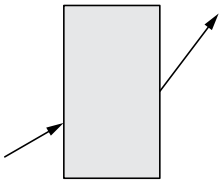
(a)



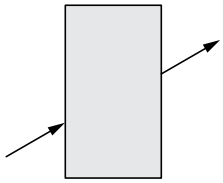
(b)



(c)



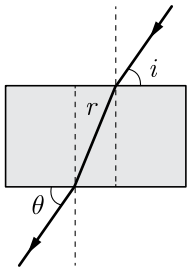
(d)



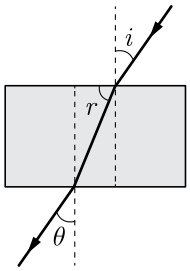
Sol : www.cbse.site/sc/gm221

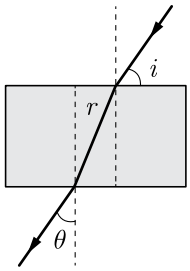
122. The path of a ray of light passing through a rectangular glass slab was traced and angles measured. Which one out of the following is the correct representation of an angle of incidence i, angle of refraction r and angle of emergence e as shown in the diagrams?

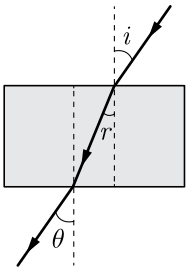
(I)



(II)



(III) 

(IV) 

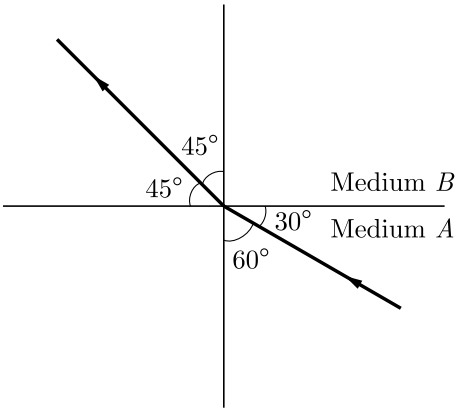
(a) I
(b) II
(c) III
(d) IV

Sol : www.cbse.site/sc/gm222

123. Which of the following can make a parallel beam of light when light from a point source is incident on it?
(a) Concave mirror as well as convex lens.
(b) Convex mirror as well as concave lens.
(c) Two plane mirrors placed at 90° to each other.
(d) Concave mirror as well as concave lens.

Sol : www.cbse.site/sc/gm223

124. Figure shows a ray of light as it travels from medium A to medium B. Refractive index of the medium B relative to medium A is-



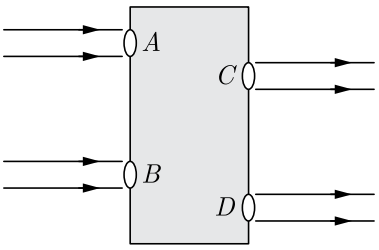
(a) $\frac{\sqrt{3}}{\sqrt{2}}$
(b) $\frac{\sqrt{2}}{\sqrt{3}}$
(c) $\frac{1}{\sqrt{2}}$
(d) $\sqrt{2}$

Sol : www.cbse.site/sc/gm224

125. A light ray enters from medium A to medium B as shown in figure. The refractive index of medium A relative to B will be-
(a) greater than unity
(b) less than unity
(c) equal to unity
(d) zero

Sol : www.cbse.site/sc/gm225

126. Beams of light are incident through the holes A and B and emerge out of box through the holes C and D respectively as shown in figure. Which of the following could be inside the box?

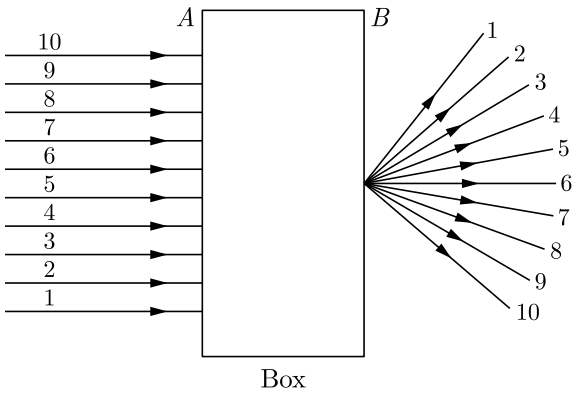


(a) A rectangular glass slab
(b) A convex lens
(c) A concave lens
(d) A prism

Sol : www.cbse.site/sc/gm226

127. A beam of light is incident through the holes on side A and emerges out of the holes on the other face of the box as shown in figure. Which of the following could be

inside the box?



(a) Concave lens
(b) Rectangular glass slab
(c) Prism
(d) Convex lens

Sol : www.cbse.site/sc/gm227

128. In which of the following, the image of an object placed at infinity will be highly diminished and point-sized?
(a) Concave mirror only
(b) Convex mirror only
(c) Convex lens only
(d) Concave mirror, convex mirror, concave lens and convex lens

Sol : www.cbse.site/sc/gm228

129. An object is at a distance of 0.5 m in front of a plane mirror. Distance between the object and image is-
(a) 0.5 m
(b) 1 m
(c) 0.25 m
(d) 1.5 m

Sol : www.cbse.site/sc/gm229

130. A watch shows time as 3.25. When seen through a mirror, the time will appear to be
(a) 8.35
(b) 9.35
(c) 7.35
(d) 8.25

Sol : www.cbse.site/sc/gm230

131. 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°

Sol : www.cbse.site/sc/gm231

132. A Convex mirror has a focal length f. A real object placed at a distance f in front of it from the pole produces an image at
(a) infinity
(b) f
(c) $\frac{f}{2}$
(d) $2f$

Sol : www.cbse.site/sc/gm232

133. The minimum distance between the object and its real image for a concave mirror is-
(a) f
(b) $2f$
(c) $4f$
(d) zero

Sol : www.cbse.site/sc/gm233

134. A plane glass slab is kept over various coloured letters. The letter, which appears

least raised, is-
(a) blue
(b) violet
(c) green
(d) red

Sol : www.cbse.site/sc/gm234

135. If the rays constituting the beam actually meet at a point or appear to meet at a point, then the beam is:
(a) divergent
(b) convergent
(c) parallel
(d) equal

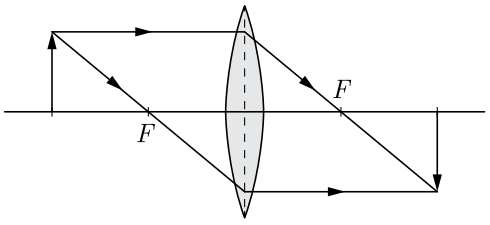
Sol : www.cbse.site/sc/gm235

136. What is the power of a concave lens whose focal length is -75.0 cm?
(a) 1.33 D
(b) -13.3 D
(c) 13.3 D
(d) -1.33 D

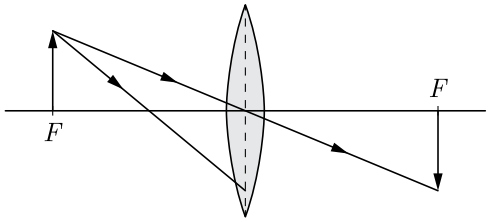
Sol : www.cbse.site/sc/gm236

137. Which of the following ray diagram is correct?

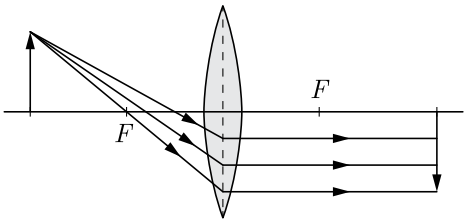
(a)



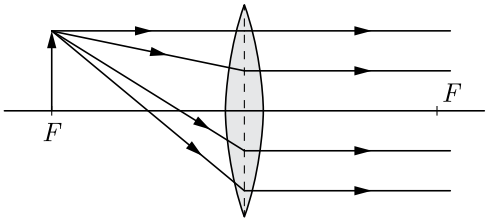
(b)



(c)



(d)



Sol : www.cbse.site/sc/gm237

138. A concave lens always gives a virtual image. In optical lenses worn by humans which of the following statements is true?
(a) The lens can never be concave.
(b) In some cases the lens can be concave if the focal length is much larger than 2.5 cm.
(c) All focal length concave lenses are possible.
(d) All focal length convex lenses are possible.

Sol : www.cbse.site/sc/gm238

139. Amount of light entering into the camera depends upon:
(a) focal length of objective lens.
(b) product of focal length and diameter of objective lens.
(c) distance of objective form camera.
(d) aperture setting of the camera.

Sol : www.cbse.site/sc/gm239

140. When sun rays are focussed with a convex lens, a sharp, bright spot is observed at its

focus. What does this spot indicate?
(a) The real image of the sun.
(b) The virtual image of the sun.
(c) An optical illusion produced by the convex lens.
(d) The magnified image of the sun.

Sol : www.cbse.site/sc/gm240

141. A convex lens has a focal length of 0.5 m. It has to combined with a second lens, so that the combination has a power of 1.5 dioptre. Which of the following could be the second lens?
(a) A concave lens of focal length 2 m.
(b) Another convex lens of focal length 0.5 m.
(c) A convex lens of focal length 0.5 m.
(d) A convex lens of focal length 2 m.

Sol : www.cbse.site/sc/gm241

142. When a ray of light enters a glass slab its wavelength
(a) decreases
(b) increases
(c) remains unchanged
(d) data are not complete

Sol : www.cbse.site/sc/gm242

143. When light travels from one medium to another which of the following factors changes?
(a) Wavelength
(b) Frequency
(c) Amplitude
(d) None of these

Sol : www.cbse.site/sc/gm243

144. The radius of curvature of plane mirror is
(a) infinite
(b) zero
(c) +5 cm
(d) −5 cm

Sol : www.cbse.site/sc/gm244

145. If a glass rod is immersed in a liquid of the same refractive index, then it will
(a) disappear
(b) look bent
(c) look longer
(d) look shorter

Sol : www.cbse.site/sc/gm245

146. An object is immersed in a fluid. In order that the object becomes invisible, it should
(a) have refractive index one
(b) absorb all light falling on it
(c) behave as a perfect reflector
(d) have refractive index exactly matching with that of the surrounding fluid

Sol : www.cbse.site/sc/gm246

147. A beam of light composed of red and green rays is incident obliquely at a point on the face of a rectangular glass slab. When coming out on the opposite parallel face, the red and green rays emerge from
(a) one point propagating in the same direction.
(b) one point propagating in two different directions.
(c) two points propagating in two different parallel directions.
(d) two points propagating in two different non-parallel directions.

Sol : www.cbse.site/sc/gm247

148. Light appears to travel in a straight line, because
(a) frequency of light is very small
(b) wavelength of light is very small
(c) light consists of very small particles
(d) velocity is different for different colours

Sol : www.cbse.site/sc/gm248

149. The velocity of light in vacuum can be changed by changing
(a) amplitude
(b) frequency
(c) wavelength
(d) medium

Sol : www.cbse.site/sc/gm249

150. The velocity of light is maximum in a medium of
(a) glass
(b) water
(c) vacuum
(d) diamond

Sol : www.cbse.site/sc/gm250

151. A man runs towards a mirror with a speed of 15 m-s^{-1}. What is the speed of his image ?
(a) 7.5 m-s^{-1}
(b) 15 m-s^{-1}
(c) 30 m-s^{-1}
(d) 45 m-s^{-1}

Sol : www.cbse.site/sc/gm251

152. The light reflected by a plane mirror will form a real image
(a) under no circumstances.
(b) if object is placed close to the mirror.
(c) if rays incident on mirror are parallel.
(d) if rays incident on mirror are converging.

Sol : www.cbse.site/sc/gm252

153. When two converging lenses of same focal length f are placed in contact, the focal length of the combination is
(a) f
(b) $2f$
(c) $\frac{f}{2}$
(d) $3f$

Sol : www.cbse.site/sc/gm253

154. A plane mirror produces a magnification of
(a) 0
(b) -1
(c) $+1$
(d) between 0 and $+1$

Sol : www.cbse.site/sc/gm254

155. If a ray of light is incident on a plane mirror at an angle of 30°, then deviation produced by the plane mirror is
(a) 30°
(b) 60°
(c) 90°
(d) 120°

Sol : www.cbse.site/sc/gm255

156. An object is placed at a distance f in the front of a convex mirror. If focal length of the mirror is f, then distance of image from pole of the mirror is
(a) f
(b) $2f$

(c) $\frac{f}{2}$

(d) $\frac{f}{4}$

Sol : www.cbse.site/sc/gm256

157. The refractive indices of water and glass are 1.2 and 1.5 respectively. What will be the refractive index of glass with respect to water ?

(a) 1.75

(b) 1.25

(c) 0.8

(d) 0.6

Sol : www.cbse.site/sc/gm257

158. The velocity of light in a medium is 2×10^8 m-s^{-1}. Refractive index of the medium is

(a) 1

(b) 1.1

(c) 1.4

(d) 1.5

Sol : www.cbse.site/sc/gm258

159. The power of combination of two lenses of powers $+1.5$ D and -2.5 D is

(a) $+1.5$ D

(b) -2.5 D

(c) -1 D

(d) $+1$ D

Sol : www.cbse.site/sc/gm259

160. A convex lens of focal length 40 cm is in contact with a concave lens of focal length 25 cm. The power of the combination is

(a) -6.5 D

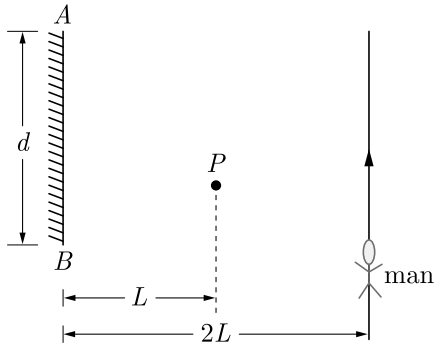
(b) $+6.5$ D

(c) $+6.67$ D

(d) -1.5 D

Sol : www.cbse.site/sc/gm260

161. A point source of light P is placed at a distance L in front 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 $2L$ as shown in the figure. The greatest distance over which he can see the image of the light source, in the mirror, is



(a) $\frac{d}{2}$

(b) d

(c) $2d$

(d) $3d$

Sol : www.cbse.site/sc/gm261

162. If the refractive index of a medium is 1.2, then light will pass through this medium with a velocity of

(a) 2.5×10^8 m -s^{-1}

(b) 3×10^8 m -s^{-1}

(c) 3.6×10^8 m -s^{-1}

(d) 4.8×10^8 m -s^{-1}

Sol : www.cbse.site/sc/gm262

163. A candle placed 25 cm from a lens, forms an image on a screen placed 75 cm on the other end of the lens. The focal length and

type of the lens should be
(a) $+18.75$ cm and convex lens
(b) -18.75 cm and concave lens
(c) $+20.25$ cm and convex lens
(d) -20.25 cm and concave lens

Sol : www.cbse.site/sc/gm263

164. The power of a plane glass is
(a) zero
(b) 1 D
(c) 2 D
(d) infinity

Sol : www.cbse.site/sc/gm264

165. If the power of a lens is $+5$ D, then its focal length is
(a) $+0.2$ cm
(b) -0.2 cm
(c) $+20$ cm
(d) -20 cm

Sol : www.cbse.site/sc/gm265

166. A combination of a concave and convex lens has power 5 D. If the power of convex lens is 4 D, then focal length of the concave lens is
(a) 10 cm
(b) 20 cm
(c) 100 cm
(d) 200 cm

Sol : www.cbse.site/sc/gm266

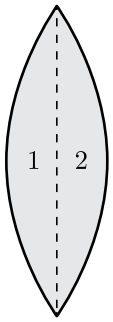
167. If two lenses of power 2 D and 3 D are kept in contact with each other, then focal length of the combination will be
(a) 5 cm
(b) 10 cm
(c) 20 cm
(d) 40 cm

Sol : www.cbse.site/sc/gm267

168. The projection lens of a projector has focal length 5 cm. It is desired to get an image with a magnification 30. The distance of the screen from the lens must be
(a) 0.3 m
(b) 0.8 m
(c) 1.55 m
(d) 2.55 m

Sol : www.cbse.site/sc/gm268

169. A convex lens has a focal length f. It is cut into two parts along the dotted line as shown in the figure. The focal length of each part will be



(a) $\frac{f}{2}$
(b) f
(c) $\frac{3f}{2}$
(d) $2f$

Sol : www.cbse.site/sc/gm269

170. The radius of curvature of concave mirror is 24 cm. Then, the focal length will be
(a) -12 cm
(b) 6 cm
(c) -24 cm

(d) -6 cm

Sol : www.cbse.site/sc/gm270

171. An object is placed 20 cm from the concave mirror of focal length 10 cm, then image is formed at

(a) centre of curvature of mirror
(b) behind the mirror
(c) between the mirror and focus
(d) at focus

Sol : www.cbse.site/sc/gm271

172. Velocity of light in air is 3×10^8 m/s. While its velocity in a medium is 1.5×10^8 m/s. Then, refractive index of this medium is

(a) 3
(b) 5
(c) 0.5
(d) 2

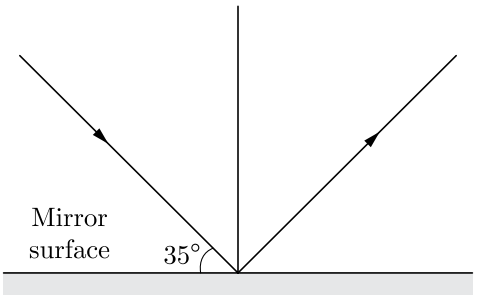
Sol : www.cbse.site/sc/gm272

173. A virtual image three times the size of the object is obtained with a concave mirror of radius of curvature 24 cm. The distance of the object from the mirror is

(a) 20 cm
(b) 10 cm
(c) 12 cm
(d) 5 cm

Sol : www.cbse.site/sc/gm273

174. The angle of incidence and angle of reflection in the following diagram.



(a) 45°, 40°
(b) 55°, 55°
(c) 60°, 60°
(d) 30°, 30°

Sol : www.cbse.site/sc/gm274

175. One light wave is incident upon a plate of refracting index μ. Incident angle i, for which refractive and reflective waves are mutually perpendicular will be

(a) $i = 45^\circ$
(b) $i = \sin^{-1}(\mu)$
(c) $i = \text{cosec}^{-1}(\mu)$
(d) $i = \tan^{-1}(\mu)$

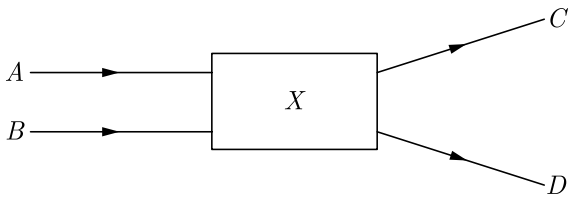
Sol : www.cbse.site/sc/gm275

176. An object is situated at a distance of $f/2$ from a convex lens of focal length f. Distance of image will be

(a) $+(f/2)$
(b) $+(f/3)$
(c) $+(f/4)$
(d) $-f$

Sol : www.cbse.site/sc/gm276

177. Light rays A and B fall on optical component X and come out as C and D.



The optical component is a

(a) concave lens

(b) convex lens

(c) convex mirror

(d) prism

Sol : www.cbse.site/sc/gm277

178. If the refractive indices for water and diamond relative to air are 1.33 and 2.4 respectively, then the refractive index of diamond relative to water is-

(a) .55

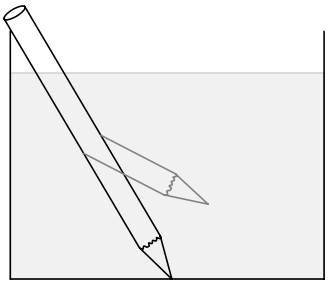
(b) 1.80

(c) 3.19

(d) None of these

Sol : www.cbse.site/sc/gm278

179. Which statement best describes the property of light waves illustrated in the diagram below?



(a) Some materials absorb light waves.

(b) Some materials refracted by some materials.

(c) Light waves are refracted by some materials.

(d) Light waves are emitted by some materials.

Sol : www.cbse.site/sc/gm279

180. **Assertion :** Convex mirror is used as a rear view mirror.
Reason : Convex mirror always forms inverted image.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm280

181. **Assertion :** Refractive indices of all transparent mediums are more than 1 (except air).
Reason : Air is the rarest medium.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm281

182. **Assertion :** When light travels from one medium to another. The direction of propagation of light in second medium changes.
Reason : Light travels with different speeds in different mediums.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm282

183. **Assertion :** Radius of curvature of a spherical minor is half its focal length.
Reason : A ray of light incident parallel to principal axis after reflection passes through C.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm283

184. **Assertion :** After refraction though a rectangular glass slab, emergent ray is parallel to the direction of incident ray.
Reason : Refractive indices of air and glass are different.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm284

185. **Assertion :** Magnification of real images is taken negative.
Reason : Magnification is ratio of image distance and object distance.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm285

186. **Assertion :** On moving from optically rarer to denser medium, a ray of light bends away from the normal.
Reason : Speed of light is more in denser medium and less in rarer medium.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm286

187. **Assertion :** When light from sun is focussed on a sheet of paper using a convex lens, the paper begins to burn producing smoke. It may even catch fire after a while.
Reason : Convex lens is a converging lens.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm287

188. **Assertion :** Power of a convex lens is positive and that of a concave lens is negative.
Reason : Convex lens forms real image and concave lens forms virtual image.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm288

189. **Assertion :** Convex mirror is used as a shaving mirror.
Reason : Convex minor always forms an enlarged image.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm289

190. **Assertion :** A small source of light casts a sharp shadow of an opaque object.
Reason : Light travels in straight lines.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm290

191. **Assertion :** Concave mirror has a real focus.
Reason : Concave mirror always forms real image.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm291

192. **Assertion :** The twinkling of star is due to reflection of light.
Reason : The velocity of light changes while going from one medium to the other.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm292

193. **Assertion :** For observing traffic at our back, we prefer to use a convex mirror.
Reason : A convex mirror has a much larger field of view than a plane mirror or a concave mirror.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are

true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/gm293

194. **Assertion :** A concave mirror of focal length 'f' in air is used in a medium of refractive index 2. Then the focal length of mirror in medium becomes double.
Reason : The radius of curvature of a mirror is double of the focal length.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm294

195. **Assertion :** Large concave mirrors are used to concentrate sunlight to produce heat in solar cookers.
Reason : Concave mirror converges the light rays falling on it to a point.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm295

196. **Assertion :** A ray incident along normal to the mirror retraces its path.
Reason : In reflection, angle of incidence is not equal to angle of reflection.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm296

197. **Assertion :** When a concave mirror is held under water, its focal length will decrease.
Reason : The focal length of a concave mirror is independent of the medium in which it is placed.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Assertion is false but reason is true.

Sol : www.cbse.site/sc/gm297

198. **Assertion :** Plane mirror may form virtual image.
Reason : Plane mirror forms virtual image, if objects is real.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm298

199. **Assertion :** An object is placed at a distance of d from a convex mirror of focal length d, its image will form at infinity.
Reason : The distance of image in convex mirror can never be infinity.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but reason is true.

Sol : www.cbse.site/sc/gm299

200. **Assertion :** The mirror used in search lights are concave spherical.
Reason : In concave spherical mirror the image formed is always virtual.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but reason is true.

Sol : www.cbse.site/sc/gm300

201. **Assertion :** For observing traffic at back, the driver mirror is convex mirror.
Reason : A convex mirror has much larger field of view than a plane mirror.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but reason is true.

Sol : www.cbse.site/sc/gm301

202. **Assertion :** Refractive index has no units.
Reason : The refractive index is a ratio of two similar quantities.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but reason is true.

Sol : www.cbse.site/sc/gm302

COMPETENCY BASED QUESTIONS

203. Three students measured the focal length of a convex lens using parallel rays from a distant object. All of them measured the distance between the lens and the inverted image on the screen. Student A saw a sharp image on the screen and labelled the distance as f_1. Student B saw a slightly larger blurred image on the screen and labelled the distance as f_2. Student C saw a slightly smaller blurred image on the screen and labelled at distance as f_3. The relation between the three measurements would not likely be :
(a) $f_1 = f_2 = f_3$
(b) $f_1 < f_2$ and f_3
(c) $f_3 < f_1 < f_2$
(d) $f_1 < f_2$ and $f_1 = f_3$

Sol : www.cbse.site/sc/gm303

Direction For Questions (201-203)

A spherical mirror produces an image of magnification -1 on a screen placed at a distance of 50 cm from the mirror

204. The type of mirror is-
(a) Concave
(b) Convex
(c) Plane convex
(d) None of these

Sol : www.cbse.site/sc/gm304

205. The distance of the image from the object is-
(a) 50 cm
(b) 100 cm
(c) 150 cm
(d) 200 cm

Sol : www.cbse.site/sc/gm304

206. The focal length of the mirror is-
(a) -30 cm
(b) 40 cm
(c) 30 cm
(d) -25 cm

Sol : www.cbse.site/sc/gm304

Direction For Questions (204-208)

A student performs the experiment with a convex lens and he marked the table between image distance (v) and object distance (u).

	Object distance (u) (cm)	**Image distance (v) (cm)**
1	-90	$+18$
2	-60	$+20$
3	-30	$+30$
4	-20	$+60$
5	-18	$+90$
6	-10	$+100$

On the basis of the above table give the answer of following questions.

207. The focal length of the convex lens is:
(a) -15
(b) $+25$
(c) -25
(d) $+15$

Sol : www.cbse.site/sc/gm305

208. In the table which observation is wrong?
(a) S.No. 1
(b) S.No. 4
(c) S.No. 3
(d) S.No. 6

Sol : www.cbse.site/sc/gm305

209. If a convex lens is used to focus sunlight on a paper, where the paper should be placed so that it catches fire.
(a) At 25 cm away from lens
(b) At optical centre of lens
(c) At principal focus.
(d) At centre of curvature

Sol : www.cbse.site/sc/gm305

210. The approximate value of magnification in case of S.No. 4 is
(a) -1
(b) -3
(c) $+4$
(d) $+1$

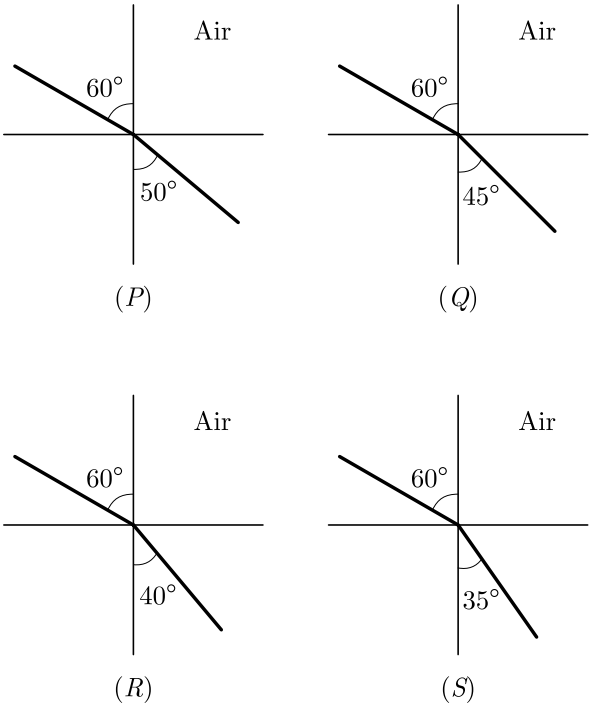
Sol : www.cbse.site/sc/gm305

211. The image formed in case of S.No. 2 is
(a) real and enlarged
(b) real and diminished
(c) virtual and diminished
(d) virtual and enlarged

Sol : www.cbse.site/sc/gm305

Direction For Questions (209-213)

Mohan is performing an experiment with four different optical media, he traced the path of light in different media P, Q, R and S as below:



212. When a light travel from medium P to S it will:
(a) reflect back to medium P
(b) pass straight without bending
(c) bend away from normal
(d) bend towards normal

Sol : www.cbse.site/sc/gm306

213. Which of the following media has maximum optical density?
(a) P
(b) R
(c) S
(d) Q

Sol : www.cbse.site/sc/gm306

214. Through which media, will speed of light be maximum?
(a) Q
(b) R
(c) S
(d) P

Sol : www.cbse.site/sc/gm306

215. Absolute refractive index of medium is maximum in:
(a) P
(b) Q
(c) R
(d) S

Sol : www.cbse.site/sc/gm306

216. Which is correct about absolute refractive index of medium?
(a) $P > Q$
(b) $R = Q$
(c) $S > P$
(d) $P = R$

Sol : www.cbse.site/sc/gm306

Direction For Questions (214-218)

When a beam of light is incident from are homogeneous medium on a shiny surface of other medium, a part of it is returned back into the same medium. The return of light into the some medium after streaking

a surface is called reflection. The law of reflection are following.
Let us recall these laws:
(a) The angle of incidence is equal to the angle of reflation, and
(b) The incident ray, the normal to the mirror at the point of incidence and the reflected ray, all lie in the same plane.
These laws of reflection are applicable to all types of reflecting surfaces including spherical surfaces. You are familiar with the formation of image by a plane mirror. What are the properties of the image? Image formed by a plane mirror is always virtual and erect. The size of the image is equal to that of the object. The image formed is as far behind the mirror as the object is in front of it. Further, the image is laterally inverted.

217. What is magnification produced by the plane mirror if the size of object is 24 cm?
(a) -24
(b) $+24$
(c) -1
(d) $+1$

Sol : www.cbse.site/sc/gm307

218. If the angle of incidence of light on mirror is 30°. The value of angle of reflection is
(a) 30°
(b) 45°
(c) 60°
(d) 90°

Sol : www.cbse.site/sc/gm307

219. The phenomenon of bouncing back of a ray of light after striking to a surface is called ..... .
(a) Dispersion of light
(b) Scattering of light
(c) Refraction of light
(d) Reflection of light

Sol : www.cbse.site/sc/gm307

220. Which of the following shows the phenomenon of reflection?
(a) A concave mirror
(b) A plane mirror
(c) A convex mirror
(d) All of these

Sol : www.cbse.site/sc/gm307

221. What is the formula for magnification obtained with a plane mirror?
(a) Ratio of height of image to height of object.
(b) Inverse of image distance.
(c) Inverse of object distance.
(d) Ratio of height of object to height of image.

Sol : www.cbse.site/sc/gm307

Direction For Questions (219-223)

The ability of a lens to converge or diverge light rays depends on its focal length. For example, a convex lens of short focal length bends the light rays through large angles, by focussing them closer to the optical centre. Similarly, concave lens of very short focal length causes higher divergence than the one with longer focal length. The degree of convergence or divergence of light rays achieved by a lens is expressed in terms of its power. The power of a lens is defined as the reciprocal of its focal length. It is represented by the lefter P. The power P of a lens of focal length f is given by

$$P = \frac{1}{f}$$

The SI unit of power of a lens is 'dioptre'. It

is denoted by the letter D. If f is expressed in metres, then, power is expressed in dioptres. Thus, 1 dioptre is the power of a lens whose focal length is 1 metre. $1\,\text{D} = 1\,\text{m}^{-1}$. The power of a convex lens is positive and that of a concave lens is negative.

222. Which one of the following lens is a converging lens?
(a) Flat lens
(b) Bifocal lens
(c) Convex lens
(d) Concave lens

Sol : www.cbse.site/sc/gm308

223. The power of a diversing lens is 2.0 D. The focal length of lens is:
(a) $+0.5\,\text{m}$
(b) $-50\,\text{cm}$
(c) $+500\,\text{mm}$
(d) $-40\,\text{cm}$

Sol : www.cbse.site/sc/gm308

224. The focal length of a lens is $+40\,\text{cm}$. The power of lens is:
(a) $+5.0\,\text{D}$
(b) $-2.5\,\text{D}$
(c) $+9.5\,\text{D}$
(d) $-9.5\,\text{D}$

Sol : www.cbse.site/sc/gm308

225. The S.I. unit of power of a lens is:
(a) Kwh
(b) Meter
(c) Watt
(d) Dioptre

Sol : www.cbse.site/sc/gm308

226. If the ratio of focal length of two convex lenses is 1 : 5 then what is the ratio of their power?
(a) 1 : 1
(b) 1 : 2
(c) 5 : 1
(d) 3 : l

Sol : www.cbse.site/sc/gm308

Direction For Questions (224-228)

If the position of object in front of the mirror is changed, the size of image changes. If the lengths of the object and image are measured perpendicular to the principle axis, the ratio of length of the image to the length of the object is called linear magnification it is represent by 'm'. The magnification m is also related to the object distance and image distance. It can be expressed as:

Magnification, $\quad m = \dfrac{h'}{h} = -\dfrac{v}{u}$

The height of the object is taken to be positive as the object is usually placed above the principal axis. The height of the image should be taken as positive for virtual images. However, it is to be taken as negative for real images. A negative sign in the value of the magnification indicates that the image is real. A positive sign in the value of the magnification indicates that the image is virtual.

227. The magnification produced by a spherical mirror of an object of 5 cm is 2. The size of the image formed by this spherical mirror will be:
(a) 20 cm
(b) 0.4 cm
(c) 2.5 cm
(d) 10 cm

Sol : www.cbse.site/sc/gm309

228. A concave mirror forms a virtual image of an object placed at a distance 20 cm. If the size of the image is twice of the size of the object then the image will be formed at a distance:
(a) 40 cm
(b) 10 cm
(c) 20 cm
(d) 30 cm

Sol : www.cbse.site/sc/gm309

229. The magnification produced by a spherical mirror is –2. What type of mirror is it?
(a) Either a convex or a concave mirror
(b) A plane mirror
(c) A convex mirror
(d) A concave mirror

Sol : www.cbse.site/sc/gm309

230. An object of size 5 cm is placed at a distance of 20 cm in front of a concave mirror focal length 10 cm. The distance of the image from the mirror and its height will be:
(a) $v = -20$ cm, $h_i = +5$ cm
(b) $v = +30$ cm, $h_i = +5$ cm
(c) $v = +20$ cm, $h_i = +10$ cm
(d) $v = -20$ cm, $h_i = -5$ cm

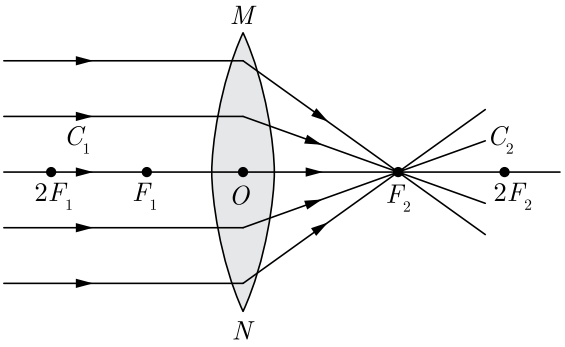
Sol : www.cbse.site/sc/gm309

231. The magnification produced by a spherical mirror is +1/2. The image formed by the mirror will be:
(a) Real, inverted and larger in size.
(b) Virtual, erect and larger in size.
(c) Virtual, erect and larger in size.
(d) Virtual, erect and smaller in size.

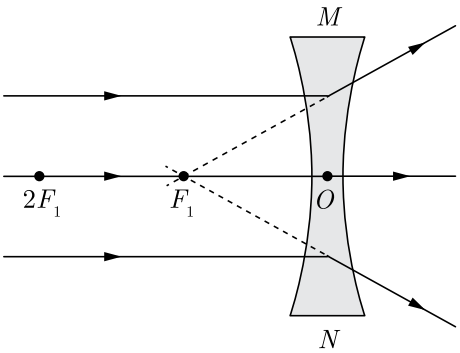
Sol : www.cbse.site/sc/gm309

Direction For Questions (229-233)

Lenses are made of transparent material usually glass, bounded by polished spherical or cylindrical surface. This means that a lens is bound by at least one spherical surface. In such lenses, the other surface would be plane. A lens which is thickes at the middle and thinner at the edge is convex lens. Is also called converging lens. A convex lens is of there types. i.e., biconvex, planoconvex and convexo-concave lens. Similarly. a double concave lens is bounded by two spherical surfaces, curved inwards. It is thicker at the edges than at the middle. Such lenses diverge light rays. Such lenses are called diverging lenses. A double concave lens is simply called a concave lens



(a)



(b)

232. The lens which is also called a diverging lens is:
(a) Plano-convex lens

(b) Convex lens
(c) Concave lens
(d) Plano-concave lens

Sol : www.cbse.site/sc/gm310

233. Which of the following difference is correct between a convex lens and a concave lens?
(a) A convex lens forms both real and virtual images while a concave lens forms only virtual images.
(b) A convex lens is a converging lens while a concave lens is a diverging lens.
(c) A convex lens is thick at the middle and thin at the edges while a concave lens is thin at the middle and thick at the edges.
(d) All of the above

Sol : www.cbse.site/sc/gm310

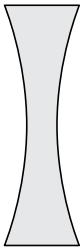
234. A transparent medium bounded by two surfaces, atleast one of them is spherical is called a:
(a) Lens
(b) Telescope
(c) Convex mirror
(d) Concave mirror

Sol : www.cbse.site/sc/gm310

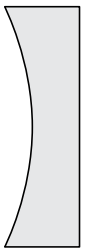
235. Which of the following lens is called a convex lens?
(a) A lens which is bounded by two spherical surfaces
(b) A lens which is thicker at the middle as compared to the edges
(c) A lens which converges light rays
(d) Both (b) and (c)

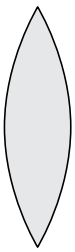
Sol : www.cbse.site/sc/gm310

236. Which of the following lens is a diverging lens?

(a) 

(b) 

(c) 

(d) 

Sol : www.cbse.site/sc/gm310

Direction For Questions (234-238)

Many optical instrument (like compound microscope)having number of lenses which are arranged is same specific manner and it is increases the magnification and sharpness of image which is formed by optical instrument. The net power (P) of the lenses placed in contact is given by the algebraic sum of the individual powers

P_1, P_2, P_3, ... as

$$P = P_1 + P_2 + P_3 + ...$$

The use of powers, instead of focal lengths, for lenses is quite convenient for opticians During eye-testing, an optician puts several different combinations of corrective lenses of known power, in contact, inside the testing spectacles frame. The optician calculates the power of the lens required by simple algebraic addition. For example, a combination of two lenses of power +2.0 D and +0.25 D is equivalent to a single lens of power +2.25 D. The simple additive property of the powers of lenses can be used to design lens systems to minimise certain defects in images produced by a single lens. Such a lens system, consisting of several lenses, in contact, is commonly used in the design of camera lenses and the objectives of microscopes and telescopes.

237. The power of a convex lens is 4.0 D. The focal length of this lens will be:
(a) 0.5 m
(b) 0.25 m
(c) 2.5 m
(d) 5 m

Sol : www.cbse.site/sc/gm311

238. Two lenses of power $\frac{1}{2}$ D and −0.3 D are in contact to each other. Their combined power will be:
(a) + 0.2 D
(b) −0.2 D
(c) + 0.5 D
(d) + 0.8 D

Sol : www.cbse.site/sc/gm311

239. Which of the following instrument consists of a lens system consisting of two or more lenses in contact?
(a) Microscope
(b) Telescope
(c) Camera
(d) All of the above

Sol : www.cbse.site/sc/gm311

240. The focal lengths of two lenses in contact to each other are 20 cm and 50 cm respectively. Their combined power is:
(a) + 7.0 D
(b) + 70 D
(c) + 3.0 D
(d) + 30 D

Sol : www.cbse.site/sc/gm311

241. In many optical instruments, the lenses are combined due to the following reason:
(a) to increase the magnification of the image
(b) to increase sharpness of the image
(c) to get virtual images of the object
(d) Both (a) and (b)

Sol : www.cbse.site/sc/gm311

Direction For Questions (239-243)

Lenses are objects made or transparent materials such as glass or clear plastic that has curved surfaces. Diverging lenses are thicker at their edges than at their centres and make light rays passing through them spread out. Converging lenses are thicker in middle than at edges and make light rays passing through them focus at a point. These are used in spectacles to help people with poor vision see better. The converging lenses magnify by bending the rays or light that pass through them to meet at a point called focus. Thicker the converging lens

is at its centre, the more it magnifies and closer the focus is to the lens.

242. Which relation of powers of lenses are correct?

(a) P_1 is positive and P_2 is negative

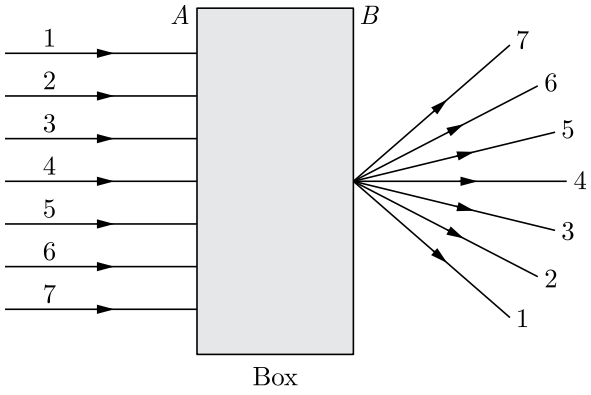
(b) $P_1 > P_2$

(c) $P_1 < P_2$

(d) $P_1 = P_2$

Sol : www.cbse.site/sc/gm312

243. A beam of light is incident on the box through the holes on side A and emerges out of the holes on the other face of the box as shown in the figure.



Which of the following could be inside the box?

(a) Rectangular glass plate

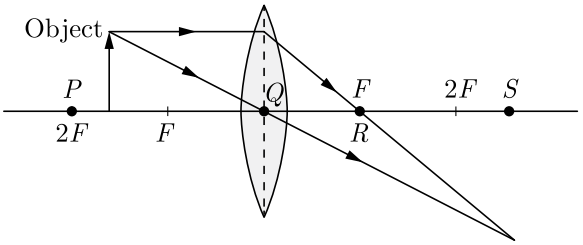
(b) Prism

(c) Convex lens

(d) Concave lens

Sol : www.cbse.site/sc/gm312

244. The image represents the rays of light travelling through a convex lens.



Where is the image most likely to form?

(a) Position S

(b) Position P

(c) Position Q

(d) Position R

Sol : www.cbse.site/sc/gm312

245. Rakhi conducts an experiment to produce an image of an object on a screen which is placed at 20 cm from the lens
She uses a convex lens of focal length 15 cm for the experiment.
Where should she place the object in order to produce the sharpest image?

(a) 60 cm in front or the lens

(b) 15 cm in front or the lens

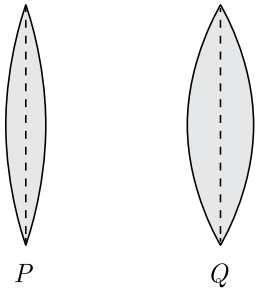
(c) 8 cm in front or the lens

(d) 20 cm in front or the lens

Sol : www.cbse.site/sc/gm312

246. Abhishek uses two lenses P and Q of same size and same material as shown. P_1 and P_2 are the powers of P and Q. An object is kept at the same distance from the lenses between F and $2F$ of each lens on the principal axis in turn. Let I_1 and I_2 be the image formed by two lenses respectively. Which one of the following statements is

correct for the images formed?

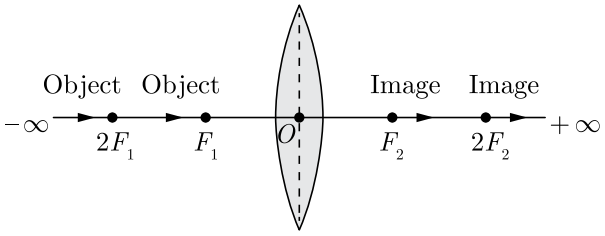


(a) Size of image I_1 will be lesser than size or image I_2.
(b) Size of image I_1 will be equal to size or image I_2.
(c) Distance of image I_2 will be greater than distance or image I_1 from the lens.
(d) Distance of image I_2 will be less than distance or image I_1 from the lens.

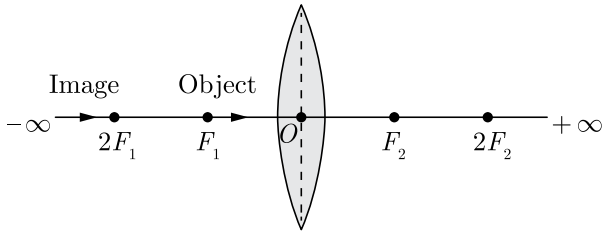
Sol : www.cbse.site/sc/gm312

Direction For Questions (244-248)

The image formed by a convex lens depends on the position of the object in front of the lens. When the object is placed anywhere between focus and infinity, the image formed by convex lens is real and inverted. The image is not obtained on the screen when the object is placed between focus and the lens.
The distance between the optical centre O of the convex lens and the focus point F_1 or F_2 is its focal length.
When the object shifts from $-\infty$ to F_1, the image moves from F_2 to $+\infty$.



When the object shifts from F_1 to O, the image moves from $-\infty$ to O.



A student did an experiment with a convex lens. He put an object at different distances from the lens. In each case he measured the distance of the image from the lens. The results were recorded in the following table

Object distance (in cm)	25	30	40	60	120
Image distance (in cm)	100	24	60	30	40

Unfortunately his results are written in the wrong order.

247. A virtual image is formed by convex lens when object is placed
(a) between F and O
(b) at infinity
(c) between C and F
(d) at F

Sol : www.cbse.site/sc/gm313

248. The minimum distance between an object and its real image formed by a convex lens is
(a) zero
(b) $2f$
(c) $4f$
(d) $3f$

Sol : www.cbse.site/sc/gm313

249. Which of this object distances gives the biggest image?
(a) 60 cm

(b) 40 cm
(c) 30 cm
(d) 25 cm

Sol : www.cbse.site/sc/gm313

250. The image distances in the correct order (in cm) is
(a) 100, 60, 40, 30, 24
(b) 100, 60, 30, 40, 24
(c) 100, 24, 60, 40, 30
(d) 24, 30, 40, 60, 100

Sol : www.cbse.site/sc/gm313

251. The focal length of this lens is
(a) 10 cm
(b) 20 cm
(c) 30 cm
(d) 40 cm

Sol : www.cbse.site/sc/gm313

Direction For Questions (249-253)

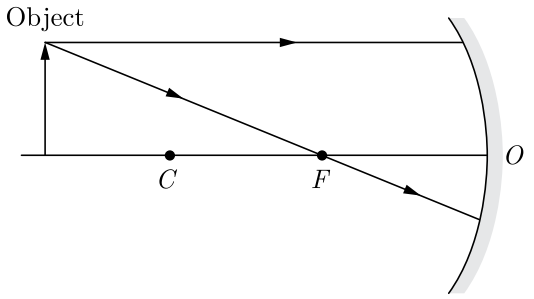
A real image (always inverted) is the one through which the rays of light actually pass after reflection from concave mirror and which can be formed on a screen. A virtual image (always erect) is the one through which the rays do not actually pass, although they appear to come from it. The position, nature and size of the image of an object formed by a concave mirror changes with the position of the object. The size of image may be determined by using a graph paper fixed on the screen.

Object	**Image**	**Nature of the image**
$u = \infty$	$v = f$	Real, inverted and highly diminished
$\infty > u > 2f$	$2f < v < \infty$	Real inverted and diminished
$u = 2f$	$v = 2f$	Real inverted and same size
$2f > u > f$	$2f < v < \infty$	Real inverted and enlarged
$u = f$	$v = \infty$	Real inverted and highly enlarged
$f > u > 0$	Behind the mirror	Virtual, erect and enlarged

252. Which of the following mirror is used by a dentist to examine a small cavity?
(a) Concave mirror
(b) Convex mirror
(c) Combination of (a) and (b)
(d) None of these

Sol : www.cbse.site/sc/gm314

253. The image shows the path of incident rays to a concave mirror.



Where would the reflected rays meet for the image formation to take place?
(a) Between F and O
(b) Beyond C
(c) Between C and F
(d) Behind the mirror

Sol : www.cbse.site/sc/gm314

254. A student conducts an activity using a concave mirror with focal length of 10 cm. He placed the object 15 cm from the mirror. Where is the image likely to form?

(a) At 6 cm in front of the mirror

(b) At 6 cm behind the mirror

(c) At 30 cm behind the mirror

(d) At 30 cm in front of the mirror

Sol : www.cbse.site/sc/gm314

255. Rekha placed a juice bottle at a distance of 20 cm in front of a convex mirror which has a focal length of 20 cm. Where is the image likely to form?

(a) At a distance of 10 cm in front of the mirror

(b) At focus in front of the mirror

(c) At a distance of 10 cm behind the mirror

(d) At focus behind the mirror

Sol : www.cbse.site/sc/gm314

256. Sunil conducts an activity using an object of height 10 cm and a convex mirror of focal length 20 cm. He placed the object at a distance of 20 cm in front of the mirror. What is likely to be height of the image produced?

(a) 15 cm

(b) 5 cm

(c) 1 cm

(d) 20 cm

Sol : www.cbse.site/sc/gm314

257. A concave mirror forms image of an object thrice in its size on a screen. Magnification of a mirror gives information about the size of the image relative to the object. It is defined as the ratio of size of image to the size of object. It is represented by m.

$$m = \frac{\text{Size of image}}{\text{Size of object}}$$

Sign of magnification by mirror gives the information about the nature of the image produce by it.

If the object x distance from the pole of mirror. The distance of image from the pole is:

(a) $2x$

(b) $3x$

(c) $-2x$

(d) $-3d$

Sol : www.cbse.site/sc/gm315

Direction For Questions (255-256)

A concave lens is thick at the edges and thin at the centre, while a convex lens is thick at the centre and thin at the edges. We can distinguish between a concave lens and a convex lens without touching them. For this keep a book close to a lens and observe the image of the text of the book through the lens. If the letters appear enlarged, then it is a convex lens and if the letters appear diminished then it is a concave lens.

Convex lens converges light rays and hence known as converging lens. Similarly, concave lens diverges light rays and is known as diverging lens. Linear magnification produced by a lens is equal to the ratio of the image distance to the object distance. Power of a lens is defined as the reciprocal of its focal length.

258. If magnification produced by a spherical lens is +0.75, then the nature of the lens is:

(a) Concave

(b) Convex

(c) Planoconvex

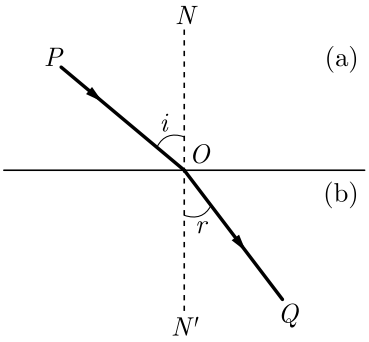
(d) None of these

Sol : www.cbse.site/sc/gm316

259. If the focal length of the convex lens is 80 cm. The power of the lens will be
(a) 1.25 D
(b) 2.25 D
(c) 1.90 D
(d) 2.90 D

Sol : www.cbse.site/sc/gm316

260. When light ray goes from one transparent medium to another transparent medium, it suffers a change in direction, into second medium. The extent of the change in direction suffered by the phenomenon of change in the path of light rays when going from one medium to another medium is known as refraction. Ray is a given pair of media can be expressed in terms of refractive index. The refractive index is related to an important physical quantity in the relative speed of light in different media.



Light enters from air to glass having refractive index 1.009. The speed of light in vacuum is $3 \times 10^8\ \text{ms}^{-1}$. The speed of light in the glass is:
(a) $2 \times 10^8\ \text{ms}^{-1}$
(b) $3 \times 10^8\ \text{ms}^{-1}$
(c) $4 \times 10^8\ \text{ms}^{-1}$
(d) $9 \times 10^8\ \text{ms}^{-1}$

Sol : www.cbse.site/sc/gm317

□□□□□□□

SELF ASSESSMENT TEST

1. The power of a concave lens of focal length of 2 m is-
(a) 0.5 D
(b) −0.5 D
(c) 1 D
(d) −1 D

2. No matter how far you stand from a mirror, your image appears erect. The mirror is likely to be-
(a) Plane
(b) Concave
(c) Convex
(d) Either plane or convex

3. An object of size 7.0 cm is placed at 27 cm in front of a concave mirror of focal length 18 cm. At what distance from the mirror should a screen be placed, so that a sharp focussed image can be obtained?
(a) 54 cm
(b) 60 cm
(c) −54 cm
(d) −60 cm

4. The speed of light in a transparent medium is 0.6 times that of its speed in vacuum. The refractive index of the medium is:
(a) 1.66
(b) 1.96
(c) 1.26
(d) 1.29

5. With respect to air, the refractive index of ice is 1.31 and that of rock salt is 1.54. the refractive index of rock salt with respect to ice is-
(a) 1.25
(b) 1.18
(c) 1.90
(d) 1.40

6. A convex lens of focal length 25 cm and a concave lens of focal length 10 cm are placed in close contact with each other. The power of this combination is-
(a) 2 D
(b) 6 D
(c) −6 D
(d) 9 D

7. A student wants to project the image of a candle flame on a screen 80 cm in front of a mirror by keeping the candle flame at a distance of 20 cm from its pole. The magnification of the image produced is-
(a) −4
(b) −2
(c) −6
(d) −1

8. The image of a candle flame placed at a distance of 30 cm from a spherical lens is formed on a screen placed on the other side of the lens at distance of 60 cm from the optical centre of the lens. The focal length of lens is-
(a) 40 cm
(b) 30 cm
(c) 50 cm
(d) 20 cm

9. Which of the following are correctly matched for the concave mirror?

	Object	**Image**
1.	Between P and F	at infinity
2.	At C	at C

3.	Beyond C	between F and C
4.	At infinity	at focus

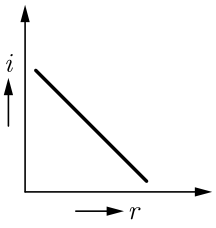
Choose the correct option from the codes given below :

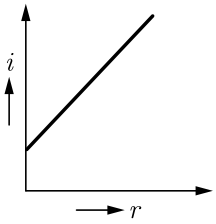
(a) 1, 3, 4
(b) 2, 3, 4
(c) 1, 2, 3
(d) 1, 2, 3, 4

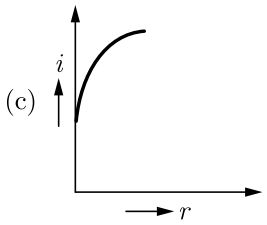
10. The laws of reflection hold good for:
(a) plane mirror only
(b) concave mirror only
(c) convex mirror only
(d) All mirrors irrespective of their shape.

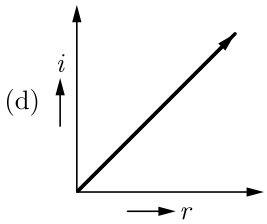
11. A child standing in front of a magic mirror. She finds the image of her head bigger, the middle portion of her body of the same size and that of the legs smaller. The following is the order of combinations for the magic mirror from the top.
(a) Plane, convex and concave
(b) Convex, concave and plane
(c) Concave, plane and convex
(d) Convex, plane and concave

12. Which of the following correctly represents graphical relation between angle of incidence (i) and angle of reflection (r)?

(a)


(b)


(c)


(d)


13. All of the following statements are correct except
(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

14. The field of view is maximum for
(a) Plane mirror
(b) Concave mirror
(c) Convex mirror
(d) Cylindrical mirror

15. The ratio of the refractive index of red light to blue light in air is-
(a) Less than unity
(b) Equal to unity
(c) Greater than unity
(d) Less as well as greater than unity depending upon the experimental arrangement

16. An object is immersed in a fluid. In order that the object becomes invisible, it should
(a) Behave as a perfect reflector

(b) Absorb all light falling on it
(c) Have refractive index one
(d) Have refractive index exactly matching with that of the surrounding fluid

17. Choose the correct relation between u, v and R for spherical mirrors.
(a) $R = \dfrac{2uv}{u+v}$
(b) $R = \dfrac{2}{u+v}$
(c) $R = \dfrac{2(u+v)}{(uv)}$
(d) None of these

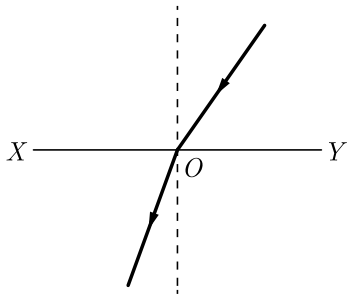
18. A spherical mirror and a thin spherical lens each has a focal length of $-15\,\text{cm}$. The mirror and the lens are likely to be-
(a) Both concave
(b) Both convex
(c) The mirror is concave and lens is convex
(d) The mirror is convex, but the lens is concave

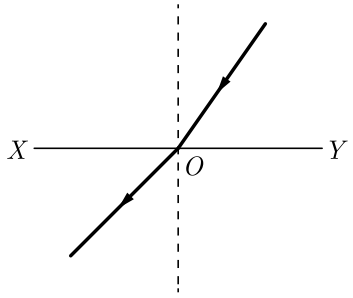
19. The inner shining surface of a steel spoon serves as a
(a) Plane mirror
(b) Concave mirror
(c) Convex mirror
(d) Any one of the above

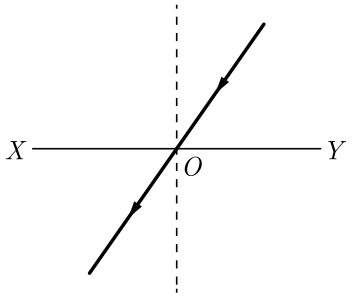
20. A ray of light falls on a plane mirror making an angle of 30° with normal. On deviation, the ray of light deviates through an angle of
(a) 120°
(b) 140°
(c) 160°
(d) 180°

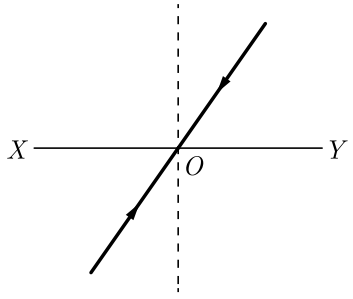
21. A full length image of a distant tall building can definitely be seen by using
(a) a concave mirror
(b) a convex mirror
(c) a plane mirror
(d) both concave as well as plane mirror

22. Which of the following figures shows refraction of light while going from denser to rarer medium?

(a)


(b)


(c)


(d)


23. The focal length of a combination of convex lens of power 1 D and concave lens of power -1.5 D is-

(a) -2 m

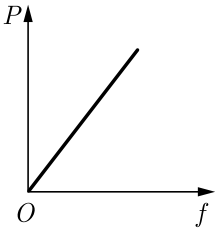
(b) 2 m

(c) 2.5 m

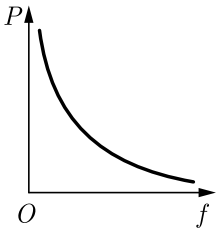
(d) 0.5 m

24. Which of the following graphs shows correct variation between the power (P) of a converging lens and its focal length (f)?

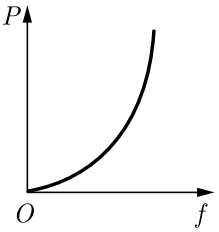
(a)



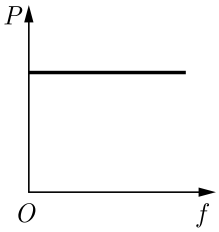
(b)



(c)

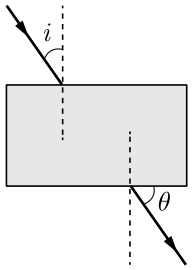


(d)

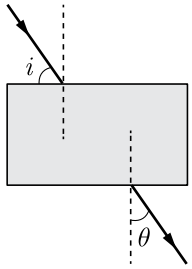


25. A student does the experiment on tracing the path of a ray of light passing through a rectangular glass slab for different angles of incidence. He can get a correct measure of the angles of incidence and the angle of emergence by following the labelling indicated in figure.

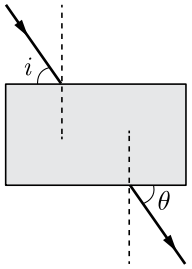
(a)



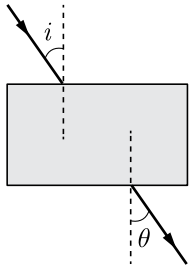
(b)



(c)



(d)



26. Which of the following can make a parallel beam of light when light from a point source is incident on it?

(a) Concave mirror as well as convex lens.

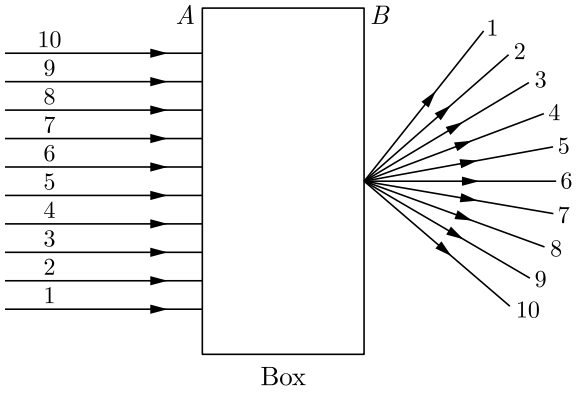
(b) Convex mirror as well as concave lens.

(c) Two plane mirrors placed at 90° to each other.

(d) Concave mirror as well as concave

lens.

27. A beam of light is incident through the holes on side A and emerges out of the holes on the other face of the box as shown in figure. Which of the following could be inside the box?



(a) Concave lens
(b) Rectangular glass slab
(c) Prism
(d) Convex lens

28. 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°

29. What is the power of a concave lens whose focal length is -75.0 cm?
(a) 1.33 D
(b) -13.3 D
(c) 13.3 D
(d) -1.33 D

30. When sun rays are focussed with a convex lens, a sharp, bright spot is observed at its focus. What does this spot indicate?
(a) The real image of the sun.
(b) The virtual image of the sun.
(c) An optical illusion produced by the convex lens.
(d) The magnified image of the sun.

31. SI unit of power of a lens is
(a) joule
(b) dioptre
(c) candela
(d) watt

32. A beam of light composed of red and green rays is incident obliquely at a point on the face of a rectangular glass slab. When coming out on the opposite parallel face, the red and green rays emerge from
(a) one point propagating in the same direction.
(b) one point propagating in two different directions.
(c) two points propagating in two different parallel directions.
(d) two points propagating in two different non-parallel directions.

33. A man runs towards a mirror with a speed of $15\,\mathrm{m-s^{-1}}$. What is the speed of his image ?
(a) $7.5\,\mathrm{m-s^{-1}}$
(b) $15\,\mathrm{m-s^{-1}}$
(c) $30\,\mathrm{m-s^{-1}}$
(d) $45\,\mathrm{m-s^{-1}}$

34. An object is placed at a distance f in the front of a convex mirror. If focal length of the mirror is f, then distance of image from pole of the mirror is
(a) f
(b) $2f$
(c) $\frac{f}{2}$
(d) $\frac{f}{4}$

35. The projection lens of a projector has focal length 5 cm. It is desired to get an image with a magnification 30. The distance of the screen from the lens must be

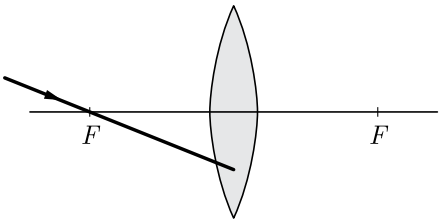
(a) 0.3 m

(b) 0.8 m

(c) 1.55 m

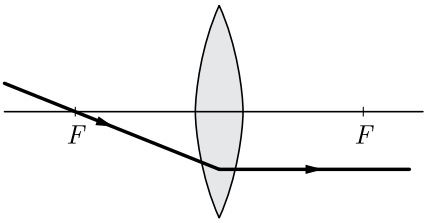
(d) 2.55 m

36. Which of the following ray diagrams is correct for the ray of light incident on a lens shown in figure.

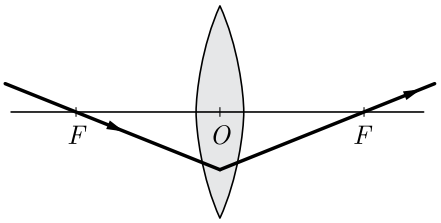


Choices are given in figure.

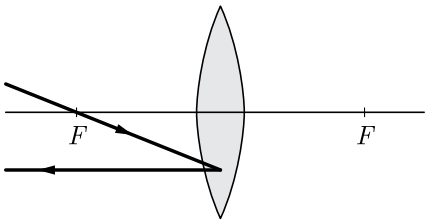
(a)



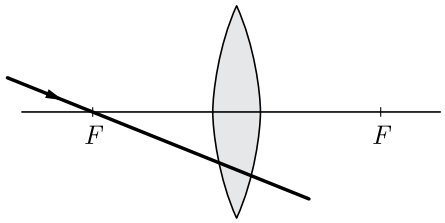
(b)



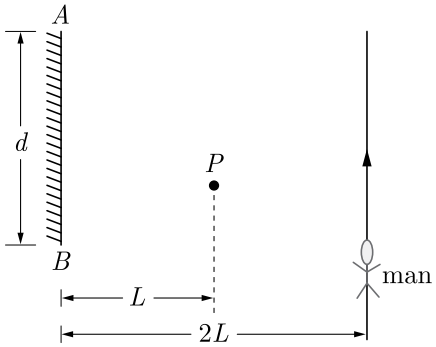
(c)



(d)



37. A point source of light P is placed at a distance L in front 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 $2L$ as shown in the figure. The greatest distance over which he can see the image of the light source, in the mirror, is



(a) $\frac{d}{2}$

(b) d

(c) $2d$

(d) $3d$

38. A combination of a concave and convex lens has power 5 D. If the power of convex lens is 4 D, then focal length of the concave lens is

(a) 10 cm

(b) 20 cm

(c) 100 cm

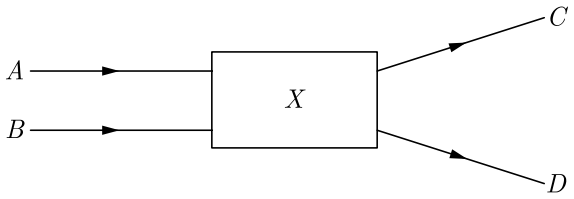
(d) 200 cm

39. An object is placed 20 cm from the concave mirror of focal length 10 cm, then image is formed at

(a) centre of curvature of mirror

(b) behind the mirror
(c) between the mirror and focus
(d) at focus

40. Light rays A and B fall on optical component X and come out as C and D.



The optical component is a
(a) concave lens
(b) convex lens
(c) convex mirror
(d) prism

41. **Assertion :** When light travels from one medium to another. The direction of propagation of light in second medium changes.
Reason : Light travels with different speeds in different mediums.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

42. **Assertion :** Power of a convex lens is positive and that of a concave lens is negative.
Reason : Convex lens forms real image and concave lens forms virtual image.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

43. **Assertion :** The twinkling of star is due to reflection of light.
Reason : The velocity of light changes while going from one medium to the other.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

44. **Assertion :** A ray incident along normal to the mirror retraces its path.
Reason : In reflection, angle of incidence is not equal to angle of reflection.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

45. **Assertion :** The mirror used in search lights are concave spherical.
Reason : In concave spherical mirror the image formed is always virtual.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but reason is true.

Direction For Questions (46-50)

Many optical instrument (like compound microscope) having number of lenses which are arranged is same specific manner and it is increases the magnification and sharpness of image which is formed by optical instrument. The net power (P) of the lenses placed in contact is given by the algebraic sum of the individual powers $P_1, P_2, P_3, \ldots$ as

$$P = P_1 + P_2 + P_3 + \ldots$$

The use of powers, instead of focal lengths, for lenses is quite convenient for opticians During eye-testing, an optician puts several different combinations of corrective lenses of known power, in contact, inside the testing spectacles frame. The optician calculates the power of the lens required by simple algebraic addition. For example, a combination of two lenses of power $+2.0$ D and $+0.25$ D is equivalent to a single lens of power $+2.25$ D. The simple additive property of the powers of lenses can be used to design lens systems to minimise certain defects in images produced by a single lens. Such a lens system, consisting of several lenses, in contact, is commonly used in the design of camera lenses and the objectives of microscopes and telescopes.

46. The power of a convex lens is 4.0 D. The focal length of this lens will be:
(a) 0.5 m
(b) 0.25 m
(c) 2.5 m
(d) 5 m

47. Two lenses of power $\frac{1}{2}$ D and -0.3 D are in contact to each other. Their combined power will be:
(a) + 0.2 D
(b) -0.2 D
(c) + 0.5 D
(d) + 0.8 D

48. Which of the following instrument consists of a lens system consisting of two or more lenses in contact?
(a) Microscope
(b) Telescope
(c) Camera
(d) All of the above

49. The focal lengths of two lenses in contact to each other are 20 cm and 50 cm respectively. Their combined power is:
(a) + 7.0 D
(b) + 70 D
(c) + 3.0 D
(d) + 30 D

50. In many optical instruments, the lenses are combined due to the following reason:
(a) to increase the magnification of the image
(b) to increase sharpness of the image
(c) to get virtual images of the object
(d) Both (a) and (b)

Answer Key

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
(b)	(d)	(c)	(b)	(b)	(c)	(a)	(d)	(b)	(d)
11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
(c)	(d)	(d)	(c)	(a)	(d)	(a)	(a)	(b)	(a)
21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
(b)	(b)	(a)	(b)	(d)	(a)	(d)	(b)	(d)	(a)
31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
(b)	(c)	(b)	(c)	(c)	(a)	(d)	(c)	(a)	(a)
41.	42.	43.	44.	45.	46.	47.	48.	49.	50.
(a)	(c)	(d)	(c)	(c)	(b)	(a)	(d)	(a)	(d)

□□□□□□□