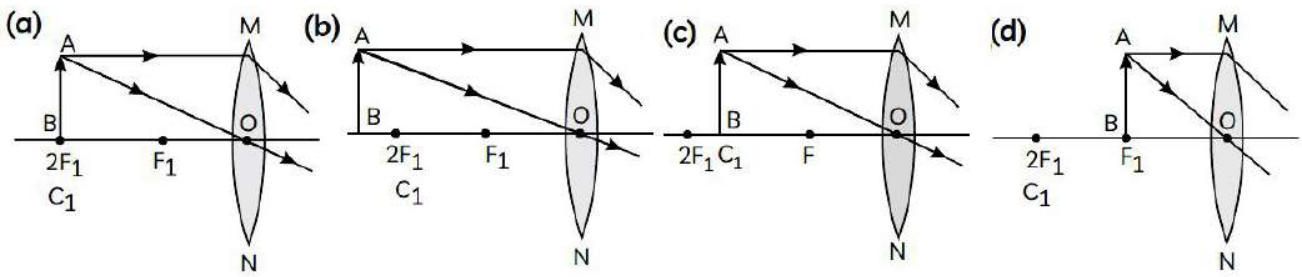
# PRACTICE PAPER 09
## CHAPTER 09 LIGHT – REFLECTION AND REFRACTION

**SUBJECT: SCIENCE** **MAX. MARKS : 40**
**CLASS : X** **DURATION : 1½ hrs**

**General Instructions:**
(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

## SECTION – A
**Questions 1 to 10 carry 1 mark each.**

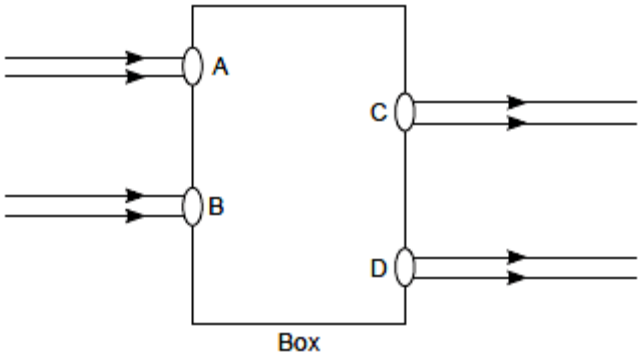
**1.** A student wants to obtain magnified image of an object AB on a screen. Which one of the following arrangements shows the correct position of AB for him/her to be successful?




**2.** If a man's face is 25 cm in front of concave shaving mirror producing erect image 1.5 times the size of face, focal length of the mirror would be
(a) 75 cm (b) 25 cm (c) 15 cm (d) 60 cm

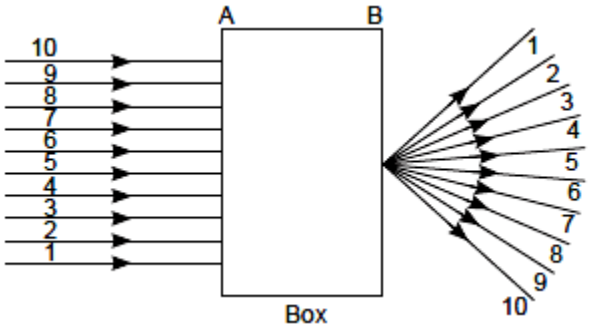
**3.** An object at a distance of 30 cm from a concave mirror gets its image at the same point. The focal length of the mirror is
(a) – 30 cm (b) 30 cm (c) – 15 cm (d) +15 cm

**4.** 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 the 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

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

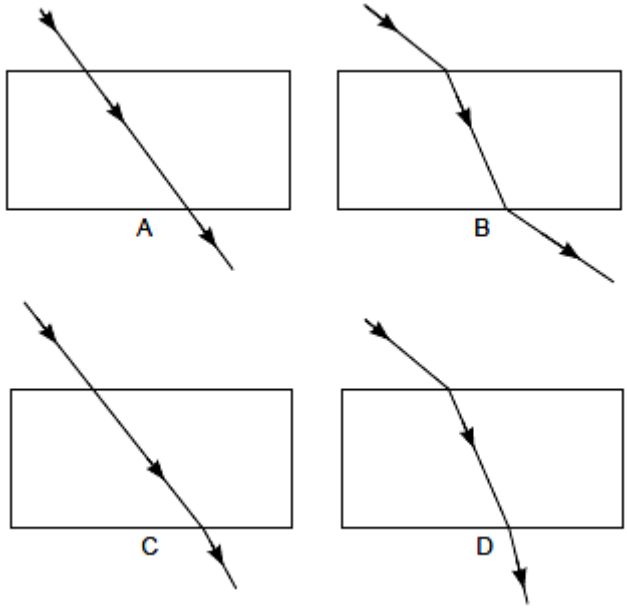



(a) Concave lens (b) Rectangular glass slab
(c) Prism (d) Convex lens

**6.** A student carries out the experiment of tracing the path of a ray of light through a rectangular glass slab for two different values of angle of incidence ∠i = 30° and ∠i = 45°. In the two cases the student is likely to observe the set of values of angle of refraction and angle of emergence as:
(a) ∠r =30°, ∠e = 20° and ∠r = 45°, ∠e = 28°
(b) ∠r =30°, ∠e = 30° and ∠r = 45°, ∠e = 45°
(c) ∠r =20°, ∠e = 30° and ∠r = 28°, ∠e = 45°
(d) ∠r =20°, ∠e = 20° and ∠r = 28°, ∠e = 28°

**7.** The nature of the image formed by concave mirror when the object is placed between the focus (F) and centre of curvature (C) of the mirror observed by us is
(a) real, inverted and diminished (b) real, inverted and enlarged
(c) virtual, erect and smaller in size (d) virtual, upright and enlarged

**8.** The path of a ray of light coming from air passing through a rectangular glass slab traced by four students are shown as A, B, C and D in figure. Which one of them is correct?




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

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

**9.** **Assertion (A):** Incident light is reflected in only one direction from a smooth surface.
**Reason (R):** Since the angle of incidence and the angle of reflection are same, a beam of parallel rays of light falling on a smooth surface is reflected as a beam of parallel light rays in one direction only.

**10.** **Assertion (A):** Refractive index has no units.
**Reason (R):** The refractive index is ratio of two similar quantities.

## SECTION – B

**Questions 11 to 14 carry 2 marks each.**

**11.** A spherical mirror produces an image of magnification –1 on a screen placed at a distance of 50 cm from the mirror.
(a) Write the type of mirror.
(b) Find the distance of the image from the object.
(c) What is the focal length of the mirror?

**12.** A student wants to obtain an erect image of an object using a concave mirror of 12 cm focal length. What should be the range of distance of the object from the mirror? State the nature and size of the image he is likely to observe.

**13.** What is understood by lateral displacement of light? Illustrate it with the help of a diagram. List any two factors on which the lateral displacement of a particular substance depends.

**14.** If the speed of light in vacuum is $3 \times 10^8$ m/s, find the absolute refractive index of a medium in which light travels with a speed of $1.4 \times 10^8$ m/s.

## SECTION – C

**Questions 15 to 17 carry 3 marks each.**

**15.** Draw a ray diagram to show the path of the refracted ray in each of the following cases: A ray of light incident on a concave lens is
(i) passing through its optical centre.
(ii) parallel to its principal axis.
(iii) directed towards its principal focus.

**16.** An object 2 cm high is placed at a distance of 64 cm from a white screen. On placing a convex lens at a distance of 32 cm from the object it is found that a distinct image of the object is formed on the screen. What is the focal length of the convex lens and size of the image formed on the screen ? Draw a ray diagram to show the formation of the image in this position of the object with respect to the lens.

**17.** 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. Find the position, size and nature of the image formed, using the lens formula.

**18.** 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? What would be the size of the image formed if the object is 2 cm high? With the help of a ray diagram show the formation of the image by the lens in this case.

## SECTION – D

**Questions 18 carry 5 marks.**

**19.** A student has focussed the image of a candle flame on a white screen using a concave mirror. The situation is as given below:
Length of the flame = 1.5 cm
Focal length of the mirror = 12 cm
Distance of flame from the mirror = 18 cm
If the flame is perpendicular to the principal axis of the mirror, then calculate the following:
(a) Distance of the image from the mirror

(b) Length of the image.

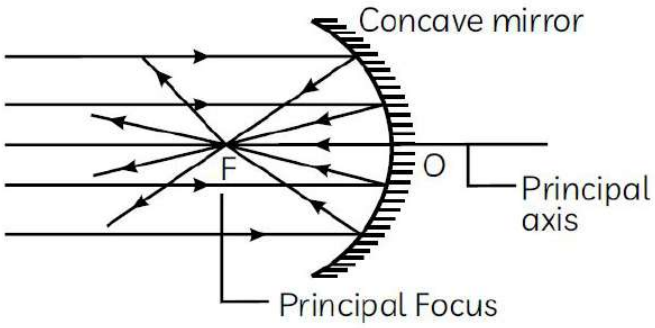
If the distance between the mirror and the flame is reduced to 10 cm, then what would be observed on the screen? Draw ray diagram to justify your answer for this situation.

## SECTION – E (Case Study Based Questions)

**Questions 19 to 20 carry 4 marks each.**

**20. Read the given passage and answer the questions based on passage and related studied concepts.**

Hold a concave mirror in your hand and direct its reflecting surface towards the sun. Direct the light reflected by the mirror on to a white card-board held close to the mirror. Move the card-board back and forth gradually until you find a bright, sharp spot of light on the board. This spot of light is the image of the sun on the sheet of paper; which is also termed as "Principal Focus" of the concave mirror.




(a) List two applications of concave mirror.

(b) If the distance between the mirror and the principal focus is 15 cm, find the radius of curvature of the mirror.

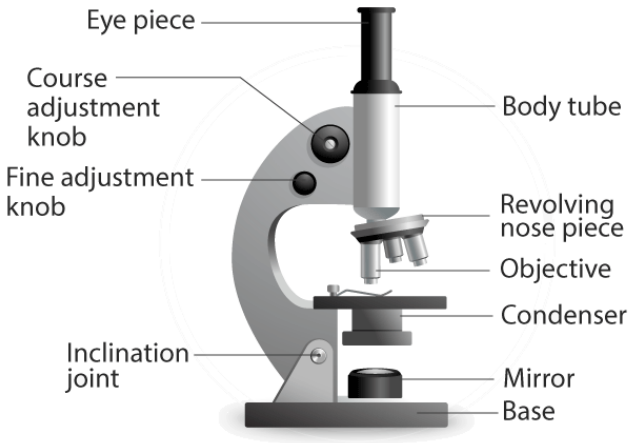
(c) Draw a ray diagram to show the type of image formed when an object is placed between pole and focus of a concave mirror.

(d) An object 10 cm in size is placed at 100 cm in front of a concave mirror. If its image is formed at the same point where the object is located, find:

(i) focal length of the mirror, and

(ii) magnification of the image formed with sign as per Cartesian sign convention.

**21.** A compound microscope is an instrument which consists of two lenses $L_1$ and $L_2$. The lens $L_1$ called objective, forms a real, inverted and magnified image of the given object. This serves as the object for the second lens $L_2$; the eye piece. The eye piece functions like a simple microscope or magnifier. It produces the final image, which is inverted with respect to the original object, enlarged and virtual.




(a) What types of lenses must be $L_1$ and $L_2$?

(b) (i) What is the value and sign of magnification (according to the new Cartesian sign convention) of the image formed by $L_1$?

(ii) What is the value and sign of (according to new Cartesian sign convention) magnification of the image formed by $L_2$?

(c) If power of the eyepiece ($L_2$) is 5 diopters and it forms an image at a distance of 80 cm from its optical centre, at what distance should the object be?

# PRACTICE PAPER 09
# CHAPTER 09 LIGHT – REFLECTION AND REFRACTION
# (ANSWERS)

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(iv). There is no overall choice.
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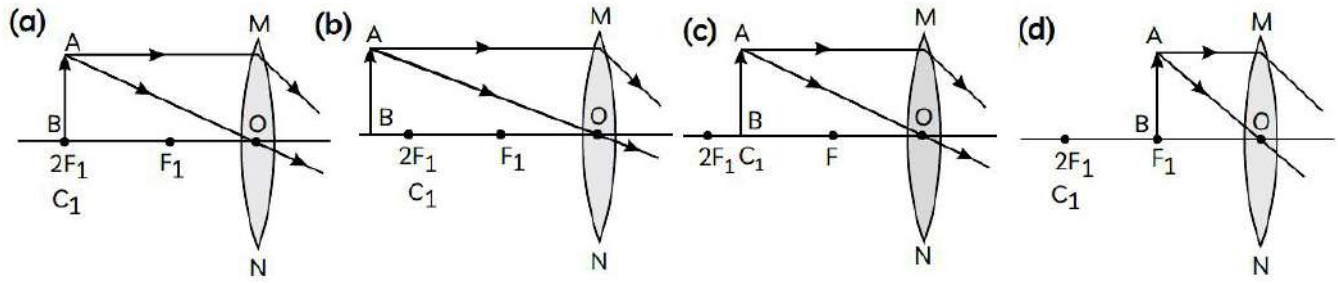
## SECTION – A

**Questions 1 to 10 carry 1 mark each.**

**1.** A student wants to obtain magnified image of an object AB on a screen. Which one of the following arrangements shows the correct position of AB for him/her to be successful?




Ans: (c)
In figure (a), the object is at $2F_1$ real, inverted and same size image is formed at $2F_2$.
In fig. (b), the object is beyond $2F_1$, real, inverted and between $F_2$ and $2F_2$ image is formed diminished.
In fig. (c), the object is kept between $F_1$ and $2F_1$, real, inverted and enlarged image is formed beyond $2F_2$.
In fig. (d), the object is kept at $F_1$ (focus), real, inverted and highly enlarged image is formed at infinity. So, option (c) is correct.

**2.** If a man's face is 25 cm in front of concave shaving mirror producing erect image 1.5 times the size of face, focal length of the mirror would be
(a) 75 cm (b) 25 cm (c) 15 cm (d) 60 cm
Ans: (a) 75 cm
In concave shaving mirror, virtual erect and large size image, behind the mirror is obtained, using

$$m = -\frac{v}{u} \Rightarrow 1.5 = -\frac{v}{-25}$$

$$\Rightarrow v = \frac{75}{2} \text{ cm}$$

Now, from mirror formula,

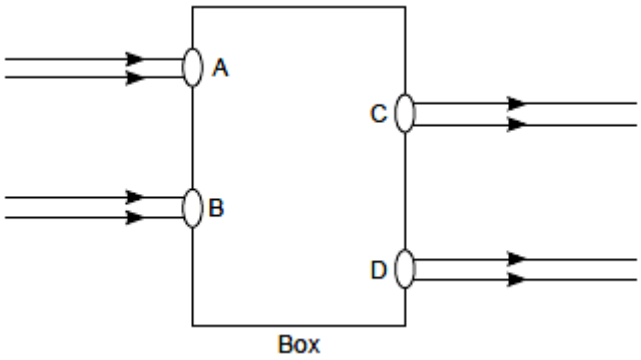
$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u} = \frac{1}{75/2} + \frac{1}{-25} = -\frac{1}{75}$$

$$\therefore f = -75 \text{ cm}$$

Hence, focal length of concave mirror is 75 cm.

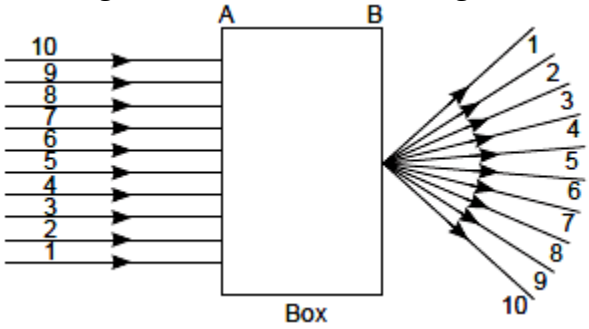
**3.** An object at a distance of 30 cm from a concave mirror gets its image at the same point. The focal length of the mirror is
(a) – 30 cm (b) 30 cm (c) – 15 cm (d) +15 cm
Ans: (c) – 15 cm
When object is placed at 2F, the image formed by concave mirror is also at 2F. So 2F = –30 or F = –15 cm.

**4.** 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 the 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
Ans: (a) A rectangular glass slab
Figure shows that emergent ray are parallel to the incident ray and shifted side ward slightly. This can be done by the rectangular glass slab only.

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



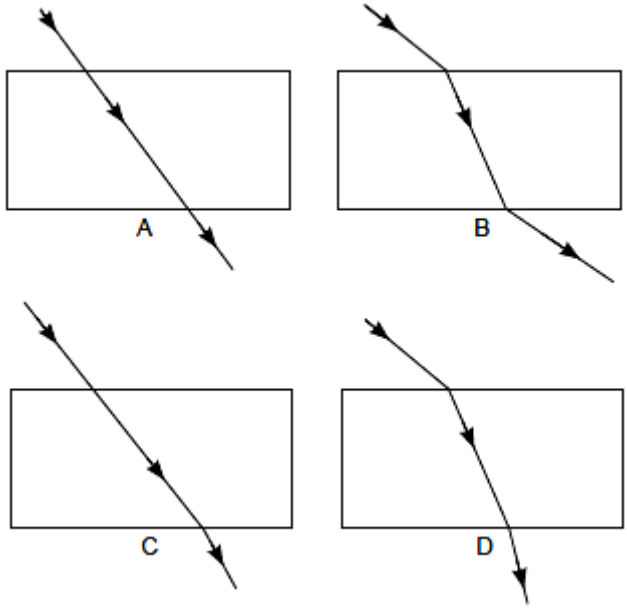

(a) Concave lens
(b) Rectangular glass slab
(c) Prism
(d) Convex lens
Ans: (d) Convex lens
From figure, it is clear that parallel rays converge at a point and emerges from face B. So convex lens would be possible inside the box.

**6.** A student carries out the experiment of tracing the path of a ray of light through a rectangular glass slab for two different values of angle of incidence ∠i = 30° and ∠i = 45°. In the two cases the student is likely to observe the set of values of angle of refraction and angle of emergence as:
(a) ∠r =30°, ∠e = 20° and ∠r = 45°, ∠e = 28°
(b) ∠r =30°, ∠e = 30° and ∠r = 45°, ∠e = 45°
(c) ∠r =20°, ∠e = 30° and ∠r = 28°, ∠e = 45°
(d) ∠r =20°, ∠e = 20° and ∠r = 28°, ∠e = 28°

Ans: (c) ∠r =20°, ∠e = 30° and ∠r = 28°, ∠e = 45°
The angle of refraction must be less than the angle of incidence. While, angle of emergence is equal to angle of incidence.
For ∠i = 30°, ∠r = 20° and ∠e = 30°
For ∠i = 45°, ∠r = 28° and ∠e = 45°

**7.** The nature of the image formed by concave mirror when the object is placed between the focus (F) and centre of curvature (C) of the mirror observed by us is
(a) real, inverted and diminished
(b) real, inverted and enlarged
(c) virtual, erect and smaller in size
(d) virtual, upright and enlarged
Ans: (b) real, inverted and enlarged
When object lies between C and F, the real, inverted and enlarged image is formed beyond C.

**8.** The path of a ray of light coming from air passing through a rectangular glass slab traced by four students are shown as A, B, C and D in figure. Which one of them is correct?




(a) A (b) B (c) C (d) D
Ans: (b) B
When a light ray is incident obliquely on one face of rectangular glass slab, the emergent ray will be parallel to the incident ray and shifted sideward slightly.

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

**9.** **Assertion (A):** Incident light is reflected in only one direction from a smooth surface.
**Reason (R):** Since the angle of incidence and the angle of reflection are same, a beam of parallel rays of light falling on a smooth surface is reflected as a beam of parallel light rays in one direction only.
Ans: (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

**10.** **Assertion (A):** Refractive index has no units.
**Reason (R):** The refractive index is ratio of two similar quantities.

Ans: (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

## SECTION – B

**Questions 11 to 14 carry 2 marks each.**

**11.** A spherical mirror produces an image of magnification –1 on a screen placed at a distance of 50 cm from the mirror.
(a) Write the type of mirror.
(b) Find the distance of the image from the object.
(c) What is the focal length of the mirror?
Ans: (a) As magnification is negative, the image formed is real. Hence, it is a concave mirror.

(b) Since, $m = \frac{-v}{u} = -1$

$\therefore u = v = -50$ cm

$\therefore$ Distance of the image from the object = $|u| + |v| = 100$ cm

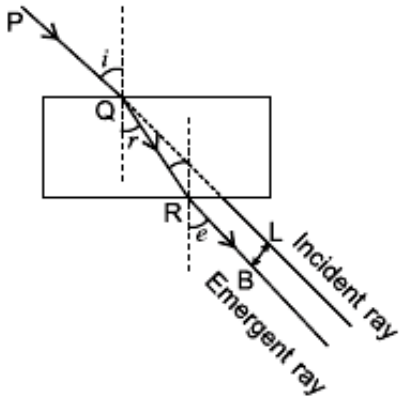
(c) Using mirror formula,

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u} = \frac{1}{(-50)} + \frac{1}{(-50)} = \frac{2}{(-50)} = \frac{-1}{25}$$

$\therefore f = -25$ cm

**12.** A student wants to obtain an erect image of an object using a concave mirror of 12 cm focal length. What should be the range of distance of the object from the mirror? State the nature and size of the image he is likely to observe.
Ans: If a student wants to obtain an erect image of an object using a concave mirror of 12 cm focal length, he should keep the object between the pole and the focus of the mirror, therefore, a virtual, erect and enlarged image will be formed behind the mirror.

**13.** What is understood by lateral displacement of light? Illustrate it with the help of a diagram. List any two factors on which the lateral displacement of a particular substance depends.
Ans: Lateral displacement is the perpendicular distance between the incident ray produced and emergent ray. The lateral displacement in the given diagram is BL. The lateral displacement depends on the thickness of the slab, the incident angle and the refractive index of the material.




**14.** If the speed of light in vacuum is $3 \times 10^8$ m/s, find the absolute refractive index of a medium in which light travels with a speed of $1.4 \times 10^8$ m/s.
Ans:
Absolute refractive index of the medium is given by

$$n_m = \frac{\text{Speed of light in vacuum (c)}}{\text{Speed of light in medium (v)}} = \frac{c}{v}$$

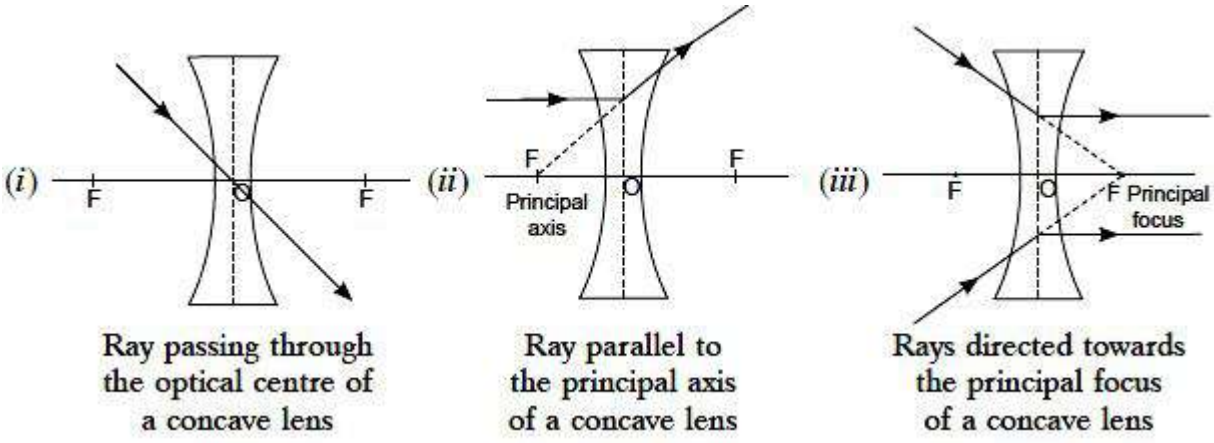
Given: $c = 3 \times 10^8$ m/s, $v = 1.4 \times 10^8$ m/s

$\therefore \quad n_m = \dfrac{c}{v} = \dfrac{3\times10^8}{1.4\times10^8} = \dfrac{3}{1.4} = 2.14$

## SECTION – C

**Questions 15 to 17 carry 3 marks each.**

**15.** Draw a ray diagram to show the path of the refracted ray in each of the following cases: A ray of light incident on a concave lens is
(i) passing through its optical centre.
(ii) parallel to its principal axis.
(iii) directed towards its principal focus.
Ans:

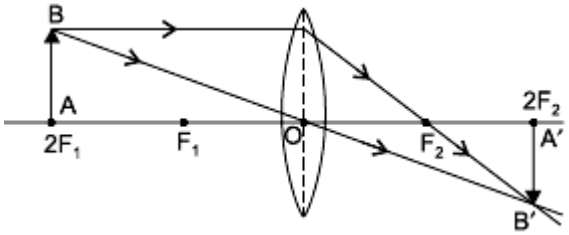



Ray passing through the optical centre of a concave lens

Ray parallel to the principal axis of a concave lens

Rays directed towards the principal focus of a concave lens

**16.** An object 2 cm high is placed at a distance of 64 cm from a white screen. On placing a convex lens at a distance of 32 cm from the object it is found that a distinct image of the object is formed on the screen. What is the focal length of the convex lens and size of the image formed on the screen ? Draw a ray diagram to show the formation of the image in this position of the object with respect to the lens.
Ans: Since the object-screen distance is double of the object-lens separation, the object is at a distance of $2f$ from the lens and the image should be of the same size of the object and formed at $2F_2$ on the screen.




So, $2f = 32 \Rightarrow f = 16$ cm
Height of image = Height of object = 2 cm

**17.** 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. Find the position, size and nature of the image formed, using the lens formula.
Ans:
Given: $h_o = +6$ cm, $f = +15$ cm, $u = -10$ cm
Using lens formula, $\dfrac{1}{f} = \dfrac{1}{v} - \dfrac{1}{u} \Rightarrow \dfrac{1}{15} = \dfrac{1}{v} - \dfrac{1}{(-10)} = \dfrac{1}{v} + \dfrac{1}{10}$

$\Rightarrow \dfrac{1}{v} = \dfrac{1}{15} - \dfrac{1}{10} = \dfrac{2-3}{30} = \dfrac{-1}{30}$

$v = -30$ cm

Thus, the image is formed on the same side of the object at a distance of 30 cm from the optical centre of the lens.

The negative sign indicates that the image is virtual.

$\because \quad m = \frac{h_i}{h_o} = \frac{v}{u}$

$\Rightarrow h_i = \frac{v}{u} \times h_o = \frac{-30}{-10} \times 6 = 18cm$

So, the image is three times larger than the size of the object, i.e. 18 cm.

The positive sign indicates that the image is erect.

**18.** 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? What would be the size of the image formed if the object is 2 cm high? With the help of a ray diagram show the formation of the image by the lens in this case.

Ans: Given: $f = +10$ cm, $v = +20$ cm as image is real and inverted.

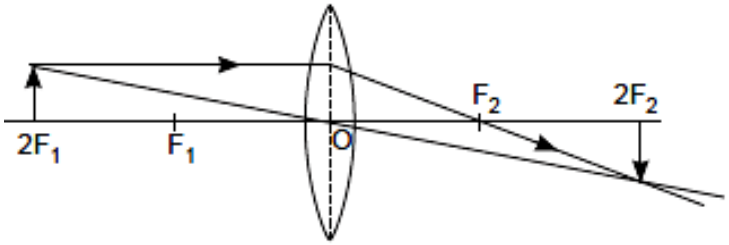
Height of the object = 2 cm (Say +ve)

Using lens formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$, we get

$\frac{1}{u} = \frac{1}{v} - \frac{1}{f} = \frac{1}{20} - \frac{1}{10} = \frac{1-2}{20} = \frac{-1}{20}$

$\therefore u = -20$ cm $(= 2f)$

Hence the object is placed at $2F_1$, the image is also formed at $2F_2$ on the other side of the lens. So, the image will be of the same size as the object as $|u| = |v|$ and therefore, the height of the image will be 2 cm.




## SECTION – D

**Questions 18 carry 5 marks.**

**19.** A student has focussed the image of a candle flame on a white screen using a concave mirror. The situation is as given below:

Length of the flame = 1.5 cm

Focal length of the mirror = 12 cm

Distance of flame from the mirror = 18 cm

If the flame is perpendicular to the principal axis of the mirror, then calculate the following:

(a) Distance of the image from the mirror

(b) Length of the image.

If the distance between the mirror and the flame is reduced to 10 cm, then what would be observed on the screen? Draw ray diagram to justify your answer for this situation.

Ans: Given: $h_o = +1.5$ cm, $f = -12$ cm, $u = -18$ cm

(a) For a concave mirror, using mirror formula

$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$, we get

$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{-12} - \frac{1}{-18} = -\frac{1}{12} + \frac{1}{18} = \frac{-3+2}{36} = \frac{-1}{36}$

or $v = -36$ cm

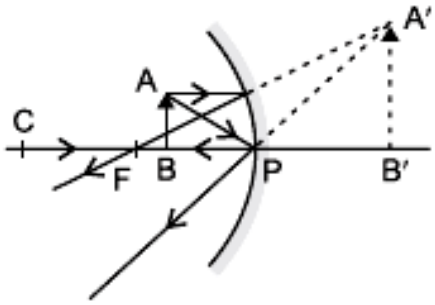
So, the distance of the image from the mirror is 36 cm, the negative sign indicates that the image is formed on the same side of the object.

(b) Using the formula $m = \frac{h_i}{h_o} = -\frac{v}{u}$

$$\Rightarrow h_i = -\frac{v}{u} \times h_o = -\frac{-36}{-18} \times 1.5 = -3.0cm$$

So, the length of the image is 3.0 cm.

If the distance between the mirror and the flame is reduced to 10 cm, no image is formed on the screen as the object lies between the focus and the pole of the mirror. So, a virtual image behind the mirror is obtained as shown in the adjoining figure.

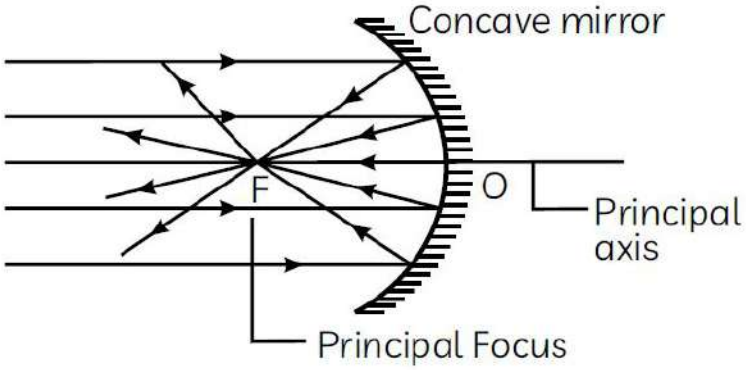



## SECTION – E (Case Study Based Questions)

**Questions 19 to 20 carry 4 marks each.**

**20. Read the given passage and answer the questions based on passage and related studied concepts.**

Hold a concave mirror in your hand and direct its reflecting surface towards the sun. Direct the light reflected by the mirror on to a white card-board held close to the mirror. Move the card-board back and forth gradually until you find a bright, sharp spot of light on the board. This spot of light is the image of the sun on the sheet of paper; which is also termed as "Principal Focus" of the concave mirror.




(a) List two applications of concave mirror.

(b) If the distance between the mirror and the principal focus is 15 cm, find the radius of curvature of the mirror.

(c) Draw a ray diagram to show the type of image formed when an object is placed between pole and focus of a concave mirror.

(d) An object 10 cm in size is placed at 100 cm in front of a concave mirror. If its image is formed at the same point where the object is located, find:

(i) focal length of the mirror, and

(ii) magnification of the image formed with sign as per Cartesian sign convention.

Ans:

(a) Applications of concave mirrors:

(i) Concave mirror is used as a shaving mirror. When the face is placed close to it so that it is within its focus and we get an erect and magnified image of the face.

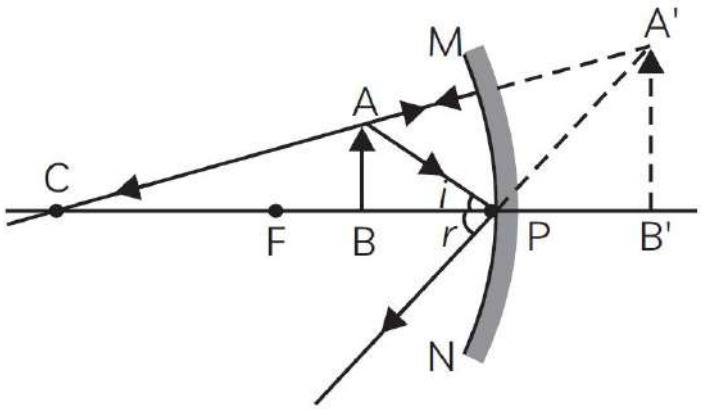
(ii) Doctors use concave mirror as a headmirror to concentrate parallel rays of light on its focus which enables them to examine body parts such as eye, throat, etc.

(b) Given, f = 15 cm

We know for a mirror, R = 2 f

$\Rightarrow$ R = 2 × 15 cm $\Rightarrow$ R = 30 cm

(c)




(d) (i) We can use the mirror formula to find the focal length of the mirror:

$\frac{1}{f}=\frac{1}{v}+\frac{1}{u}$ where, f is the focal length of the mirror,

v is the image distance and u is the object distance.

Since the image is formed at the same point as the object,

v = u = –100 cm (Distances to the left of the mirror are negative).

Substituting the values, we get:

$$\frac{1}{f}=\frac{1}{-100}+\frac{1}{-100}\Rightarrow\frac{1}{f}=\frac{-2}{100}\Rightarrow f=-50cm$$

So, the focal length of the mirror is –50 cm.

(Negative sign indicates that it is a concave mirror).

(ii) The magnification of the image is: $m=-\frac{v}{u}$

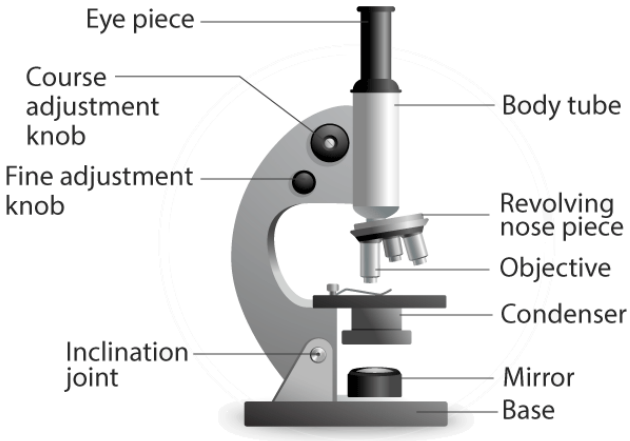
where, m is the magnification of the image.

Substituting the values, we get m = –1

So, the magnification of the image is 1.

(Negative sign indicates that the image is real and inverted).

**21.** A compound microscope is an instrument which consists of two lenses $L_1$ and $L_2$. The lens $L_1$ called objective, forms a real, inverted and magnified image of the given object. This serves as the object for the second lens $L_2$; the eye piece. The eye piece functions like a simple microscope or magnifier. It produces the final image, which is inverted with respect to the original object, enlarged and virtual.



(a) What types of lenses must be $L_1$ and $L_2$?
(b) (i) What is the value and sign of magnification (according to the new Cartesian sign convention) of the image formed by $L_1$?
(ii) What is the value and sign of (according to new Cartesian sign convention) magnification of the image formed by $L_2$?
(c) If power of the eyepiece ($L_2$) is 5 diopters and it forms an image at a distance of 80 cm from its optical centre, at what distance should the object be?
Ans: (a) Both lenses will be convex lens as it forms a real, inverted and magnified image of the given object.
Only convex lens forms real and inverted image of the object. The eye piece of second lens ($L_2$) is also a convex lens as it forms inverted image with respect to the original object and it magnifies the real image formed by the objective lens.
(b) (B) (i) The value will be more than 1 and sign would be negative. As the image formed is magnified. Size of image is greater than the size of the object i.e. hi > ho

As $m = \frac{h_i}{h_o}$, m > 1

When the image is real and inverted, the image lies below the principal axis. Therefore, height of image (hi) is negative. As height of object (ho) is always positive, therefore, $m = \frac{h_i}{h_o}$ = negative.

(ii) The value will be more than 1 and sign would be positive. In lens ($L_2$) the image formed is magnified, inverted but virtual. Magnified means m > 1
Since image formed is virtual, m = +ve
(c) $L_2$ lens is convex, so P = +5D
v = –80 cm (virtual image)
u = ?

$$P = \frac{1}{f} \Rightarrow f = \frac{1}{P} = \frac{1}{5} = \frac{100}{5} = 20cm$$

Using lens formula,

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

$$\Rightarrow \frac{1}{u} = \frac{1}{-80} - \frac{1}{20} = \frac{-1-4}{80} = \frac{-5}{80} \Rightarrow u = \frac{80}{-5} = -16cm$$

Thus, the object is present at a distance less than the focal length i.e., between focus and optical centre.