

Q25 A student has obtained an image of a distant object on a screen to determine the focal length F_1 of the given lens. His teacher, after checking the image, gave him another lens of focal length F_2 and asked him to focus the same object on the same screen. The student found that to obtain a sharp image, he has to move the lens away from the screen. From this finding, we may conclude that both the lenses given to the student were :

- (A) Concave and $F_1 < F_2$
- (B) Convex and $F_1 < F_2$
- (C) Convex and $F_1 > F_2$
- (D) Concave and $F_1 > F_2$

Solution:

The lens is convex, as it forms real image. As mentioned in the second case, the image distance (v) is increasing; hence, the object distance (u) is decreasing.

The lens formula is

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

$$\Rightarrow F = \frac{uv}{u-v}$$

For convex lens, object distance = $-u$

image distance = $+v$

$$\Rightarrow F = \frac{uv}{u+v}$$

where F is the focal length of the lens.

Therefore, F is lesser for the second lens of focal length F_2 .

Hence, $F_1 > F_2$.

Hence, the correct option is C.

Q26 A student has obtained the image of a distant object with a concave mirror to determine its focal length. If he has selected a well-illuminated red building as object, which of the following correctly describes the features of the image formed?

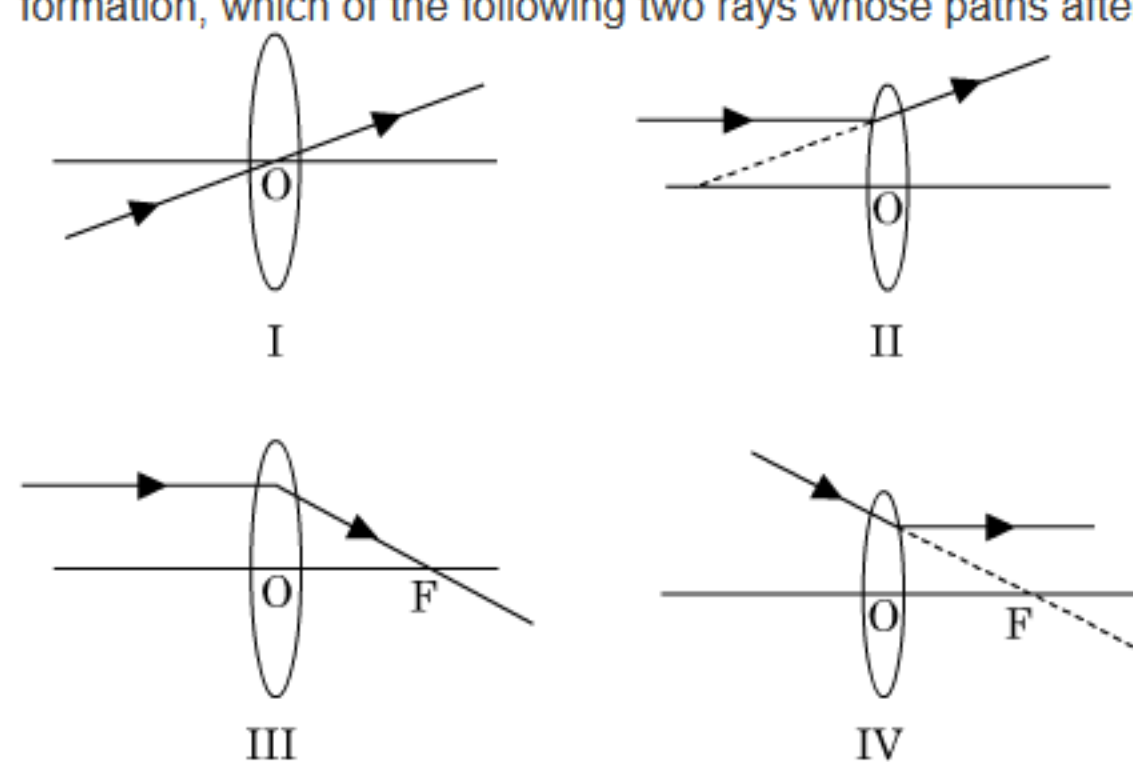
- (A) Virtual, inverted and diminished image in red shade
- (B) Real, erect and diminished image in pink shade
- (C) Real, inverted and diminished image in red shade
- (D) Virtual, erect and enlarged image in red shade

Solution:

To measure the focal length of the mirror, the object should be taken at infinity. Therefore, the image formed by the concave mirror would be real, inverted, diminished and red in shade.

Hence, the correct option is C.

Q27 A student has obtained a magnified image of a flame on a screen using a convex lens. To draw the corresponding ray diagram to show the image formation, which of the following two rays whose paths after refraction are shown, should he select ?



- (A) I and II
- (B) II and III
- (C) III and IV
- (D) I and III

Solution:

A convex lens converges the refracting ray. Therefore, rays I and III represent the path of the refracting ray from a convex lens (converging lens). As rays II and IV show the refracting ray being diverged, the ray diagrams are incorrect.

Hence, the correct option is D.

Q28 A student was asked by his teacher to find the image distance for various object distance in case of a given convex lens. He performed the experiment with all precautions and noted down his observations in the following table:

S. No.	Object distance (cm)	Image distance (cm)
1	60	15
2	48	16
3	36	21
4	24	24
5	18	36
6	16	48

After checking the observations table the teacher pointed out that there is a mistake in recording the image distance in one of the observations. Find the serial number of the observations having faulty image distance.

- (A) 2
- (B) 3
- (C) 5
- (D) 6

Solution:

Observation no. 3 is incorrect because the focal length of the lens in all other observations is 12 cm. In observation no. 3, the focal length comes out to be 13.26 cm.

Hence, the correct option is B.

Q29 A student is observing a diagram showing the path of a ray of light passing through a glass prism. He would find that for all angles of incidence the ray of light bends:

- (A) towards the normal while entering the prism and away from the normal while emerging from the prism
- (B) away from the normal while entering the prism and towards the normal while emerging from the prism
- (C) away from the normal while entering as well as while emerging from the prism
- (D) towards the normal while entering as well as while emerging from the prism

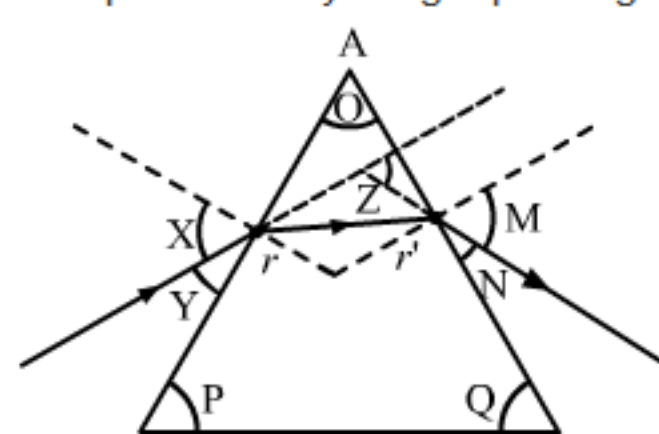
Solution:

When a ray of light enters a glass prism, it travels from a rarer medium to a denser medium. So, the ray of light bends towards the normal.

When the ray of light emerges from the glass prism, it travels from a denser medium to a rarer medium. So, the ray of light bends away from the normal.

Hence, the correct option is A.

Q30 The path of a ray of light passing through a glass prism is shown below:



In this diagram, the angle of prism, angle of incidence, angle of emergence and angle of deviation, respectively, have been represented by:

- (A) O, Y, Z and N,
- (B) P, Y, M and Z,
- (C) O, X, M and Z,
- (D) P, X, Z and N.

Solution:

O is the angle of prism.

Angle of incidence is the angle made by the incident ray with the normal to the surface of the prism. Here, X represents the angle of incidence.

Angle of emergence is the angle made by the emerging ray with the normal to the surface of the prism. Here, M represents the angle of emergence.

Angle of deviation is the angle made by the emerging ray with the incident ray. Here, Z represents the angle of deviation.

Hence, the correct option is C.