PRACTICAL QUESTIONS

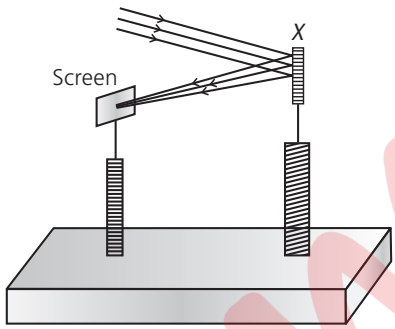
Multiple Choice Questions

1. While doing an experiment, a student found that if the object moves from infinity towards pole of a mirror, the image also moves from pole to infinity. The mirror must be

(a) parabolic (b) concave
(c) convex (d) all of these

Ans. (b) : In case of concave mirror, when object moves towards, the screen, the image moves away from the screen.

2. A student determines the focal length of a device X, by focussing the image of a far off object on the screen positioned as shown in the figure below.



The device X is a

(a) convex lens (b) concave lens
(c) convex mirror (d) concave mirror

Ans. (d) : When light rays are coming from infinity, image is formed at the first focal point of the concave mirror.

3. On the basis of the experiment 'to trace the path of a ray of light passing through a rectangular glass slab', four students arrived at the following interpretations.

I. Angle of incidence is greater than the angle of emergence.
II. Angle of emergence is less than the angle of refraction.
III. Emergent ray is parallel to the incident ray.
IV. Emergent ray is parallel to the refracted ray.

Correct interpretation is that of the student :

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

Ans. (c) : $\angle e = \angle i$.

4. A student has to do an experiment, for finding the focal length of a given concave mirror, by using a distant object. Following are the four set-ups (P, Q, R, S) available to her.

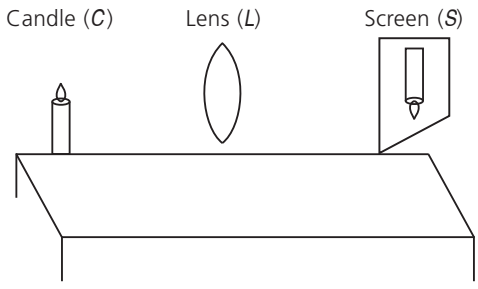
(P) A screen, a mirror holder and a scale
(Q) A mirror holder, a screen holder and a scale
(R) A screen holder and a scale
(S) A mirror holder and a screen holder

Out of the given set-ups, which one is likely to give her the best result?

(a) P (b) Q
(c) R (d) S

Ans. (a) : For getting the best result one must need a screen, a mirror holder and a scale.

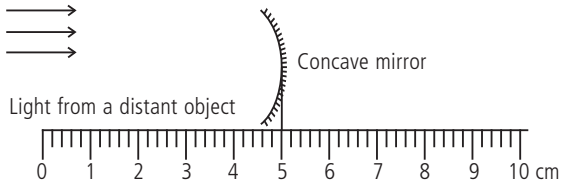
5. A student performs an experiment, on finding the focal length of a convex lens by keeping a light candle on one end of the laboratory table, a screen on its other end and the lens between them as shown in the figure. The positions of the three are adjusted to get a sharp image of the candle flame on the screen. If now the candle flame is to be replaced by a distant lamp on a far away electric pole, the student would be able to get a sharp image of this distant lamp on the screen by moving :



(a) the screen in the direction of the lens or the lens in the direction of the screen.
(b) the screen in the direction of the lens or the lens away from the direction from the screen.
(c) the screen away from the lens or the lens in the direction of the screen.
(d) neither the screen nor the lens.

Ans. (a) : The image will be closer to focus as the distance of the object is larger.

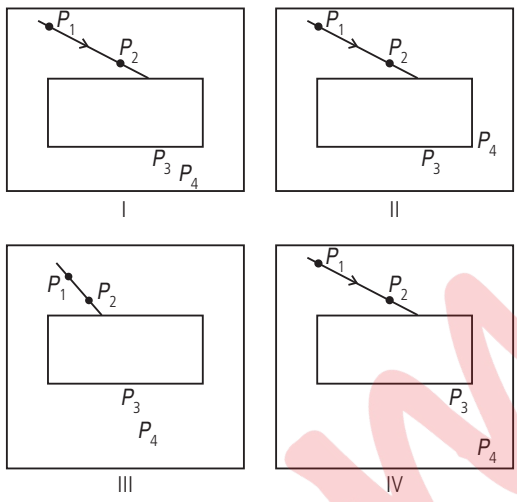
6. In the given set up, the focal length of the concave mirror is 4.0 cm. The mark on the scale on which the screen should be placed to obtain a sharp image :



(a) at 8 cm (b) at 2 cm
(c) at 6 cm (d) at 1 cm

Ans. (d) : Distance between mirror and screen would be the *f* of mirror *i.e.*, 5 – 4 = 1 cm.

7. Four students set up the glass slab experiment as shown here :

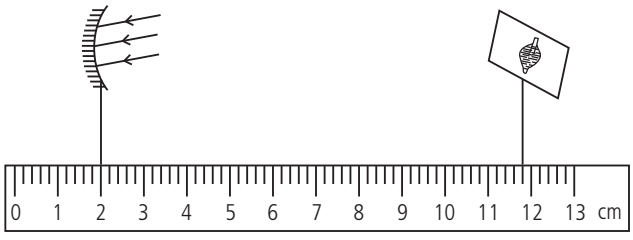


The correct fixing of the pins P_1 and P_2 for defining the incident ray; and of pins of P_3 and P_4, for finding the emergent ray; has done by student:

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

Ans. (c) : Light emerging out from the glass slab is parallel to the incident light and shifted sideways *i.e.*, laterally displaced from the direction of incident light.

8. In the set-up shown below, a clear image of a distant object is obtained on the screen. The focal length of the concave mirror is



(a) 11.4 cm (b) 9.4 cm
(c) 9.8 cm (d) 9.9 cm

Ans. (c) : Focal length of the concave mirror, $f = 11.8 - 2$
$= 9.8$ cm.

9. A student recalls the rules to draw ray diagrams with the help of a concave mirror.

(i) The ray of light parallel to the principal axis will converge at the focus after reflection.

(ii) The ray of light passing through the centre of curvature will retrace its path after reflection.

(iii) The ray of light falling at the pole gets reflected at a different angle on the other side of principal axis.

The correct statement(s) is/are

(a) (i) only
(b) (i) and (ii) only
(c) (ii) and (iii) only
(d) (i) and (iii) only

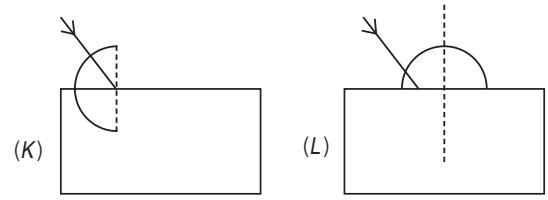
Ans. (b) : As in case of concave mirror light rays parallel to principal axis always converge at focus after reflection and rays of light passing through centre of curvature will retrace its path after reflection.

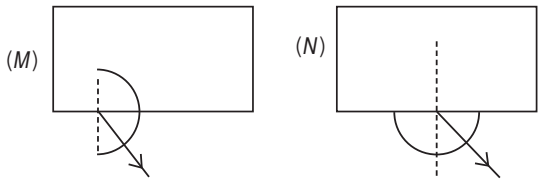
10. A student obtains a blurred image of an object on a screen by using a concave mirror. In order to obtain a sharp image of the same object on the screen, he will have to shift the mirror

(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.

Ans. (d) : Shifting the concave mirror away or towards the screen will help in positioning the screen at the focal point of mirror, so as to get a sharp image of the object.

11. In the experiment of tracing the path of a ray of light passing through a rectangular glass slab, the correct setting of the protractor for measuring the angle of incidence ($\angle i$), and the angle of emergence ($\angle e$), corresponds, respectively to diagrams





(a) K and M (b) K and N
(c) L and M (d) L and N

Ans. (a) : Angle of incidence and angle of emergence is always measured with respect to the normal.

Subjective Questions

12. To determine the focal length of a convex lens, a student focuses a classroom window, a distant tree and the sun on the screen. In which case will the student is closer to accurate value of focal length?

Ans. For Sun, the rays of light can be assumed to be coming from infinity. So gives the most accurate value of focal length.

13. What type of mirror is used as shaving mirror or in vanity boxes?

Ans. Concave mirror, because when the object is placed between its focus and pole, the magnified, erect and virtual image of the object will be formed.

14. While tracing the path of a ray of light through a glass slab, the angle of incidence is generally taken between 30° and 60°. Explain the reason on the basis of your performing this experiment for different angles of incidence.

Ans. On the basis of the experiment, it is observed that:

(i) The angle of emergence also increases with the increase in angle of incidence or vice-versa.

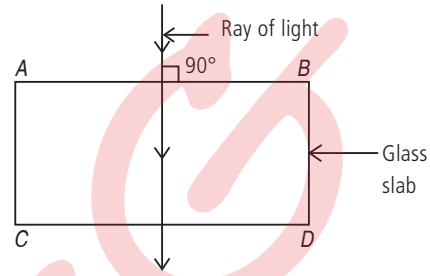
(ii) If the angle of incidence is less than 30°, very less bending to be found at the emergent glass-air-interface.

(iii) If the angle of incidence is greater than 60°, the emergent ray may come out from the side surface of the rectangular glass slab instead of opposite parallel surface.

For this reason angle of incidence should be taken between 30° and 60° for tracing the path of a ray of light through a glass slab.

15. Draw the path of a ray of light when it enters perpendicular to the surface of a glass slab.

Ans.



16. How does the lateral displacement of emergent ray depend on the width of the glass slab and angle of incidence?

Ans. Lateral displacement of emergent ray in a rectangular glass slab of thickness t is, $t\frac{\sin(i-r)}{\cos r}$. Therefore, lateral displacement of the emergent ray is proportional to

(i) the angle of incidence for the given thickness of the glass slab and a pair of media.

(ii) the thickness of the glass slab for a given angle of incidence and a pair of media.

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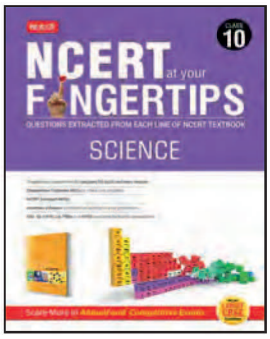

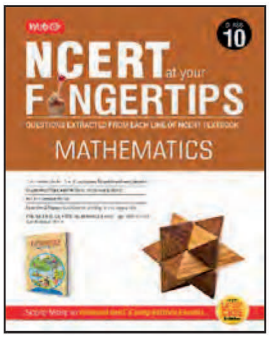

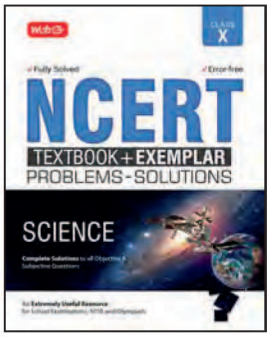

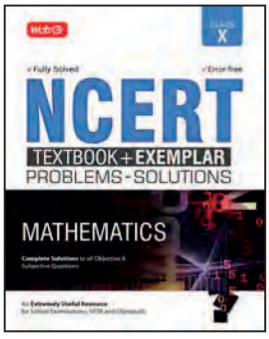

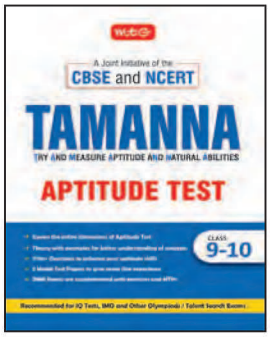

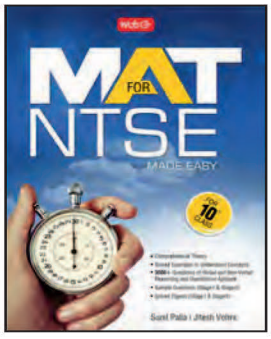

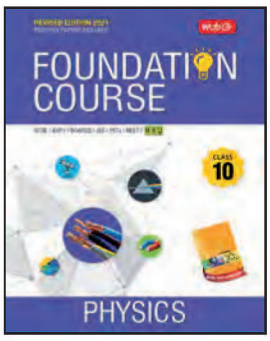

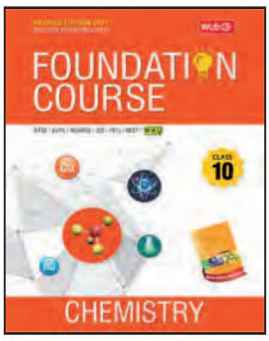

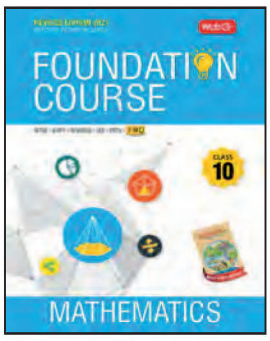

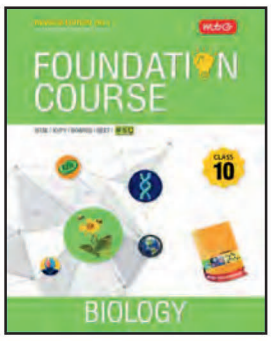

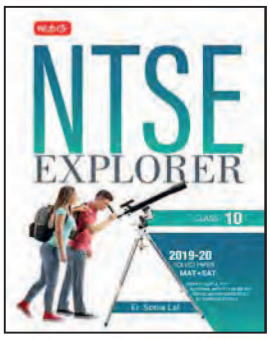

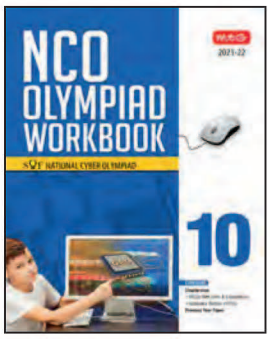

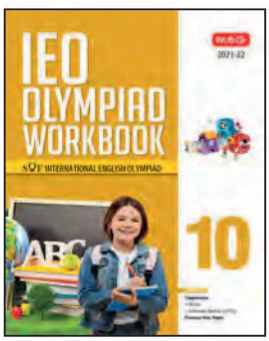

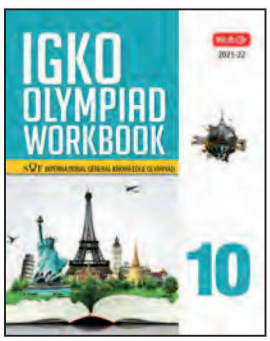

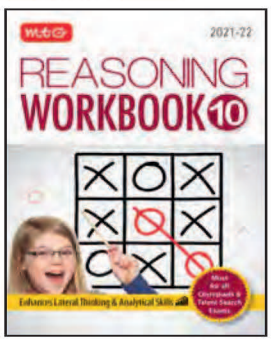

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