Question 1.
A coin placed at the bottom of a tank appears to be raised when water is poured into it. Explain.

Answer 1. This occurs due to the phenomenon of refraction of light. Here, the ray of light from the coin travels from a denser medium to a rarer medium. In this process, it bends away from the normal. The point from which the refracted rays appear to come gives the apparent position of the coin. As the rays appear to come from a point above the coin, so, the coin seems to be raised.

Question 2.
A 5 cm tall object is placed perpendicular to the principal axis of a convex lens of focal-length 20 cm. The distance of the object from the lens is 30 cm. Find the:
(i) position
(ii) nature
(iii) size of the image formed.
Question 3

A 5cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 10 cm. The distance of the object from the lens is 15 cm. Find the nature, position and size of the image. Also find its magnification.

Answer :-
Question 4 :-

One half of a convex lens is covered with a black paper.
(a) Show the formation of image of an object placed at 2F1, of such covered lens with the help of ray diagram. Mention the position and nature of image.
(b) Draw the ray diagram for same object at same position in front of the same lens, but now uncovered. Will there be any difference in the image obtained in the two cases? Give reason for your answer.

Answer 4 :-

\[ h_o = 5 \text{ cm}, \ f = 10 \text{ cm}, \ u = -15 \text{ cm}, \ v = ? \]

Using lens formula
\[ \frac{1}{f} = \frac{1}{v} - \frac{1}{u} \]
\[ \frac{1}{10} = \frac{1}{v} - \frac{1}{-15} \]
or \[ v = 30 \text{ cm} \]

Now \[ m = \frac{v}{u} = -2 \]

Now
\[ \frac{h_i}{h_o} = -2 \]
or \[ h_i = -10 \text{ cm} \]

So, image is real, inverted and enlarged
Complete image will be formed when the one half of a convex lens is covered with a black paper. Basically the other half refract to form the final image.

The image formation is shown above.

Full images are formed in both the cases. It is just the intensity of the image which is different. The intensity of image in Case 1 will be half of Case 2.

Question 5 :-

A 10 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 30 cm. The distance of the object from the lens is 20 cm. Find the:
(a) Position
(b) Nature
(c) Size of the image formed.

Answer 5 :-
Given that \( f = 30\, \text{cm} \), \( u = -20\, \text{cm} \), \( v = ? \)

Using Lens formula
\[
\frac{1}{f} = \frac{1}{v} - \frac{1}{u}
\]
\[
\frac{1}{30} = \frac{1}{v} - \frac{1}{-20}
\]

\( v = -60\, \text{cm} \)

Hence the image is at a distance of \( 60\, \text{cm} \) from the lens. The negative sign indicates it is on the same side on lens as the object and it is a real image.

Now the size can be obtained using the magnification formula
\[
m = \frac{h_i}{h_o} = \frac{v}{u}
\]
\[
h_i = \frac{-60}{-20}
\]
\[
h_i = 30\, \text{cm}
\]

Hence Position of image is \( 60\, \text{cm} \) on same side of lens and image is \( 30\, \text{cm} \) and it is erect image.

Question 6 :-

A 6 cm 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.

Answer 6 :-
Given that \( f=15\text{cm} \), \( u=-10\text{cm} \), \( v=? \)

Using Lens formula,
\[
\frac{1}{f} = \frac{1}{v} - \frac{1}{u}
\]
\[
\frac{1}{15} = \frac{1}{v} - \frac{1}{-10}
\]
\( v = -30 \text{ cm} \)

Hence the image is at a distance of 30 cm from the lens. The negative sign indicates it is on the same side on lens as the object and it is a real image.

Now the size can be obtained using the magnification formula
\[
m = \frac{h_i}{h_o} = \frac{v}{u}
\]
\[
\frac{h_i}{6} = \frac{-30}{-10}
\]
\( h_i = 18\text{cm} \)

Hence Position of image is 30 cm on same side of lens and image is 18 cm and it is erect image

*This document is prepared in home.*
Assignment (Physics)
NOTE :-

1.) Question no. 1 to 4 each one is of 1 mark.
2.) Question no. 5 & 6 of 3 marks each.
3.) Question no. 7 & 8 of 5 marks each.

Total Mark :- 20

1. An object is placed 20 cm in front of a plane mirror. The mirror is moved 2 cm towards the object. The distance between the positions of the original and final images seen in the mirror is:

(a) 2 cm

(b) 4 cm

(c) 10 cm

(d) 22 cm
2. A ray of light that strikes a plane mirror PQ at an angle of incidence of 30°, is reflected from the plane mirror and then strikes a second plane mirror QR placed at right angles to the first mirror. The angle of reflection at the second mirror is:

(a) 30°
(b) 45°
(c) 60°
(d) 90°

3. An object is placed at 100 mm in front of a concave mirror which produces an upright image (erect image). The radius of curvature of the mirror is:

(a) Less than 100 mm
(b) Between 100 mm and 200 mm
(c) Exactly 200 mm
(d) More than 200 mm
4. Which position of the object will produce a magnified virtual image, if a concave mirror of focal length 15 cm is being used?

(a) 10 cm  
(b) 20 cm  
(c) 30 cm  
(d) 35 cm

5. Refractive index of diamond with respect to glass is 1.6 and absolute refractive index of glass is 1.5. Find out the absolute refractive index of diamond.

6. A convex lens of focal length 20 cm can produce a magnified virtual as well as real image. Is this a correct statement? If yes, where shall the object be placed in each case for obtaining these images?

7. Size of image of an object by a mirror having a focal length of 20 cm is observed to be reduced to 1/3rd of its size. At what distance the object has been placed from the mirror? What is the nature of the image and the mirror?

8. Define power of a lens. What is its unit? One student uses a lens of focal length 50 cm and another of -50 cm. What is the nature of the lens and its power used by each of them?

- This assignment is prepared from home.