INDIAN SCHOOL AL WADI AL KABIR		
Class: X	Department: SCIENCE 2020-2021 SUBJECT-PHYSICS	Date of submission: 22.07.2020
Worksheet No:3 WITH ANSWERS	Topic: LIGHT -REFLECTION AND REFRACTION-PART 1	Note: A4 FILE FORMAT [PORTFOLIO]
NAME OF THE STUDENT	CLASS & SEC:	ROLL NO.

OBJECTIVE TYPE QUESTIONS

1. An object is placed at a distance of 0.25 m in front of a plane mirror. The distance between the object and image will be

    (a) 0.25 m   (b) 1.0 m

    (c) 0.5 m   (d) 0.125 m

    Ans:- (c)0.5m

2. The angle of incidence for a ray of light having zero reflection angle is

    (a) 0   (b) 30°

    (c) 45°   (d) 90°

    Ans:- (a) 0

3. Which of the following mirror is used by a dentist to examine a small cavity?

    (a) Convex mirror   (b) Plane mirror

    (c) Concave mirror   (d) Combination of convex and concave mirror

    Ans:- (c) Concave mirror

4. 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

5. An object at a distance of 15 cm is slowly moved towards the pole of a convex mirror. The image will get

    (a) shortened and real   (b) enlarged and real

    (c) enlarge and virtual   (d) diminished and virtual

    Ans:- (d) diminished and virtual

ASSERTION AND REASONING

DIRECTION: In the following questions, 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.
(e) Both Assertion and Reason are false.

6. **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.
   Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

7. **Assertion**: The height of an object is always considered positive.
   Reason: An object is always placed above the principal axis in this upward direction.
   Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

8. **Assertion**: When a concave mirror is held under water, its focal length will increase.
   Reason: The focal length of a concave mirror is independent of the medium in which it is placed.
   Ans : (d) Assertion (A) is false but reason (R) is true

9. **Assertion**: A ray incident along normal to the mirror retraces its path.
   Reason: In reflection, angle of incidence is always equal to angle of reflection.
   Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

10. **Assertion**: A convex mirror is used as a driver's mirror.
    Reason: Because convex mirror's field of view is large and images formed are virtual, erect and diminished.
    Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

11. **Assertion**: The mirror used in search lights are concave spherical.
    Reason: In concave spherical mirror the image formed is always virtual.
    Ans : (c) Assertion (A) is true but reason (R) is false

ONE MARK TYPE QUESTIONS

12. An object is placed at a distance of 10 cm in front of a plane mirror, then the distance of image from mirror will be
    Ans:- 10cm (The distance of image is equal to the distance of object from mirror. Therefore, the distance of image from mirror is 10 cm.)

13. The centre of the reflecting surface of a spherical mirror is a point called the ....
    Ans : Pole

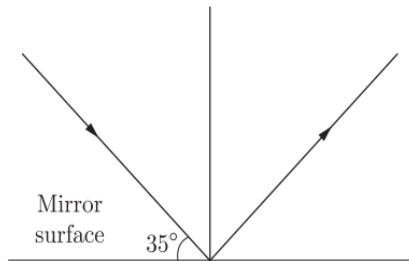14. The mirror used in the construction of shaving glass is .... mirror.
    Ans : Concave

15. Parallel rays of light are reflected by a concave mirror to a point called the ....

The focal length is the distance from the .... to the pole of mirror.

Ans : Focus point, focus

TWO MARKS TYPE QUESTIONS

16. Find the angle of incidence and angle of reflection from the diagram

Ans:- $55^0,55^0$

17. An object is placed 60 cm in front of a concave mirror. The real image formed by the mirror is located 30 cm in front of the mirror. What is the object's magnification?
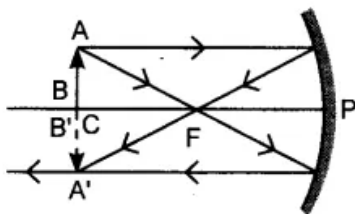
Ans:- *m= -v/u*

   v= -30 cm
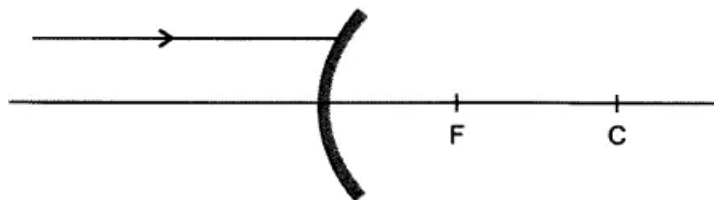
   u= -60cm

   m= -(-30/-60)

   = -0.5

18. Draw the ray diagram in each case to show the position and nature of the image formed when the object is placed at the centre of curvature of a concave mirror
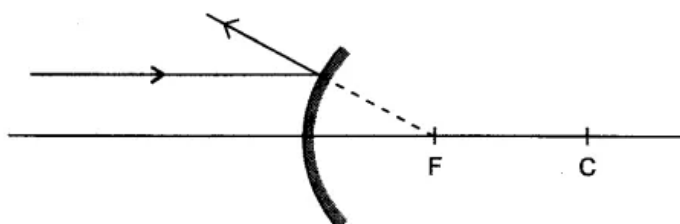
Ans:-

19. Redraw the diagram given below in your answer book and show the direction of the light ray after reflection from the mirror.

Ans:-

THREE MARKS TYPE QUESTIONS

20. 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 _____

Ans:-

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

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

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.

21. An object 2 cm in size is placed 30 cm in front of a concave mirror of focal length 15 cm. At what distance from the mirror should a screen be placed in order to obtain a sharp image?

Ans:-

$f = -15$ cm, $h_o = 2$ cm, $u = -30$ cm.

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

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{-15} - \frac{1}{-30}$$

$$= \frac{2-1}{-30} = \frac{1}{-30}$$

$\Rightarrow \quad v = -30$ cm

22. It is desired to obtain an erect image of an object, using a concave mirror of focal length 20 cm.

(i) What should be the range of distance of the object from the mirror?

(ii) Will the image be bigger or smaller than the object?

(iii) Draw a ray diagram to show the image formation in this case.

Ans:-

(*i*) Range of the object distance is 0 to 20 cm from the pole.

(*ii*) Image will be bigger than the object.

(*iii*) Ray diagram:
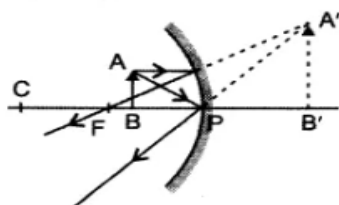
FIVE MARKS TYPE QUESTIONS

23. List the sign conventions for reflection of light by spherical mirrors. Draw a diagram and apply these conventions in the determination of focal length of a spherical mirror which forms three times magnified real image of an object placed 16 cm in front of it.

Ans:-Sign conventions for reflection of light by spherical mirror are:

1. The object is always placed to the left of the mirror.
2. All the distances parallel to the principal axis are always measured from the pole of the spherical mirror.
3. All the distances measured along the direction of incident light (along +ve x-axis), are considered to be positive.
4. Those distances measured opposite to the direction of incidence light (i.e. along -ve x-axis), are taken as negative.
5. The distances measured in upward direction, i.e. perpendicular to and above the principal axis (along +ve y-axis), are taken as positive.
6. The distances measured in the downward direction, (along -ve y-axis), i.e. perpendicular to and below the principal axis are taken as negative.

From the question

$$u = -16 \text{ cm}, \ m = -3 \text{ for real image}$$

But

$$m = -\frac{v}{u} = -3$$

$$\Rightarrow \quad v = 3u = 3(-16) = -48 \text{ cm}.$$

Using mirror formula,
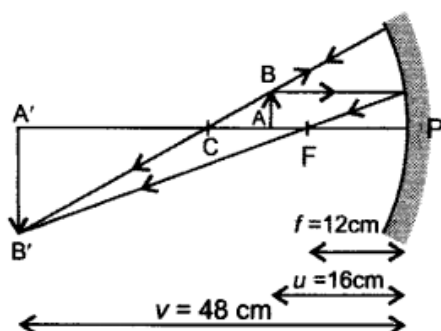
$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

We get,

$$\frac{1}{f} = \frac{1}{-48} + \frac{1}{-16}$$

$$= \frac{1}{-48} - \frac{1}{16} = \frac{-1-3}{48} = \frac{-4}{48} = \frac{-1}{12}$$

or

$$f = -12 \text{ cm}$$

So, focal length of spherical mirror is 12 cm. Negative sign of focal length indicates that mirror is concave in nature.

PREVIOUS YEAR BOARD QUESTIONS

24. Explain why a ray of light passing through the centre of curvature of a concave mirror, gets reflected along the same path. CBSE 2010

Ans:-The ray passing through the centre of curvature incident to the mirror along its normal so $\angle i = \angle r = 0$. Therefore, the ray retraces its path.

25. What is the nature of the image formed by a concave mirror if the magnification produced by the mirror is +3? CBSE 2010

Ans:- Positive sign of magnification indicates that image is virtual, erect and enlarged.

26. State the two laws of reflection of light. CBSE 2019

Ans:-Laws of reflection of light are:

1. *The angle of incidence is equal to the angle of reflection.*
2. *The incident ray, the normal to the reflecting surface at the point of incidence and reflected ray from that point, all lies in the same plane.*

27. Distinguish between a real and a virtual image of an object. What type of image is formed (i) by a plane mirror, (ii) on a cinema screen?   CBSE 2011

Ans:- If light rays after reflection actually meet a point to form an image on its own, it is called a real image. If the light rays appear to meet and they form a virtual image. Real image can be obtained on a screen, while a virtual image cannot be.
(i) Plane mirror forms virtual image.
(ii) On cinema screen, real image is formed.

28. Name the type of mirror used in the following situations:
(i) Headlights of a car (ii) Rear-view mirror of vehicles (iii) Solar furnace Support your answer with reason.   CBSE 2012

Ans:-Type of mirror used in
(i) Headlights of a car: Concave mirror Concave mirror is used because light from the bulb placed at the focus of it gets reflected and produces a powerful parallel beam of light to illuminate the road.
(ii) Rear view mirror of vehicles: Convex mirror
Convex mirror is used because it always produces a virtual, and erect image whose size is smaller than the object. Therefore it enables the driver to see wide field view of the traffic behind the vehicle in a small mirror.
(iii) Solar furnace: Concave mirror
Concave mirror has the property to concentrate the sunlight coming from sun along with heat radiation at its focus. As a result, temperature at its focus increases and the substance placed at the focal point gets heated to a high temperature.

EXEMPLAR QUESTIONS

29. The magnification produced by a plane mirror is +1. What does this mean ?

Ans:-Since magnification, $m = \dfrac{h'}{h} = \dfrac{-v}{u}$. Given, m = +1, so h' = h and v = -u

(i) m = 1 indicates the size of image is same as that of object.
(ii) positive sign of m indicates that an erect image is formed.

The opposite signs of v and u indicate that image is formed on the other side of the mirror from where the object is placed i.e., image is formed behind the mirror and thus image formed is virtual.

30. 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 focused image can be obtained ? Find the size and the nature of the image.

Ans:- Here, object size, h = +7.0 cm,
object distance, u = -27 cm
and focal length, f = -18 cm
Image distance, v = ?
and image size, h' = ?
From the mirror formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$, we have

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} \quad \text{or} \quad \frac{1}{v} = \frac{1}{-18} - \frac{1}{-27} = \frac{-3+2}{54} = -\frac{1}{54} \quad \text{or} \quad v = -54 \text{ cm}$$

The screen should be placed at a distance of 54 cm on the object side of the mirror to obtain a sharp image.

Now, magnification, $m = \frac{h'}{h} = -\frac{v}{u}$

or image size, $h' = -\frac{vh}{u} = \frac{(-54) \times (+7)}{(-27)} = -14$ cm.

The image is real, inverted and enlarged in size.

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