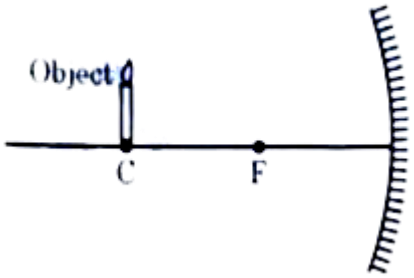
	INDIAN SCHOOL AL WADI AL KABIR	
Class: X	**Department: SCIENCE 2023 – 24** **SUBJECT: PHYSICS**	**Date of submission:** **MAY 2023**
Worksheet No: 1 **WITH ANSWERS**	**CHAPTER: LIGHT REFLECTION AND REFRACTION -PART 1**	**Note:** **A4 FILE FORMAT**
NAME OF THE STUDENT	**CLASS & SEC:**	**ROLL NO.**

OBJECTIVE TYPE QUESTIONS

1.



Which of the following statement is not true in reference to the diagram shown above?

(a) Image formed is real.

(b) Image formed is enlarged.

(c) Image is formed at a distance equal to double the focal length.

(d) Image formed is inverted.

2. The radius of curvature of a converging mirror is 30 cm. At what distance from the mirror should an object be placed so as to obtain a virtual image?

(a) infinity

(b) 30 cm

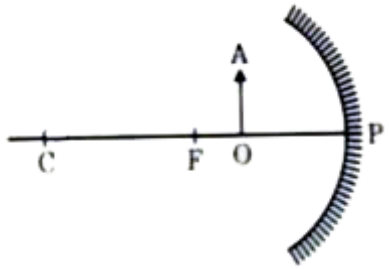
(c) Between 16 cm and 30 cm

(d) Between 0 cm and 15 cm

3. An object of height 4 cm is kept at a distance of 30 cm from the pole of a diverging mirror. If the focal length of the mirror is 10 cm, the height of the image formed is

a)+3.0cm b) +2.5cm c) +1.0cm d) +0.75 cm

4.



For the diagram shown, according to the new Cartesian sign convention the magnification of the image formed will have the following specifications:

a. Sign -Positive, Value -Less than 1
b. Sign- Positive, Value -More than 1
c. Sign -Negative, Value - Less than 1
d. Sign -Negative, Value - More than 1

5. An object is placed in front of a convex mirror at infinity. According to the new cartesian sign convention, the sign of the focal length and the sign of the image distance in this case respectively:

a)+,- b)-,+ c)-,- d) +,+

6. There are certain rules for the image formation in spherical mirror. Which of the following are applicable in convex mirror?

i. In a convex mirror a ray of light parallel to the principal axis after reflection appears to diverge from the focus.
ii. In a convex mirror a ray of light directed towards the centre of curvature after reflection is reflected back along the same direction.
iii. In a convex mirror a ray of light passing through the optical centre goes without any deviation.
iv. In a convex mirror a ray of light directed towards the focus after reflection goes parallel to the principal axis.

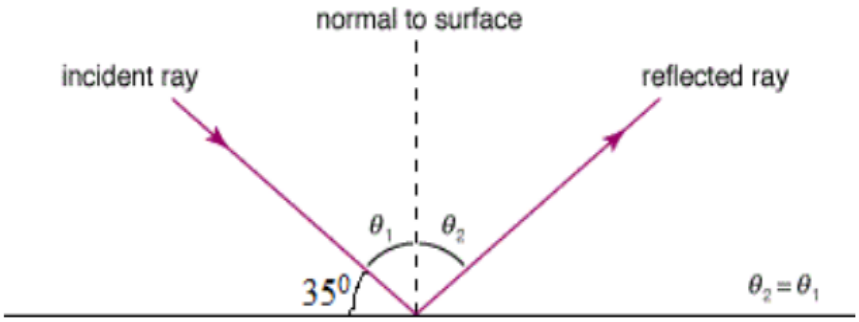
Choose the correct option

a. (i)(ii) and (iii)
b. (i) (ii)and (iv)
c. (ii) (iii)and (iv)
d. (i) (iii)and (iv)

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) virtual, erect and smaller in size
(c) real, inverted and enlarged (d) virtual, upright and enlarged

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



(a)55^0, 45^0 (b) 45^0, 55^0 (c)55^0, 55^0 (d)45^0, 45^0

9. 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
10. The radius of curvature of concave mirror is 14 cm. Then, the focal length will be
   (a) 14 cm (b) 7 cm
   (c) -28 cm (d) -7 cm

ASSERTION AND REASONING

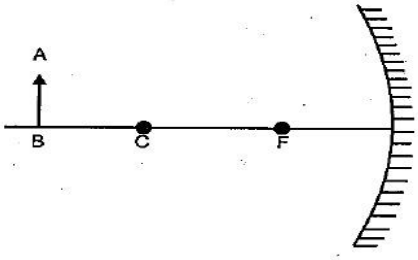
DIRECTION: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (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.

11. **Assertion**: The height of an object is always considered positive.
    Reason: An object is always placed above the principal axis in this upward direction.
12. **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.
13. **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.
14. **Assertion**: A convex mirror is used as a driver's mirror.
    Reason: Because convex mirror's field of view is small and images formed are virtual, erect and diminished.

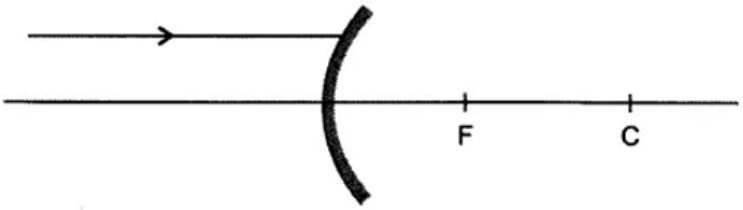
15. **Assertion**: The mirror used in search lights are concave spherical.
Reason: In concave spherical mirror the image formed is always virtual.
16. **Assertion :** A ray passing through the centre of curvature of a concave mirror after reflection, is reflected back along the same path.
Reason : The incident rays fall on the mirror along the normal to the reflecting surface.
17. **Assertion(A) :** The height of an object is always considered positive.
Reason (R) : An object is always placed above the principal axis in this upward direction.
18. **Assertion(A) :** Concave mirrors are used as make-up mirrors.
Reason (R) : When the face is held within the focus of a concave mirror, then a diminished image of the face is seen in the concave mirror.
19. **Assertion(A) :** Mirror formula can be applied to a plane mirror.
Reason (R) : A plane mirror is a spherical mirror of infinite focal length.
20. **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.

TWO MARKS TYPE QUESTIONS

21. a. What is the magnification produced if an object is placed at the centre of curvature of a concave mirror?
b. Complete the ray diagram and show the position of the image

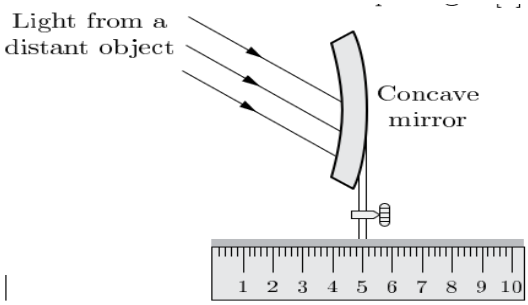


22. a. Redraw the diagram given below in your answer book and show the direction of the light ray after reflection from the mirror.

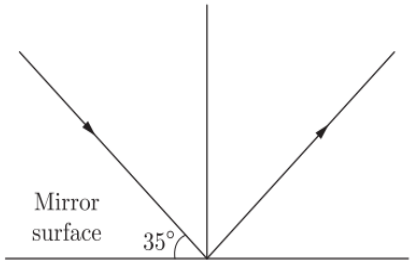


b. If the image formed by a spherical mirror for all positions of the object placed in front of it is always erect and diminished, what type of mirror is it?

23. In the below set-up, the focal length of the concave mirror is 4.0 cm. Where should the screen be placed on the scale to obtain a sharp image?



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



25. An object is placed 80 cm in front of a concave mirror. The real image formed by the mirror is located 40 cm in front of the mirror. What is the object's magnification?

THREE MARKS TYPE QUESTIONS

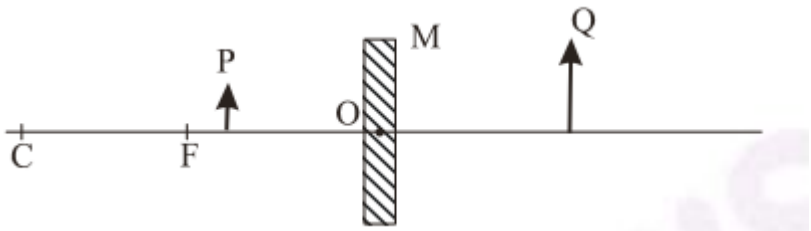
26. a) To get an enlarged, real and inverted image of an object by a concave mirror, where should the object be placed? Draw a labelled ray diagram to justify your answer.
    (b) If an object is placed at the centre of curvature of this mirror, what will be the magnification produced?
27. If a man's 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 _____
28. 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? Draw the ray diagram for the image formation.
29. 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.
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.

FIVE MARKS TYPE QUESTIONS

31. (i) A concave mirror of focal length 10 cm can produce a magnified real as well as virtual image of an object placed in front of it. Draw ray diagrams to justify this statement.

(ii) An object is placed perpendicular to the principal axis of a convex mirror of focal length 10 cm. The distance of the object from the pole of the mirror is 10 cm. Find the position of the image formed.

32. 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.
33. (a) Define the following terms in the context of spherical mirrors :
    (i) Pole
    (ii) Centre of curvature
    (iii) Principal axis
    (iv) Principal focus
    (b) Draw ray diagrams to show the principal focus of a :
    (i) Concave mirror
    (ii) Convex mirror
    (c) Consider the following diagram in which M is a mirror and P is an object and Q is its magnified image formed by the mirror.



State the type of the mirror M and one characteristic property of the image Q.

CASE STUDY QUESTIONS/PASSAGE BASED QUESTIONS

34. *Read the following and answer any four questions from (i) to (v).*

The spherical mirror forms different types of images when the object is placed at different locations. When the image is formed on screen, the image is real and when the image does not form on screen, the image is virtual. When the two reflected rays meet actually, the image is real and when they appear to meet, the image is virtual.
A concave mirror always forms a real and inverted image for different positions of the object. But if the object is placed between the focus and pole. the image formed is virtual and erect.
A convex mirror always forms a virtual, erect and diminished image. A concave mirror is used as doctor's head mirror to focus light on body parts like eyes, ears, nose etc., to be examined because it can form erect and magnified image of the object. The convex mirror is used as a rear view mirrors in automobiles because it can form an small and erect image of an object.

(i) When an object is placed at the centre of curvature of a concave mirror, the image formed is
    (a) larger than the object
    (b) smaller than the object

(c) same size as that of the object
(d) highly enlarged

(ii) No matter how far you stand from a mirror, your image appears erect. The mirror is likely to be
(a) plane
(b) concave
(c) convex
(d) either plane or convex.

(iii) A child is standing in front of a magic mirror. She finds the image of her head bigger, the middle portion of her body of the same size and that of the legs smaller. The following is the order of combinations for the magic mirror from the top.
(a) Plane, convex and concave
(b) Convex, concave and plane
(c) Concave, plane and convex
(d) Convex, plane and concave

(iv) To get an image larger than the object, one can use
(a) convex mirror but not a concave mirror
(b) a concave mirror but not a convex mirror
(c) either a convex mirror or a concave mirror
(d) a plane mirror.

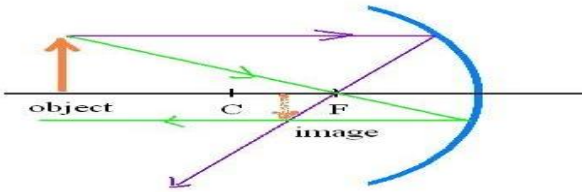
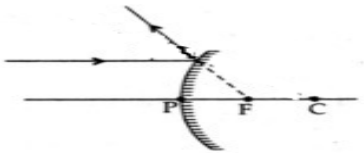
(v) A convex mirror has wider field of view because
(a) the image formed is much smaller than the object and large number of images can be seen.
(b) the image formed is much closer to the mirror
(c) both (a) and (b)
(d) none of these.

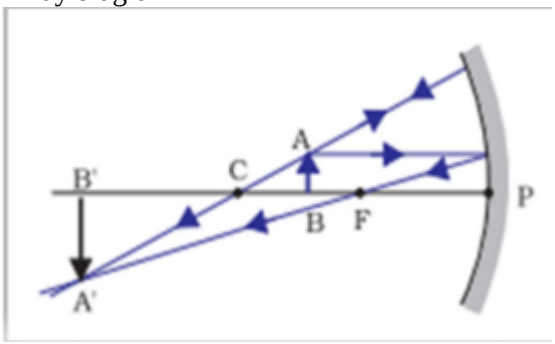
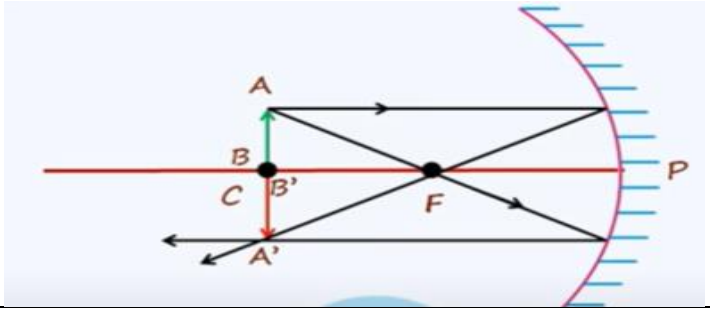
35. Highly polished smooth surface from which most of the light is reflected is called a mirror. There are two types of mirrors; plane mirror and curved mirror. Plane mirror is a mirror whose reflecting surface is plane and a curved mirror is a mirror whose reflecting surface is curved one. It may be of any shape - spherical, elliptical or parabolic. There are two types of spherical mirrors; concave mirror and convex mirror. In a concave mirror, the reflecting surface faces inwards. The reflection takes place only at the inner surface. In a convex mirror, the reflecting surface faces outwards. Thus the spherical mirror that has a convex reflecting surface is called a convex mirror.

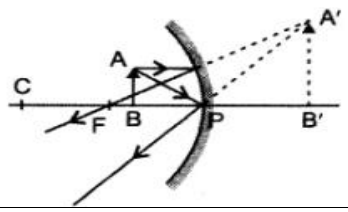
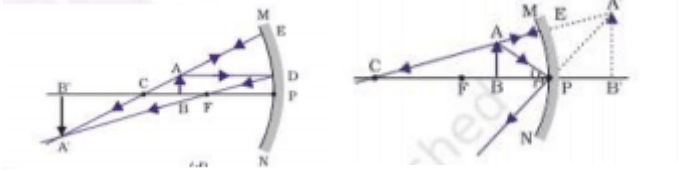
(i) What is the radius of curvature of a mirror having focal length 15 cm.
(ii) What is the nature of the image formed by a concave mirror if the magnification produced by the mirror is +3?
(iii) What kind of mirrors are used in the headlights of a motor-car and why?

OR

(iii) An object is placed 60cm in front of a convex mirror. The virtual image formed by the mirror is located 30 cm behind the mirror. What is the magnification? Write the characteristics of the image.

ANSWER KEY	
1	(b) Image formed is enlarged.
2	(d) Between 0 cm and 15 cm
3	c) +1.0cm
4	b) Sign- Positive, Value -More than 1
5	d) +,+
6	b. (i) (ii)and (iv)
7	(c) real, inverted and enlarged
8	(c)55^0, 55^0
9	(c) Concave mirror
10	(d) -7 cm
11	(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
12	(d) Assertion (A) is false but reason (R) is true
13	(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
14	(c) Assertion (A) is true but reason (R) is false
15	(c) Assertion (A) is true but reason (R) is false
16	(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
17	(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
18	(c) Assertion (A) is true but reason (R) is false
19	(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
20	(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
21	-1 
22	 Convex mirror
23	1 cm on the scale
24	*55^0,55^0*
25	*m= -v/u* *v= -40 cm* *u= -80cm*

	m= -(-40/-80) *= -0.5*
26	a)Between F and C • Ray diagram  b) Magnification produced is (-)1 (if 1 is written deduct ½ mark) Image formed is of same size, real and inverted (Note : If a candidate writes give ½ mark)
27	$m = -\frac{v}{u} \Rightarrow 1.5 = -\frac{v}{-25}$ $\Rightarrow v = \frac{75}{2}$ cm Now, from mirror formula, $\frac{1}{f} = \frac{1}{v} + \frac{1}{u} = \frac{1}{75/2} + \frac{1}{-25} = -\frac{1}{75}$ $\therefore f = -75$ cm *Hence, focal length of concave mirror is 75 cm.*
28	$f = -15$ cm, $h_o = 2$ cm, $u = -30$ cm. Using, $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$, we get $\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{-15} - \frac{1}{-30}$ $= \frac{2-1}{-30} = \frac{1}{-30}$ $\Rightarrow v = -30$ cm 

29	(*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: 
30	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 $\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$ or $\frac{1}{v} = \frac{1}{-18} - \frac{1}{-27} = \frac{-3+2}{54} = -\frac{1}{54}$ or $v = \mathbf{-54\ cm}$ 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, $h' = -\frac{vh}{u} = \frac{(-54)\times(+7)}{(-27)} = \mathbf{-14\ cm.}$ The image is real, inverted and enlarged in size.
31	 Real Virtual f =+ 10 cm u = -10 cm => 1/f = (1/v)+(1/u) => 1/10 = 1/v+ 1/-10 =>1/v = (1/+10) - (1/-10) =>1/v = (1/10)+(1/10) =>1/v = 2/10 => v = 10/2 => v = +5 cm
32	*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

$u = -16$ cm, $m = -3$ for real image

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

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

Using mirror formula,

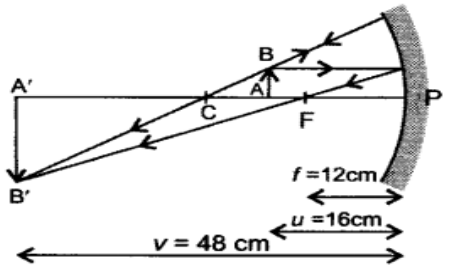
$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

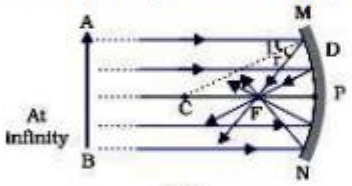
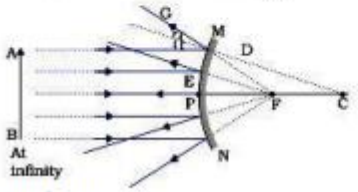
We get, $\frac{1}{f} = \frac{1}{-48} + \frac{1}{-16}$

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

or $f = -12$ cm

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



33	a) i) Pole – Centre of the reflecting surface of the mirror. ii) Centre of curvature – The centre of the hollow sphere of which the reflecting surface of mirror forms a part. iii) Principal axis – Straight-line passing through the pole and the centre of curvature of a spherical mirror. iv) Principal focus – Incident rays parallel to principal axis, after reflection, either converge to or appear to diverge from a fixed point on the principal axis called principal focus of the spherical mirror. 4x ½ b) i)  1 ii)  1 c) Concave mirror ½ Image formed is virtual ½
34	i.(c) same size as that of the object ii.(d) either plane or convex. iii.(c) Concave, plane and convex iv.(b) a concave mirror but not a convex mirror v.(c) both (a) and (b)
35	(a) The radius of curvature = 30 cm (b) The image is virtual, erect and magnified. (c) Concave mirrors (1) are used in head- lights to get powerful beam of light. This is because when a lighted bulb is placed at the focus of a concave reflector, it produces a powerful beam of parallel light rays. (1) OR (c) m = -v / u = - 30 / - 60 (1⁄2) m = 1⁄2 , (1⁄2) Image is virtual ,erect and smaller than the object. (1)

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