INDIAN SCHOOL AL WADI AL KABIR

Class: X	Department: SCIENCE 2021-2022 SUBJECT-PHYSICS	Date of submission: 06.05.2021
Worksheet No:1	Topic: LIGHT -REFLECTION AND REFRACTION-PART 1	Note: A4 FILE FORMAT [PORTFOLIO]
NAME OF THE STUDENT	CLASS & SEC:	ROLL NO.

OBJECTIVE TYPE QUESTIONS

1. The image formed by concave mirror is real, inverted and of the same size as that of the object. The position of object should be
   (a) at the focus   (b) at the centre of curvature
   (c) between focus and centre of curvature   (d) beyond centre of curvature

2. 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

3. The angle of incidence for a ray of light having zero reflection angle is
   (a) 0   (b) 30°
   (c) 45°   (d) 90°

4. 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

5. The radius of curvature of concave mirror is 12 cm. Then, the focal length will be
   (a) 12 cm   (b) 6 cm
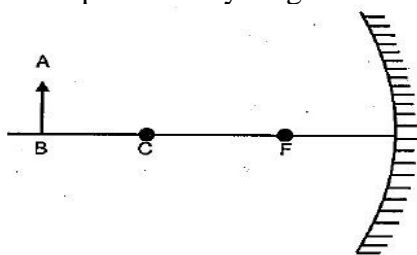   (c) -24 cm   (d) -6 cm

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.

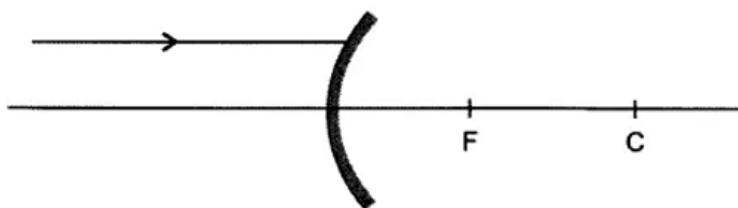(e) Both Assertion and Reason are false.

6. **Assertion**: The height of an object is always considered positive.
    Reason: An object is always placed above the principal axis in this upward direction.
7. **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.
8. **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.
9. **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.
10. **Assertion**: The mirror used in search lights are concave spherical.
    Reason: In concave spherical mirror the image formed is always virtual.

ONE MARK TYPE QUESTIONS

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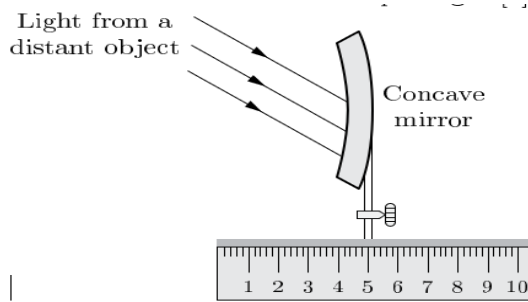12. Complete the ray diagram and show the position of the image

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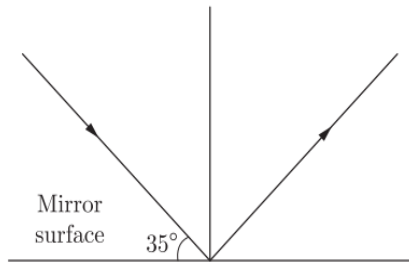

14. If the image formed by a spherical mirror for all positions of the object placed in front of it is always erect and diminished, what type of mirror is it?
15. An object is placed at a distance of 0.25 m in front of a plane mirror. What will be the distance between the object and image?

TWO MARKS TYPE QUESTIONS

16. 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?

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

18. 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?

19. 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

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 _____

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? Draw the ray diagram for the image formation.

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.

FIVE MARKS TYPE QUESTIONS

23. (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.

24. 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.

PREVIOUS YEAR BOARD QUESTIONS

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

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

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

28. 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
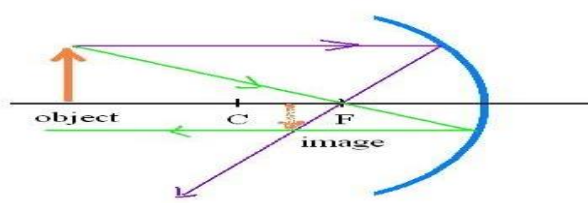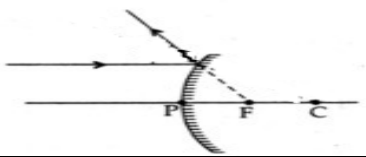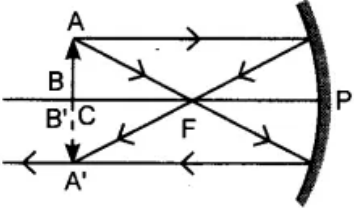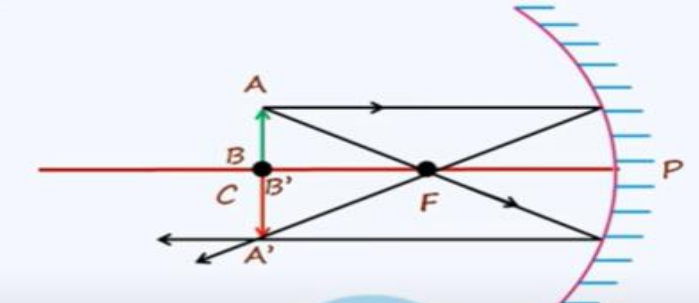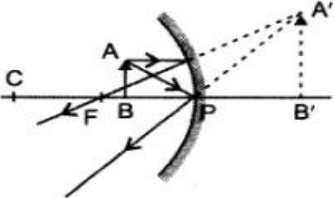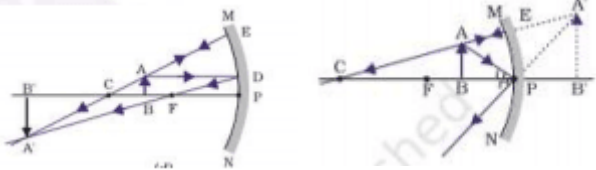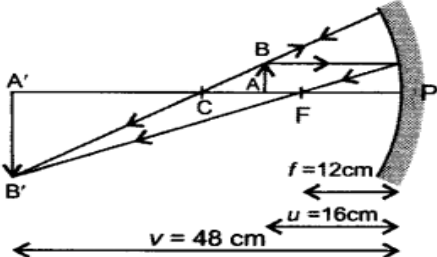
EXEMPLAR QUESTIONS

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

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.

ANSWERS

QN NO	ANSWER	MARKS
1.	(b) at the centre of curvature	1
2.	(c) real, inverted and enlarged	1
3.	(a) 0	1
4.	(c) Concave mirror	1
5.	(d) -6 cm	1
6.	*(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).*	1
7.	*(d) Assertion (A) is false but reason (R) is true*	1
8.	*(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).*	1
9.	*(c) Assertion (A) is true but reason (R) is false*	1
10.	*(c) Assertion (A) is true but reason (R) is false*	1
11.	-1	1
12.		1
13.		1
14.	Convex mirror	1
15.	0.5m	1
16.	1 cm on the scale	2
17.	$55^0, 55^0$	2
18.	*m= -v/u* *v= -40 cm* *u= -80cm* *m= -(-40/-80)* *= -0.5*	2

19.		2
20.	$$m = -\frac{v}{u} \Rightarrow 1.5 = -\frac{v}{-25}$$ $$\Rightarrow v = \frac{75}{2} \text{ cm}$$ 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.*	3
21.	$f = -15$ 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	3
22.	(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:	3
23.	Real Virtual f =+ 10 cm u = -10 cm	5

	=> 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	
24.	*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.* 	5

25.	*The ray passing through the centre of curvature incident to the mirror along its normal so ∠i= ∠r = 0. Therefore, the ray retraces its path.*	1
26.	*Positive sign of magnification indicates that image is virtual, erect and enlarged.*	1

27.	*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.*
		2

28.	*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.*	2

29	*Since magnification,* $m = \frac{h'}{h} = \frac{-v}{u}$. *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.
		3

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*
	
	$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} \quad \text{or} \quad \frac{1}{v} = \frac{1}{-18} - \frac{1}{-27} = \frac{-3+2}{54} = -\frac{1}{54} \quad \text{or} \quad v = \mathbf{-54\ cm}$$
	
	The screen should be placed at a distance of 54 cm on the object side of the mirror to obtain a sharp image.
	
	$$\text{Now,} \quad \text{magnification,}\ m = \frac{h'}{h} = -\frac{v}{u}$$
	$$\text{or} \quad \text{image size,}\ h' = -\frac{vh}{u} = \frac{(-54) \times (+7)}{(-27)} = \mathbf{-14\ cm.}$$
	
	The image is real, inverted and enlarged in size.
		5

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