

Grade10 – Physics

Worksheet

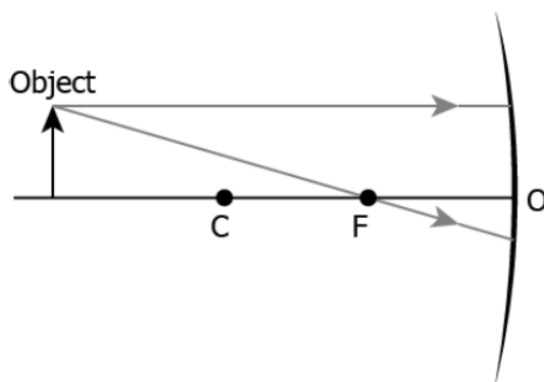
Chapter 10

Light

Multiple choice Questions:

- 1) **The angle of incidence for a light ray incident on a plane mirror is 30 degrees. What will be the angle of reflection?**
 - a) 30 degrees
 - b) 60 degrees
 - c) 90 degrees
 - d) 120 degrees
- 2) **A concave mirror is used to form an image of an object placed beyond its focus. The image formed will be:**
 - a) Real, inverted and magnified
 - b) Real, inverted and diminished
 - c) Virtual, erect and magnified
 - d) Virtual, erect and diminished
- 3) **Which of the following statements is true regarding the focal length of a convex lens?**
 - a) It is always positive
 - b) It is always negative
 - c) It can be either positive or negative
 - d) It is always zero
- 4) **The power of a concave lens of focal length 10 cm is:**
 - a) -10 dioptre
 - b) +10 dioptre
 - c) -0.1 dioptre
 - d) +0.1 dioptre

- 5) **An object is placed at a distance of 30 cm from a convex lens of focal length 20 cm. The image formed will be:**
- Real, inverted and magnified
 - Real, inverted and diminished
 - Virtual, erect and magnified
 - Virtual, erect and diminished
- 6) **The image shows the path of incident rays to a concave mirror.**



Where would the reflected rays meet for the image formation to take place?

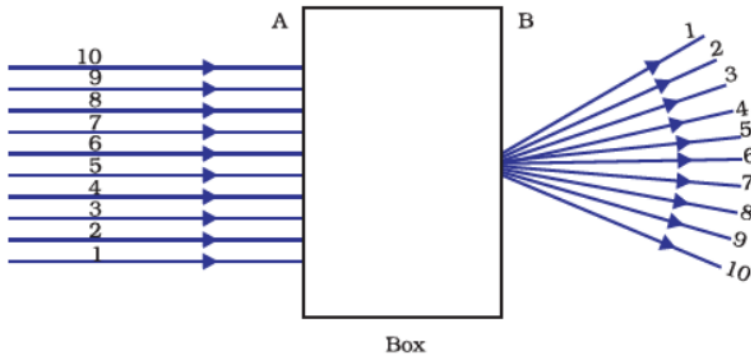
- Behind the mirror
 - Between F and O
 - Between C and F
 - Beyond C
- 7) **Twinkling of stars is due to which optical phenomenon?**
- Reflection
 - Interference
 - Refraction
 - Divergence

8) **A beam of light is incident through the holes on side A and emerges out of the holes on the other face of the box, as shown in Figure 10.4. Which of the following could be inside the box?**

- Concave lens
- Rectangular glass slab

(c) Prism

(d) Convex lens



9) Magnification produced by a rearview mirror fitted in vehicles

(a) is less than one

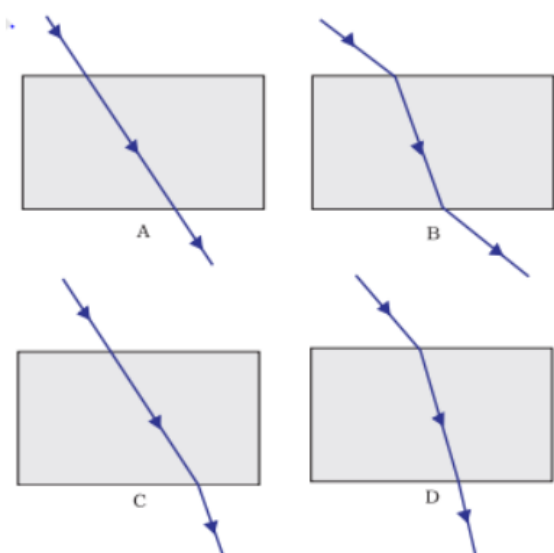
(b) is more than one

(c) is equal to one

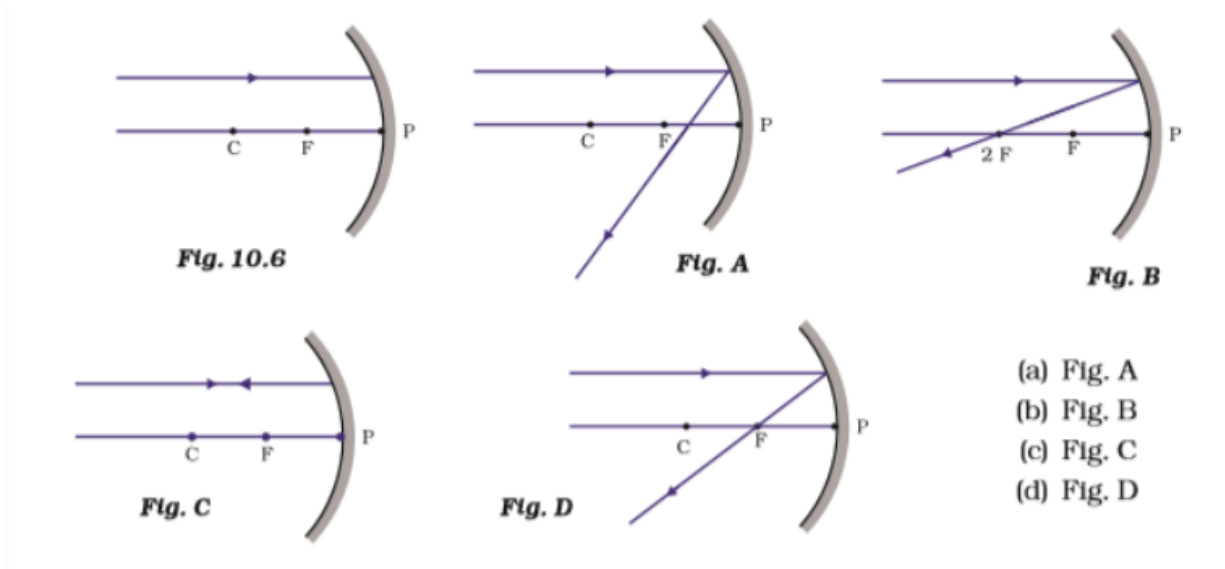
(d) can be more than or less than one, depending upon the position of the object in front of it

10) The path of a ray of light coming from air passing through a rectangular glass slab traced by four students are shown as A, B, C and D.

Which one of them is correct?



11) Which of the following ray diagrams is correct for the ray of light incident on a concave mirror as shown in Figure 10.6



- (a) Fig. A
- (b) Fig. B
- (c) Fig. C
- (d) Fig. D

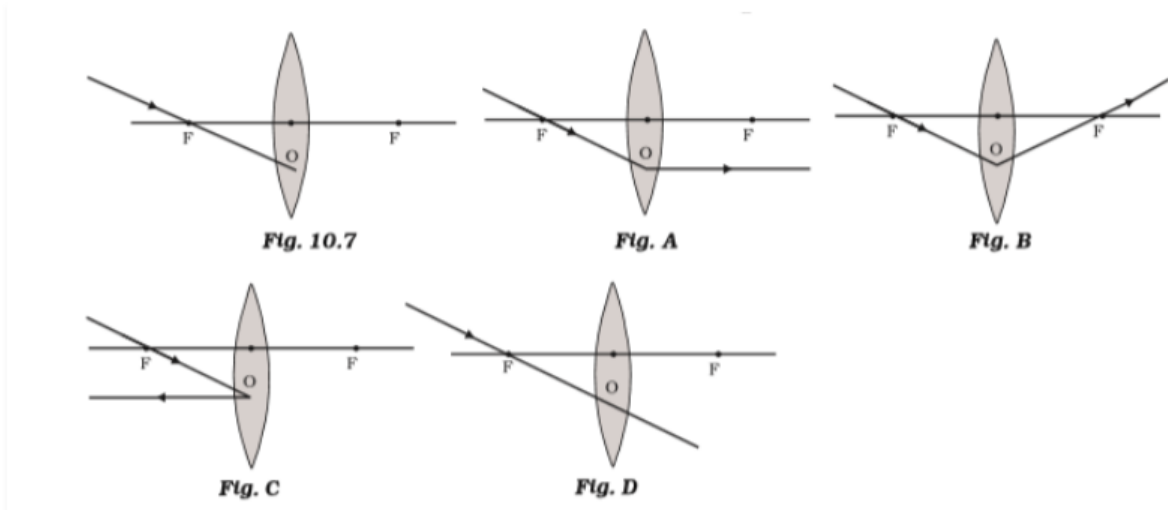
12) Which of the following ray diagrams is correct for the ray of light incident on a lens shown in Fig. 10.7?

(a) Fig. A.

(b) Fig. B.

(c) Fig. C.

(d) Fig. D.



13) 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

14) The focal length of four convex lens P, Q, R and S are 20 cm, 15 cm, 5 cm and 10 cm, respectively. The lens having the greatest power is

(a) P

(b) Q

(c) R

(d) S

15) The focal length of a lens is -0.4 m. The lens is

(a)convex

(b)concave

(c) cylindrical

(d) none of these

Answer the following:

- 1) A pencil, when dipped in water in a glass tumbler, appears to be bent at the interface of air and water. Will the pencil appear to be bent to the same extent if, instead of water, we use liquids like kerosene or turpentine? Support your answer with reasons.
- 2) List four characteristics of the images formed by plane mirrors.
- 3) 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? Draw a labelled ray diagram to support your answer.
- 4) "The magnification produced by a spherical mirror is -3 ". List four informations you obtain from this statement about the mirror/ image.
- 5) An object 4 cm in height, is placed at 15 cm in front of a concave mirror of focal length 10 cm. At what distance from the mirror should a screen be placed to obtain a sharp image of the object. Calculate the height of the image.
- 6) The image of an object formed by a mirror is real, inverted and is of magnification -1 . If the image is at a distance of 40 cm from the mirror, where is the object placed? Where would the image be if the object is moved 20 cm towards the mirror? State reason and also draw ray diagram for the new position of the object to justify your answer.
- 7) A spherical mirror produces an image of magnification -1 on a screen placed at a distance of 50 cm from the mirror.

- (a) Write the type of mirror.
 (b) Find the distance of the image from the object.
 (c) What is the focal length of the mirror?
 (d) Draw the ray diagram to show the image formation in this case.
- 8) What is meant by power of a lens? What does its sign (+ve or -ve) indicate? State its S.I. unit related to focal length of a lens.
- 9) "A ray of light incident on a rectangular glass slab immersed in any medium emerges parallel to itself." Draw labelled ray diagram to justify the statement".
- 10) The absolute refractive indices of glass and water are 1.5 and 1.33 respectively. In which medium does light travel faster? Calculate the ratio of speeds of light in the two media.
- 11) To construct a ray diagram we use two light rays which are so chosen that it is easy to know their directions after refraction from the lens. List these two rays and state the path of these rays after refraction. Use these two rays to locate the image of an object placed between ' f ' and ' $2f$ ' of a convex lens.
- 12) Draw a ray diagram in each of the following cases to show the formation of image, when the object is placed:
 (i) between optical centre and principal focus of a convex lens.
 (ii) anywhere in front of a concave lens.
 (iii) at $2F$ of a convex lens.
 State the signs and values of magnifications in the above mentioned cases (i) and (ii).
- 13) (a) 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 position, nature and size of the image formed.
 (b) Draw a labelled ray diagram showing object distance, image distance and focal length in the above case.
- 14) At what distance from a concave lens of focal length 25 cm a 10 cm tall object be placed so as to obtain its image at 20 cm from the lens. Also calculate the size of the image formed. Draw a ray diagram to justify your answer for the above situation and label it.
- 15) (a) State the laws of refraction of light. Explain the term absolute refractive index of a medium and write an expression to relate it with the speed of light in vacuum.

(b) The absolute refractive indices of two media A and B are 2.0 and 1.5 respectively. If the speed of light in medium B is 2×10^8 m/s, calculate the speed of light in

(i) vacuum

(ii) medium A

- 16) List the sign conventions that are followed in case of refraction of light through spherical lenses. Draw a diagram and apply these conventions in determining the nature and focal length of a spherical lens which forms three times magnified real image of an object placed 16 cm from the lens.

Assertion-Reason Questions

In the following questions a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

(a) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(c) Assertion is correct statement but reason is wrong

statement. (d) Assertion is wrong statement but reason is correct statement.

- 1) Assertion (A) : The centre of curvature is not a part of the mirror. It lies outside its reflecting surface. Reason (R) : The reflecting surface of a spherical mirror forms a part of a sphere. This sphere has a centre.**
- 2) Assertion (A) : A ray passing through the centre of curvature of a concave mirror after reflection, is reflected back along the same path. Reason (R) : The incident rays fall on the mirror along the normal to the reflecting surface.**
- 3) Assertion (A) : Light does not travel in the same direction in all the media. Reason (R) : The speed of light does not change as it enters from one transparent medium to another.**
- 4) Assertion (A) : A ray of light travelling from a rarer medium to a denser medium slows down and bends away from the normal. When it travels from a denser medium to a rarer medium, it speeds up and bends towards the normal. Reason (R) : The speed of light is higher in a rarer medium than a denser medium.**
- 5) Assertion (A) : The mirrors used in search lights are concave spherical. Reason (R) : In concave spherical mirror the image formed is always virtual.**
- 6) Assertion (A) : Refractive index has no units. Reason (R) : The refractive index is a ratio of two similar quantities.**

Case-Based questions

1) Case 1

A taxi driver was driving his taxi on road. Suddenly in his rear-view mirror, he saw an over-speeding car coming from behind as if the he had lost his control over the car. The taxi driver immediately turned his car towards the side of the road and stopped. Soon after that the speeding car collided with another car ahead and met with an accident. The taxi driver came out of the car and went towards the accident site. He took the injured person to the nearby hospital.

- a) What type of mirror is used for rear-view in the car? Mention the nature of the image formed.
- b) Name the mirror that can form both real and virtual image. Also draw the ray diagram of a concave mirror when the object is placed between principal focus and pole of the mirror.
- c) Plane mirrors are not used as rear-view mirrors in vehicles. Give reason
- d) Draw the ray diagram of a convex mirror when the object is placed anywhere between infinity and pole of the mirror

2) Case 2

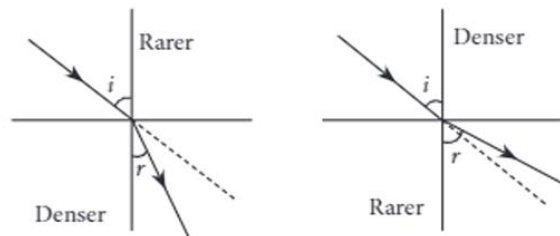
The curved surface of a spoon can be considered as a spherical mirror. A highly smooth polished surface is called mirror. The mirror whose reflecting surface is curved inwards or outwards is called a spherical mirror. Inner part works as a concave mirror and the outer bulging part acts as a convex mirror. The center of the reflecting surface of a spherical mirror is called pole and the radius of the sphere of which the mirror is formed is called radius of curvature.

- 1) The distance between pole and focal point of a spherical mirror is equal to the distance between
 - a) pole and center of curvature
 - b) focus and center of curvature
 - c) Pole and object
 - d) object and image
- 2) When a concave mirror is held towards the Sun and its sharp image is formed on a piece of carbon paper for sometime, a hole is burnt in the carbon paper. What is the name given to the distance between the mirror and carbon paper?
 - a) Radius of curvature
 - b) Focal length
 - c) Principal focus
 - d) Principal axis
- 3) The focal length of a mirror is 15 cm. The radius of curvature is

- a) 15 cm
 - b) 30 cm
 - c) 45 cm
 - d) 60 cm
- 4) The normal at any point on the mirror passes through
- a) focus
 - b) Pole
 - c) Center of curvature
 - d) any point

3)Case 3

When the rays of light travels from one transparent medium to another, the path of light is deviated. This phenomena is called refraction of light. The bending of light depends on the optical density of medium through which the light pass.



The speed of light varies from medium to medium. A medium in which the speed of light is more is optically rarer medium whereas in which the speed of light is less is optically denser medium. Whenever light goes from one medium to another, the frequency of light does not change however, speed and wavelength change. It concluded that change in speed of light is the basic cause of refraction.

- (i) When light travels from air to glass, the ray of light bends
 - (a) towards the normal
 - (b) away from normal
 - (c) anywhere
 - (d) none of these
 - (ii) A ray of light passes from a medium A to another medium B. No bending of light occurs if the ray of light hits the boundary of medium B at an angle of
 - (a) 0°
 - (b) 45°
 - (c) 90°
 - (d) 120°
 - (iii) When light passes from one medium to another, the frequency of light
 - (a) increases
 - (b) decreases
 - (c) remains same
 - (d) none of these
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- (iv) When light passes from glass to water, the speed of light
 - (a) increases
 - (b) decreases
 - (c) remains same
 - (d) first increases then decrease