CHAPTERWISE QUESTION

LIGHT - REFLECTION AND REFRACTION

CLASS X **Time : 1½ hrs.**

SET A **Mark : 40**

SECTION - A OBJECTIVE TYPE **8 × 1 = 8**

1. The image of an object placed in front of a convex mirror is formed at

   a) the object itself b) twice the distance of the object in front of the mirror

   c) half the distance of the object in front of the mirror d) behind the mirror

2. An object is placed 40.0 cm in front of a convex mirror. The image appears 15 cm behind the mirror. What is the focal length of the mirror?

   a) +24 cm b) +11 cm c) –11 cm d) –24 cm

3. Two plane mirrors are set at right angle and a flower is placed in between the mirrors. The number of images of the flower which will be seen is

   a) One b) Two c) Three d) Four

4. An object is placed at the centre of curvature of a concave mirror. The distance between its image and the pole is

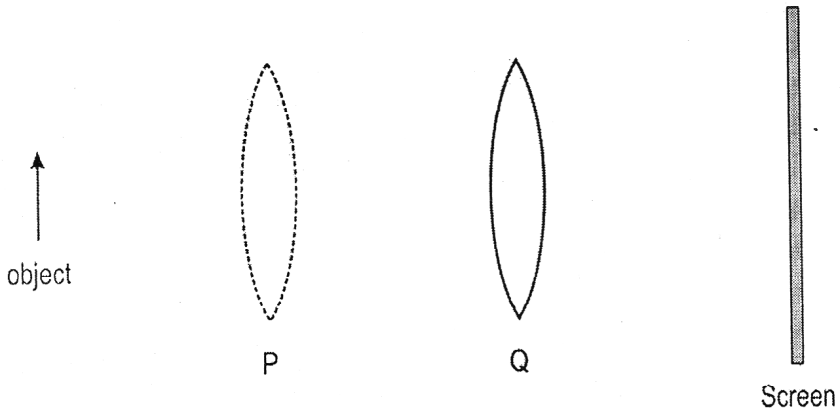
   a) equal to *f* b) between *f* and 2*f* c) equal to 2*f* d) greater than 2*f*

5. When an incident ray of light enters a medium from air, it bends towards the normal. Which of the following is True about the refractive index of the medium (n_m) as compared to the refractive index of air (n_a)?

   a) n_m is equal to n_a b) n_m is less than n_a c) n_m is more than n_a

   d) (The refractive indices cannot be compared based on the given information)

6. When a lens in placed at Q, a sharp image is formed on the screen. The image formed is real, inverted and diminished. When the lens is moved to P, another sharp image is formed on the screen.



   What is the nature of the image formed when the lens is at P?

   a) magnified and inverted b) magnified and upright

   c) diminished and upright d) diminished and inverted

7. Which of the following can make a parallel beam of light when light from a point source is incident on it?

   a) Concave mirror as well as convex lens

   b) Convex mirror as well as concave lens

   c) Two plane mirrors placed at 90^0 to each other

   d) Concave mirror as well as concave lens

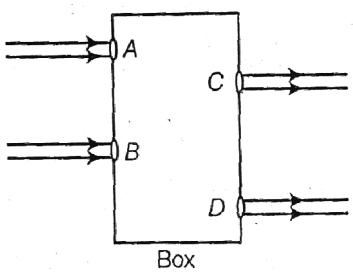
8. Beams of light are incident through the holes A and B and emerge out of box through the holes C and D respectively as shown in the figure. Which of the following could be inside the box?

   a) A rectangular glass slab

   b) A convex lens

   c) A concave lens

   d) A prism



In the following questions (No. 9-10) a statement of Assertion followed by a statement of Reason is given. Choose the correct answer out of the following choices. 2 × 1 = 2

a) If both the assertion and the reason are true and the reason is a correct explanation of the assertion.

b) If both the assertion and reason are true but the reason is not a correct explanation of the assertion.

c) Assertion is true but reason is false

d) Assertion is false but reason is true.

9. Assertion (A) : When a concave mirror is held under water, its focal length will increase.

   Reason (R) : The focal length of a concave mirror is independent of the medium in which it is placed.

10. Assertion (A) : Propagation of light through an optical fibre is due to total internal reflection taking place at the core-clade interface.

    Reason (R) : Refractive index of the material of the core of the optical fibre is greater than of air.

SECTION - B

11. a) What should be the position of the object, when a concave mirror is to be used:

    (i) as a shaving mirror, and (ii) in torches producing parallel beam of fight?

    b) A man standing in front of a mirror finds his image having a very small head and legs of normal size. What type of mirror are used in designing such a mirror? **2**

12. If the image formed by a spherical mirror for all positions of the object placed in front of it, is always erected and diminished, what type of mirror is it? Draw a labelled ray diagram to support your answer. **2**

13. Define absolute refractive index. Absolute refractive indices of medium A and medium B are n_a and n_b respectively, what is the refractive index of medium B with respect to medium A? How does the velocity of light vary with change in the optical density of the media?

OR

What is meant by radius of curvature of a spherical mirror? How is it related to the focal length of the mirror? **2**

SECTION - C

14. a) Define power of a lens and write its SI unit.

    b) A convex lens forms a real and inverted image of a needle at a distance of 50 cm from it. Where is the needle placed in front of the lens, if image size is equal to the object size? Also, find the power of the lens. **3**

15. A student wants to project the image of a candle flame on a screen 60 cm in front of a mirror by keeping the flame at a distance of 15 cm from its pole.

    a) Write the type of mirror he should use.

    b) Find the linear magnification of the image produced.

    c) What is the distance between the object and its image?

    d) Draw a ray diagram to show the image formation in this case. **3**

16. Smriti is looking at herself in a convex mirror in a science museum, standing 2 m away from the mirror. Her image appears to be around half her actual height. Estimate the focal length of the mirror. **3**

17. a) Calculate the distance at which an object should be placed in front of a convex lens of focal length 10 cm to obtain a virtual image of double its size.

    b) In the above given case, find the magnification, if image formed is real. Express it in terms of relation between *v* and *u.* **3**

18. 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. **3**

SECTION - D

19. a) Write one use of concave mirror as well as convex mirror.

    b) Draw ray diagrams for the following cases when a ray of light:

        i) passing through centre of curvature of a concave mirror is incident on it.

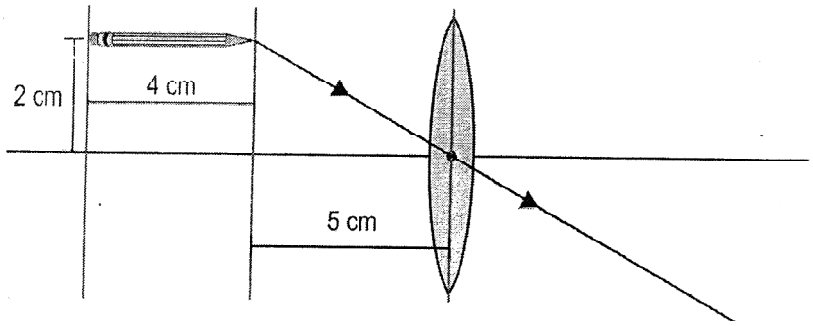
        ii) parallel to principal axis is incident on convex minor.

        iii) is incident at the pole of a convex mirror.

        iv) passing through focus of a concave mirror incident on it. **5**

OR

a) Copy the scaled ray diagram given below. Draw more required incident rays from the pencil to illustrate the formation of the image of the pencil by the convex lens of focal length 3 cm.



Your completed diagram should show the image of the whole pencil.

(Note : Assume that the lens in the diagram is a thin lens.)

b) What is the distance of the image of the pointed end of the pencil from the lens?

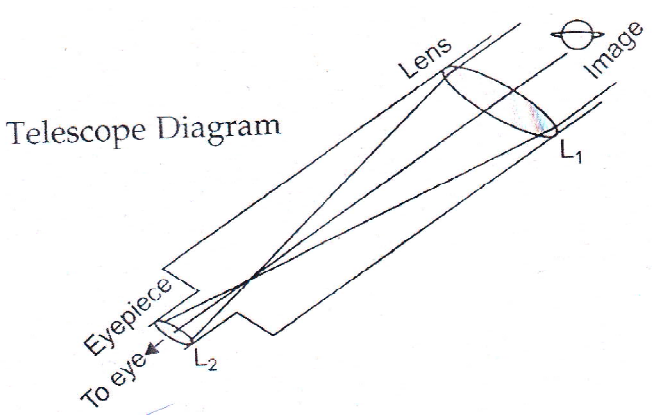
c) What is the length of the image of the pencil?

SECTION - E - (COMPETING BASED QUESTIONS)

20. **Read the following and answer the questions.** **4 × 1 = 4**

Sumati wanted to see the stars of the night sky. She knows that she needs a telescope to see those distant stars. She finds out that the telescopes, which are made of lenses, are called refracting telescopes and the ones which are made of mirrors are called reflecting telescopes.

So she decided to make a refracting telescope. She bought two lenses, L_1 and L_2, out of which L_1 was bigger and L_2 was smaller. The larger lens gathers and bends the light, while the smaller lens magnifies the image. Big, thick lenses are more powerful. So to see far away, she needed a big powerful lens. Unfortunately, she realized that a big lens is very heavy. Heavy lenses are hard to make and difficult to hold in the right place. Also since the light is passing through the lens, the surface of the lens has to be extremely smooth. Any flaws in the lens will change the image. It would be like looking through a dirty window.



i) Based on the diagram shown, what kind of lenses would Sumati need to make the telescope?

ii) If the powers of the lenses L_1 and L_2 are in the ratio of 4 : 1, what would be the ratio of the focal length of L_1 and L_2?

iii) What is the formula for magnification obtained with a lens?

OR

Sumati did some preliminary experiment with the lenses and found out that the magnification of the eye piece (L_2) is 3. If in her experiment with L_2 she found an image at 24 cm from the lens, at what distance did she put the object?

CHAPTERWISE QUESTION

LIGHT - REFLECTION AND REFRACTION

CLASS X **Time : 1½ hrs.**

SET B **Mark : 40**

SECTION - A OBJECTIVE TYPE **8 × 1 = 8**

1. An object is placed 20 cm from the concave mirror of focal length 10 cm, then image is formed at

   a) behind the mirror
   b) between the mirror and focus
   c) at focus
   d) centre of curvature of mirror

2. 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

   a) 5 cm b) 10 cm c) 20 cm d) 0

3. A virtual image three times the size of the object is obtained with a concave mirror of radius of curvature 36 cm. The distance of the object from the mirror is

   a) 20 cm b) 10 cm c) 12 cm d) 5 cm

4. Refractive index of diamond with respect to glass is 1.6. If the absolute refractive index of glass is 1.5, then the absolute refractive index of diamond is

   a) 1.4 b) 2.4 c) 3.4 d) 4.4

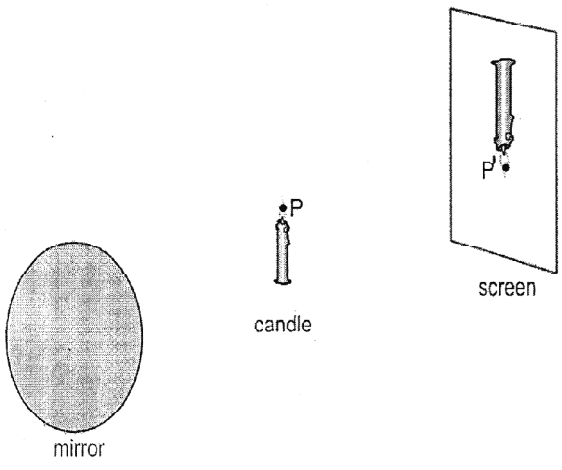
5. Two convex lenses P and Q have focal length 0.50 m and 0.40 m respectively. Which of the following is True about the combined power of the two lenses?

   a) P is equal to 4.5 D
   b) P is less than 4.5 D
   c) P is more than 4.5 D
   d) P cannot be determined from the information given

6. The diagram below shows the image of a candle, as formed through reflection from a concave mirror, obtained on a screen.

   How many light rays from the point P on the candle flame can be drawn to the corresponding point on the image P'?

   a) only one
   b) infinitely many
   c) two only
   d) none of these



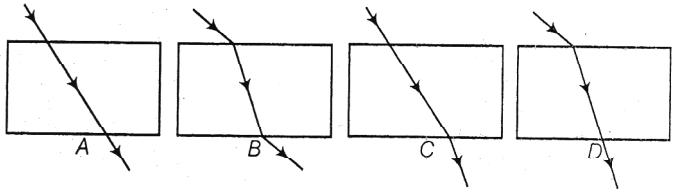
7. Under which of the following conditions, a concave mirror can form an image larger than the actual object?

   a) When the object is kept at a distance equal to its radius of curvature
   b) When object is kept at a distance less than its focal length

c) When object is placed between the focus and centre of curvature

d) When object is kept at a distance greater than its radius of curvature

8. The path of a ray of light coming from air passing through a rectangular glass slab traced by four students shown as A, B, C and D in the figure. Which one of them is correct?



a) A b) B c) C d) D

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b) If both the assertion and reason are true but the reason is not a correct explanation of the assertion.

c) Assertion is true but reason is false. d) Assertion is false but reason is true.

9. Assertion (A) : Keeping a point object fixed, if a plane mirror is moved, the image will also move.

Reason (R) : In case of a plane mirror, distance of object and its image is equal from any point on the mirror.

10. Assertion (A) : Large concave mirrors are used to concentrate sunlight to produce heat in solar cookers.

Reason (R) : Concave mirror converges the light rays falling on it to a point.

SECTION - B

11. "Vehicles in the mirror are closer than they appear". Why is this warning printed on the side view mirror of most vehicles? **2**

12. A lemon kept in water in a glass tumbler appears to be bigger than its actual size, when viewed from the sides. Explain why it so appears? **2**

13. An object is placed at the following distances from a concave mirror of focal length 15 cm.

(a) 10 cm (b) 20 cm (c) 30 cm (d) 40 cm

Which position of the object will produce:

(i) Virtual image (ii) A diminished real image

(iii) An enlarged real image (iv) An image of same size. **2**

OR

When light undergoes refraction at the surface of two media, what happens to the speed of light?

SECTION - C

14. a) A ray of light falls normally on a face of a glass slab. What are the values of angle of incidence and angle of refraction of this ray?

    b) Light enters from air to a medium X. Its speed in medium X becomes 1.5×10^8 ms^{-1}. Find the refractive index of medium X. **3**

15. A 4.5 cm needle is placed 12 cm away from a convex mirror of focal length 15 cm. Give the location of image and magnification. Describe what happens to the image as the needle is moved farther from the mirror. **3**

16. In human eye, the distance between the lens and the retina is 17 mm. The light entering the eye gets refracted at the cornea and then at the lens. Ciliary muscles in the eye can control the focal length of the lens by changing its shape.

    a) Diana is looking at the Moon. What is the focal length of the combination of cornea and the lens in Diana's eyes at this time?

    b) Diana is reading a book kept at a distance of 20 cm from her eyes. What is the focal length of the combination of the cornea and the lens in Diana's eyes at this time?

    c) When Diana brings the book closer to her eyes, the letters appear blurry to her and she cannot read the book. Explain why the letters appear blurry to her. **3**

17. An object of height 5 cm is placed perpendicular to the principal axis of a concave lens of focal length 10 cm. If the distance of the object from the optical centre of the lens is 20 cm, determine the position, nature and size of the image formed using the lens formula. **3**

18. One half of a convex lens is covered with a black paper.

    a) Show the formation of image of an object placed at 2F 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. **3**

SECTION - D

19. a) A thin converging lens forms a
        i) Real magnified image.
        ii) Virtual magnified image of an object placed in front of it.
        Write the positions of the objects in each case.
    b) Draw labelled ray diagrams to show the image formation in each case.
    c) How will the following be affected on cutting this lens into two halves along the principal axis?
        i) Focal length
        ii) Intensity of the image formed by half lens. **5**

OR

A student focussed the image of a candle flame on a white screen using a convex lens. He noted down the position of the candle, screen and the lens as under.

position of candle = 12.0 cm. position of convex lens = 50.0 cm

position of the screen = 88.0 cm

i) What is the focal length of the convex lens?

ii) Where will the image be formed, if he shifts the candle towards the lens at a position of 31.0 cm?

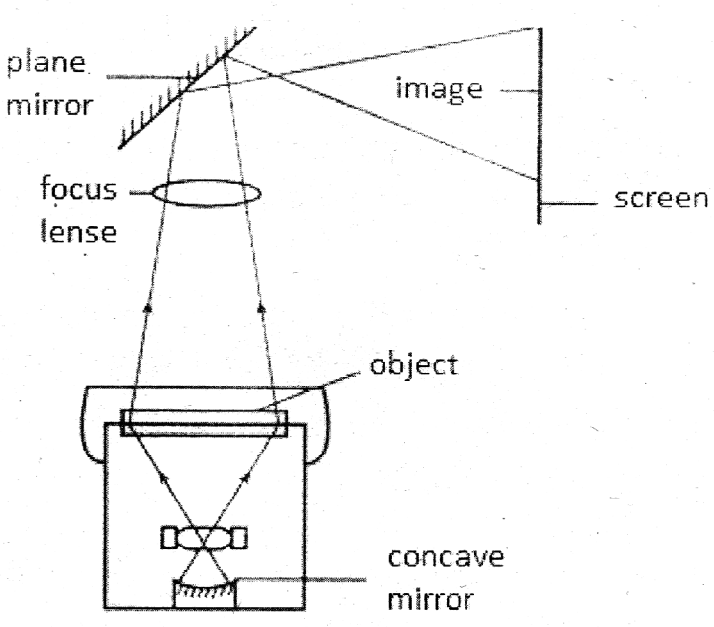
iii) What will be the nature of the image formed, if he further shifts the candle towards the lens?

iv) Draw a ray diagram to show the formation of the image in case as said above.

SECTION - E - (COMPETING BASED QUESTIONS)

20. **Read the following passage and answer the questions.** **4 × 1 = 4**

An overhead projector (OHP), like a film or slide projector; uses light to project an enlarged image on a screen. In the OHP, the source of the image is a page-sized sheet of transparent plastic film (also known as foils) with the image to be projected either printed or hand-written/drawn. These are placed on the glass surface of the projector, which has a light source below it and a projecting mirror and lens assembly above it as shown in the figure.



i) Based on the diagram shown, what kind of lens is used to make the overhead projector?

ii) The image obtained will be erect and real. How?

iii) Why is concave mirror used and not convex mirror?

iv) If the radius of curvature of concave mirror is 12 cm. Then, what will be the focal length.