GreyQuantaEducare
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Year 2024

Multiple Choice Questions [1 Mark]

1) At what distance from a convex lens should an object be placed to get an image of the same size as that of the object on a screen ? **[(31/1/1); (31/1/2); (31/3/3)]**
   (a) Beyond twice the focal length of the lens.
   (b) At the principal focus of the lens.
   (c) At twice the focal length of the lens.
   (d) Between the optical centre of the lens and its principal focus.

2) The speed of light in vacuum is 3×10^8 m/s. If the speed of light in a medium is 2.25×10^8 m/s, the absolute refractive index of the medium is:**[(31/2/3)]**
   (a) $\frac{7}{6}$ (b)$\frac{5}{4}$ (c)$\frac{4}{3}$ (d)$\frac{3}{2}$

3) Absolute refractive index of glass and water is $\frac{3}{2}$ and $\frac{4}{3}$ respectively. If the speed of light in glass is 2×10^8 m/s. the speed of light in water is **[(31/4/1); (31/4/2); (31/4/3)]**
   (a) $\frac{9}{4} \times 10^8 \, m/s$ (b) $\frac{5}{2} \times 10^8 \, m/s$ (c) $\frac{7}{3} \times 10^8 \, m/s$ (d) $\frac{16}{9} \times 10^8 \, m/s$

4) How will the image formed by a convex lens be affected, if the upper half of the lens is wrapped with a black paper ? **[(31/5/1); (31/5/2); (31/5/3)]**
   (a) The size of the image formed will be one-half of the size of the image due to complete lens.
   (b) The image of upper half of the object will not be formed.
   (c) The brightness of the image will reduce.
   (d) The lower half of the inverted image will not be formed.

5) The colour of light for which the refractive index of glass is minimum, is : **[(31/5/1); (31/5/2); (31/5/3)]**
   (a) Red   (b) Yellow   (c) Green   (d) Violet

Very Short Answer Type Question [2 Marks]

1) An object is placed at a distance of 10 cm from a convex mirror of focal length 15 cm. Find the position of the image formed by the mirror. **[(31/1/1); [(31/1/3)]**

2) A ray of light falls making an angle of incidence 8 on the surface of a glass slab. Draw a labelled ray diagram to show its path. Also mark lateral displacement on it. **[(31/1/2)]**

3) State two laws of refraction of light. **[(31/2/1);(31/2/2)]**

4) Define the term absolute refractive index of a medium. A ray of light enters from vacuum to glass of absolute refractive index 1.5. Find the speed of light in glass. The speed of light in vacuum is 3×10^8 m/s. **[(31/2/1); (31/2/2)]**

5) The heat produced at a point due to concentration of sunlight by a convex lens burns a paper.
   (a) Explain why it happens.
   (b) Name the term (in the context of the lens used) given to the point at which the paper starts burning. What does the bright spot formed on the paper represent? **[(31/5/1)]**

6) Define power of a lens. Find power of a lens whose focal length is 50 cm. **[(31/5/2)]**

7) The linear magnification produced by a spherical mirror is + 3. Based on this statement answer the following questions :
   (a) What is the type of mirror?
   (b) Where is the object located?
   (c) List two properties of the image formed (other than the size/magnification). **[(31/5/3)]**

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Short Answer Type Question [3 Marks]

1) An object is placed in front of a concave mirror of focal length 12 cm. If distance of the object from the pole of the mirror is 8 cm, then use mirror formula to determine the position of the image formed. Draw a labelled ray diagram to justify your answer in this case.**[(31/2/2)]**

2) (i) 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 30 cm from the mirror, where is the object placed ? Give reason to justify your answer.
   (ii) Where would the image be if the object is moved 15 cm towards the mirror ? Draw ray diagram for the new position of the object to justify your answer.**[(31/2/2)]**

Long Answer Type Question [5 Marks]

1) (a) Upper half of a convex lens is covered with a black paper. Draw a ray diagram to show the formation of image of an object placed at a distance of 2F from such a lens. Mention the position and nature of the image formed. State the observable difference in the image obtained if the lens is uncovered. Give reason to justify your answer.
   (b) An object is placed at a distance of 30 cm from the optical centre of a concave lens of focal length 15 cm. Use lens formula to determine the distance of the image from the optical centre of the lens. **[(31/2/1); (31/2/2); (31/2/3)]**

2) (i) Draw a ray diagram to show the path of the refracted ray in each of the following cases :
   A ray of light incident on a concave lens
   (1) parallel to its principal axis, and
   (2) is directed towards its principal focus.
   (ii) A 4 cm tall object is placed perpendicular to the principal axis of convex lens of focal length 24 cm. The distance of object from the lens is 16 cm. Find the position and size of image formed. **[(31/3/1); (31/3/2); (31/3/3)]**

3) (i) Draw a ray diagram to show the path of the reflected ray in each of the following cases :
   A ray of light incident on a convex mirror
   (1) parallel to its principal axis, and
   (2) is directed towards its principal focus
   (ii) A 1.5 cm tall candle flame is placed perpendicular to the principal axis of a concave mirror of focal length 12 cm. If the distance of the flame from the pole of the mirror is 18 cm, use mirror formula to determine the position and size of the image formed. **[(31/3/1); (31/3/2); (31/3/3)]**

4) (a) The variation of image distance (v) with object distance (u) for a convex lens is given in the following observation table. Analyse it and answer the questions that follow :

S. No.	Object distance (u) cm	Image distance (v) cm
1	- 150	+ 30
2	- 75	+ 37.5
3	- 50	+ 50
4	- 37.5	+ 75
5	- 30	+ 150
6	- 15	+ 37.5

   (i) Without calculation, find the focal length of the convex lens.
   Justify your answer.
   (ii) Which observation is not correct? Why? Draw ray diagram to find the position of the image formed for this position of the object.
   (iii) Find the approximate value of magnification for u = - 30 cm. **[(31/4/1); (31/4/2); (31/4/3)]**

5)   (i) Define principal axis of a lens. Draw a ray diagram to show what happens when a ray of light parallel to the principal axis of a concave lens passes through it.
(ii) The focal length of a concave lens is 20 cm. At what distance from the lens should a 5 cm tall object be placed so that its image is formed at a distance of 15 cm from the lens ? Also calculate the size of the image formed. **[(31/4/1); (31/4/2); (31/4/3)]**

6)   (i) State laws of reflection of light.
(ii) An object of height 5·0 cm 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, so that a focused image is obtained on it? Find the height of the image.   **[(31/4/3)]**

7)   (i) State laws of refraction of light.
(ii) Draw a ray diagram to show refraction of a ray of light through a rectangular glass slab. How is the emergent ray related to incident ray ? Mark lateral displacement in the diagram. **[(31/4/3)]**

Case Study [4 Marks]

1)   Study the data given below showing the focal length of three concave mirrors A, B and C and the respective distances of objects placed in front of the mirrors :   **[(31/1/1); (31/1/2); (31/1/3)]**

Case	Mirror	Focal length (cm)	Object Distance (cm)
1	A	20	45
2	B	15	30
3	C	30	20

(i) In which one of the above cases the mirror will form a diminished image of the object ? Justify your answer.
(ii) List two properties of the image formed in case 2.
(iii) (A) What is the nature and size of the image formed by mirror C ?Draw ray diagram to justify your answer.
OR
(iii) (B) An object is placed at a distance of 18 cm from the pole of a concave mirror of focal length 12 cm. Find the position of the image formed in this case.

2)   A highly polished surface such as a mirror reflects most of the light falling on it. In our daily life we use two types of mirrors plane and spherical. The reflecting surface of a spherical mirrors may be curved inwards or outwards. In concave mirrors, reflection takes place from the inner surface, while in convex mirrors reflection takes place from the outer surface.
(a) Define the principal axis of a concave mirror.
(b) A ray of light is incident on a concave mirror, parallel to its principal axis. If this ray after reflection from the mirror passés through the principal axis from a point at a distance of 10 cm from the pole of the mirror, find the radius of curvature of the mirror.
(c) (i) An object is placed at a distance of 10 cm from the pole of a convex mirror of focal length 15 cm. Find the position of the image.
OR
(c) (ii) A mirror forms a virtual, erect and diminished image of an object. Identify the type of this mirror. Draw a ray diagram to show the image formation in this case. **[(31/5/1); (31/5/2); (31/5/3)]**

Year 2023

Multiple Choice Questions [1 Mark]

1) 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 are respectively: **[(31/2/3)]**
   (a)+, −   (b) −,+   (c) −, −   (d) **+,+**

2) A student wants to obtain an erect image of an object using a concave mirror of 10 cm focal length. What will be the distance of the object from mirror? **[(31/6/1)]**
   (a) Less than 10 cm (b) 10cm (c) between 10 cm and 20 cm (d) more than 20 cm

3) To obtain a magnification of + 2 with a concave mirror of radius of curvature 60 cm the object distance must be   **[(31/6/2)]**
   (a) —90cm   (b) —45cm   (c) —30cm   (d) —15cm

4) In torch lights and head lights of vehicles, the bulb is placed   **[(31/6/3)]**
   (a) between the pole and the focus of the reflector.
   (b) very near to the focus of the reflector.
   (c) between the focus and centre of curvature of the reflector.
   (d) at the centre of curvature of the reflector.

## Very Short Answer Type Questions [3 Marks]

1) Alight ray enters from medium A to medium B as shown in the figure .**[(31/6/1); (31/6/2); (31/6/3)]**
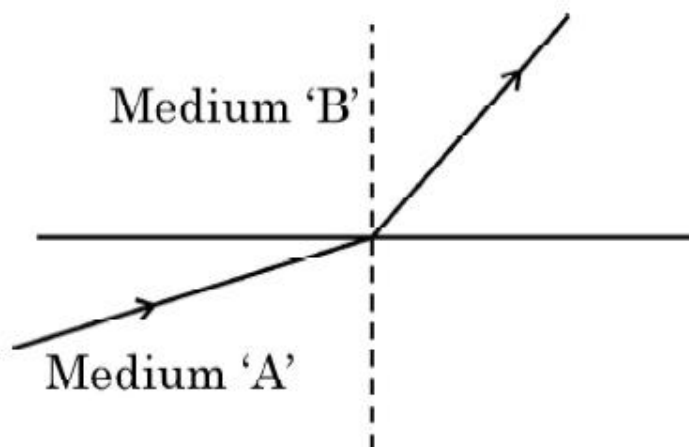
   (a) Which one of the two media is denser w.r.t. other medium ? Justify your answer.
   (b) If the speed of light in medium A is v_a, and in medium B is v_b, what is the refractive index of B with respect to A.

2) (a) A ray of light starting from diamond is incident on the interface separating diamond and water. Draw a labelled ray diagram to show the refraction of light in this case.   **[(31/6/1); (31/6/2); (31/6/3)]**
   (b) Absolute refractive indices of diamond and water are 2.42 and 1.33 respectively. Find the value of refractive index of water w.r.t. diamond.

Short Answer Type Questions [3 Marks]

1) (a) Complete the following ray diagram to show the formation of image: **[(31/1/1)]**
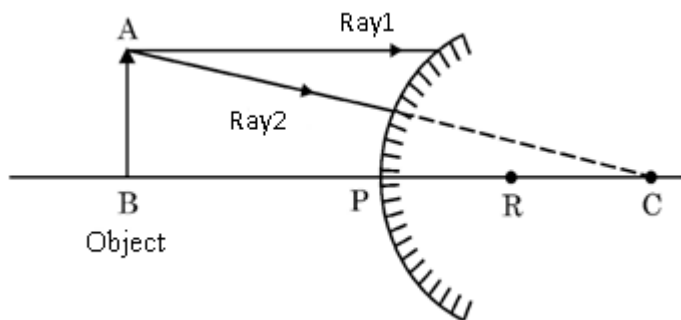
(b) Mention the nature, position and size of the image formed in this case.

(c) State the sign of the image distance in this case using the Cartesian sign convention.

2) (a) The image of an object formed by a lens is of same size but inverted. If the object distance is 30 cm, calculate

(i) The distance between the object and its image.

(ii) Focal length of the lens.

(b) Draw a ray diagram to show the image formed in above case. **[(31/1/2)]**

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

(a) Name the type of mirror used.

(b) Also calculate :

(i) Magnification of the image produced

(ii) Distance between object and its image

(c) Draw a ray diagram to show the image formation. **[(31/1/3)]**

4) A student has focussed the image of an object of height 3 cm on a white screen using a concave mirror of focal length 12 cm. If the distance of the object from the mirror is 18 cm, find the values of the following :

(i) Distance of the image from the mirror

(ii) Height of the image   **[(31/2/1); (31/2/2); (31/2/3)]**

5) Define power of a lens. The focal length of a lens is – 10 cm. Write the nature of the lens and find its power. If an object is placed at a distance of 20 cm from the optical centre of this lens, according to the New Cartesian Sign Convention, what will be the sign of magnification in this case ?   **[(31/2/1); (31/2/2); (31/2/3)]**

6) Define the following terms in the context of a diverging mirror : **[(31/4/1); (31/4/2)]**

(i) Principal focus

(ii) Focal length

Draw a labelled ray diagram to illustrate your answer.

7) An object of height 10 cm is placed 25 cm away from the optical centre of a converging lens of focal length 15 cm. Calculate the image-distance and height of the image formed. **[(31/4/1)]**

8) An object is kept at a distance of 1m from a lens of power +2D :

(i) Identify the type of lens.

(ii) Calculate its focal length and distance of the image formed. **[(31/4/2)]**

9) The power of a lens is +4D. Find the focal length of this lens. An object is placed at a distance of 50 cm from the optical centre of this lens. State the nature and magnification of the image formed by the lens and also draw a ray diagram to justify your answer. **[(31/4/1)]**

10) The magnification produced when an object is placed at a distance of 20 cm from a spherical mirror is +1/2. Where should the object be placed to reduce the magnification to +1/3. **[(31/4/3)]**

11) Draw a labelled diagram of a common type of bifocal lens. State the function of each of its parts. Name the defect for the correction of which it is used and state its main cause. **[(31/5/2)]**

12) (i) An object of 5 cm height is placed at a distance of 20 cm from the optical centre of a concave lens of focal length 18 cm. Calculate (1) image distance and (2) the magnification in this case. (ii) Compare the values of magnification obtained by a concave lens and a convex lens when both the lenses form virtual images. **[(31/5/1); (31/5/2)]**

13) A convex lens can form a (i) real, inverted and magnified image as well as (ii) virtual, erect and magnified image of an object. If the focal length of the lens is 10 cm, what should be the range of the object distance in both cases? Draw ray diagrams to justify your answer.**[(31/5/1); (31/5/2)]**

14) A student has focussed the image of an object of height 3 cm on a white screen using a concave mirror of focal length 12 cm. If the distance of the object from the mirror is 18 cm, find the values of the following :   **[(31/5/3)]**
(i) Distance of the image from the mirror
(ii) Height of the image

15) Define power of a lens. The focal length of a lens is – 10cm. Write the nature of the lens and find its power. If an object is placed at a distance of 20 cm from the optical centre of this lens, according to the New Cartesian Sign Convention, what will be the sign of magnification in this case ?   **[(31/5/3)]**

Long Answer Type Questions [5 Marks]

1) (a) An object is placed in front of a convex lens of focal length f. If the distance of the object from the lens is 2f, draw a ray diagram to show the formation of the image. Write the value of magnification in this case.
(b) A student has focussed the image of a candle flame on a white screen using a convex lens. The situation is as given below :
Length of the flame = 2 cm
Focal length of the lens = 12 cm
Distance of the flame from the lens = 16 cm
If the flame is perpendicular to the principal axis of the lens,
calculate the values of the following :
(i) Distance of the image from the lens
(ii) Length of the image formed   **[(31/2/1)]**

2) (a) Name the type of mirror that should be used to obtain the following types of images :
   (i) A magnified and virtual image of an object
   (ii) A diminished and virtual image of an object
(b) Draw labelled ray diagrams to justify your answers in each case mentioned above.
(c) Which of these mirrors can also be used to obtain a magnified and real image of an object ? State the position of the object in this case.   **[(31/2/2)]**

3) (a) Draw a ray diagram for showing the convergence of a parallel beam of light by a concave mirror and mark the positions of pole and the centre of curvature in it.
(b) An object 4 cm in size is placed at 25 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 ? Find the nature and size of the image.
(c) List any two uses of a concave mirror.   **[(31/2/3)]**

Case Study [4 Marks]

1) Hold a concave mirror in your hand and direct its reflecting surface towards the sun. Direct the light reflected by the mirror on to a white card-board held close to the mirror. Move the card-board back and forth gradually until you find a bright, sharp spot of light on the board. This spot of light is the image of the sun on the sheet of paper; which is also termed as "PrincipalFocus" of the concave mirror.
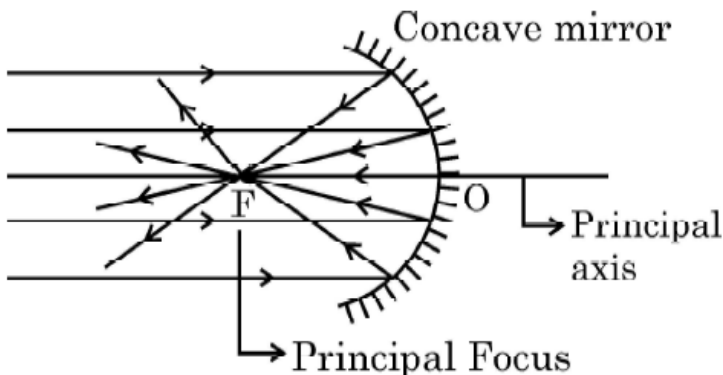
(a) List two applications of concave mirror. 1

(b) If the distance between the mirror and the principal focus is 15 cm, find the radius of curvature of the mirror.   1

(c) Draw a ray diagram to show the type of image formed when an object is placed between pole and focus of a concave mirror.

OR

(c)An object 10 cm in size is placed at 100 cm in front of a concave mirror. If its image is formed at the same point where the object is located, find :   2

(i) focal length of the mirror, and

(ii)magnification of the image formed with sign as per Cartesian sign convention. **[(31/1/1), (31/1/2); (31/1/3)]**

2) The ability of a medium to refract light is expressed in terms of its optical density. Optical density has a definite connotation. It is not the same as mass density. On comparing two media, the one with the large refractive index is optically denser medium than the other. The other medium with a lower refractive index is optically rarer. Also the speed of light through a given medium is inversely proportional to its optical density.

(i) Determine the speed of light in diamond if the refractive index of diamond with respect to vacuum is 2.42. Speed of light in vacuum is 3×10^8 m/s. 1

(ii) Refractive indices of glass, water and carbon disulphide are 1.5, 1.33and 1.62 respectively. If a ray of light is incident in these media at the same angle (say θ), then write the increasing order of the angle of refraction in these media. 1

(iii) (A) The speed of light in glass is 2×10^8 m/s and in water is 2.25×10^8 m/s. 2

    (a) Which one of the two is optically denser and why ?

    (b) A ray of light is incident normally at the water-glass interface when it enters a thick glass container filled with water. What will happen to the path of the ray after entering the glass ? Give reason.

        OR

(iii) (B) The absolute refractive indices of water and glass are 4/3 and 3/2 respectively. If the speed of light in glass is 2×10^8 m/s, find the speed of light in (i) vacuum and (ii) water.**[(31/4/1); (31/4/2); (31/4/3)]**

3) Many optical instruments consist of a number of lenses. They are combined to increase the magnification and sharpness of the image. The net power (P) of the lenses placed in contact is given by the algebraic sum of the powers of the individual lenses P_1, P_2, P_3 ……. as

$P = P_1 + P_2 + P_3$

This is also termed as the simple additive property of the power of lens, widely used to design lens systems of cameras, microscopes and telescopes. These lens systems can have a combination of convex lenses and also concave lenses.

(a) What is the nature (convergent / divergent) of the combination of a convex lens of power + 4 D and a concave lens of power – 2D ? 1

(b) Calculate the focal length of a lens of power – 2·5D. 1

(c) Draw a ray diagram to show the nature and position of an image formed by a convex lens of power + 0·1 D, when an object is placed ata distance of 20 cm from its optical centre. 2

OR

(c) How is a virtual image formed by a convex lens different from that formed by a concave lens ? Under what conditions do a convex and a concave lens form virtual images ?**[(31/5/1); (31/5/2); (31/5/3)]**

4) A student took three concave mirrors of different focal lengths and performed the experiment to see the image formation by placing an object at different distances with these mirrors as shown in the following table.

Case No	Object-Distance	Focal length
I	45 cm	20 cm
II	30 cm	15 cm
III	20 cm	30 cm

Now answer the following questions :

(a) List two properties of the image formed in Case I.

(b) In which one of the cases given in the table, the mirror will form real image of same size and why ?

(c) Name the type of mirror used by dentists. Give reason why do they use such type of mirrors.

OR

(c) Look at the table and identify the situation (object distance and focal length) which resembles the situation in which concave mirrors are used as shaving mirrors ? Draw a ray diagram to show the image formation in this case.   **[(31/6/1); (31/6/2); (31/6/3)]**

Year 2020

Multiple choice questions [1Mark]

1) The laws of reflection hold true for:
   (a) plane mirrors only
   (b) concave mirrors only
   (c) convex mirrors only
   (d) all reflecting surfaces   **[(31/1/1); (31/1/2)]**

2) When an object is kept within the focus of a concave mirror, an enlarged image is formed behind the mirror. This image is:
   (a) real
   (b) inverted
   (c) virtual and inverted

(d) virtual and erect   **[(31/1/1); (31/1/2)]**

3) A real image is formed by the light rays after reflection or refraction when they:

   (a) actually meet or intersect with each other.

   (b) actually converge at a point.

   (c) appear to meet when they are produced in the backward direction.

   (d) appear to diverge from a point.

   Which of the above statements are correct?

   (a) (a) and (d)   (b) (b) and (d)   (c) (a), (b) and (c)   (d) (a), (b)and (d)   **[(31/1/3)]**

4) Consider the following properties of virtual images :

   (a) cannot be projected on the screen

   (b) are formed by both concave and convex lens

   (c) are always erect

   (d) are always inverted

   The correct properties are

   (a) (a) and (d)   (b) (a) and (b)   (c) (a), (b) and (c)   (d) (a), (b)and (d)   **[(31/1/3)]**

Short Answer Type Questions [3 Marks]

1) What happens after refraction, when:

   (i) a ray of light parallel to the principal axis passes through a concave lens?

   (ii) a ray of light falls on a convex lens while passing through its principal focus?

   (iii) a ray of light passes through the optical centre of a convex lens? **[(31/2/1); (31/2/2); (31/2/3)]**

2) The diagram given below shows an object O and its image I.
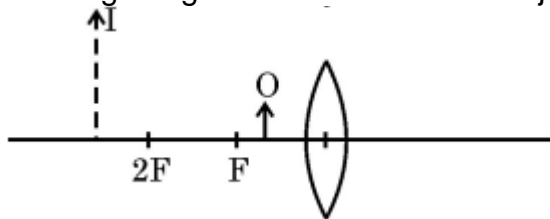
   Without actually drawing the ray diagram, state the following :

   (i) Type of lens (Converging / Diverging)

   (ii) Name two optical instruments where such an image is obtained.

   (iii) List three characteristics of the image formed if this lens is replaced by a concave mirror of focal length 'f' and an object is placed at a distance 'f/2' in front of the mirror.   **[(31/3/1)]**

3) (a) Water has refractive index 1.33 and alcohol has refractive index 1.36. Which of the two medium is optically denser? Give reason for your answer.

   (b) Draw a ray diagram to show the path of a ray of light passing obliquely from water to alcohol.

   (c) State the relationship between angle of incidence and angle of refraction in the above case.
   [(31/3/2)]

4) (a) State Snell's law of refraction of light.

   (b) When a ray of light travelling in air enters obliquely into a glass slab, it is observed that the light ray emerges parallel to the incident ray but it is shifted sideways slightly. Draw a labelled ray diagram to illustrate it.   **[(31/3/3)]**

5) A concave mirror is used for image formation for different positions of an object. What inferences can be drawn about the following when an object is placed at a distance of 10 cm from the pole of a concave mirror of focal length 15 cm?

   (a) Position of the image

   (b) Size of the image

(c) Nature of the image
Draw a labelled ray diagram to justify your inferences.   **[(31/4/1); (31/4/2); (31/4/3)]**

6) The refractive index of a medium 'x' with respect to a medium 'y' is 2/3 and the refractive index of medium 'y' with respect to medium 'z' is 4/3. Find the refractive index of medium 'z' with respect to medium 'x'. If the speed of light in medium 'x' is 3×10^8 ms^{-1}, calculate the speed of light in medium 'y'.   **[(31/4/1); (31/4/3)]**

7) (a) For the same angle of incidence of 45°, the refraction angle in two transparent media P and Q is 20° and 30° respectively. Which of the two is optically denser and why?
(b) Define 1 dioptre power of a lens.
(c) Find the focal length of a lens of power + 0.5 D.   **[(31/4/2)]**

8) Draw ray diagram in each of the following cases to show what happens after reflection to the incident ray when
(a) it is parallel to the principal axis and falling on a convex mirror.
(b) it is falling on a concave mirror while passing through its principal focus.
(c) it is coming oblique to the principal axis and falling on the pole of a convex mirror. **[(31/5/1); (31/5/3)]**

9) 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. Explain the construction of the magic mirror using different types of mirrors. Also state the reasons in support of your answer. **[(31/5/2)]**

Long Answer Type Questions [5 Marks]

1) 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). **[(31/1/1); (31/1/2); (31/1/3)]**

2) An object 4.0 cm in size, is placed 25.0 cm in front of a concave mirror of &focal length 15.0 cm.
(i) At what distance from the mirror should a screen be placed in order to aobtain a sharp image?
(ii) Find the size of the image.
(iii) Draw a ray diagram to show the formation of image in this case. **[(31/1/1); (31/1/2); (31/1/3)]**

3) (a) 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.
(b) 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. **[(31/2/1); (31/2/2)]**

4) (a) Define the following terms : (i) Power of a lens (ii) Principal focus of a concave mirror
(b) Write the relationship among the object distance (u), image distance (v) and the focal length (f) of a
   (i) Spherical lens
   (ii) Spherical mirror
(c) An object is placed at a distance of 10 cm from optical centre of a convex lens of focal length 15 cm. Draw a labelled ray diagram to show the formation of image in this case. **[(31/2/1); (31/2/2)]**

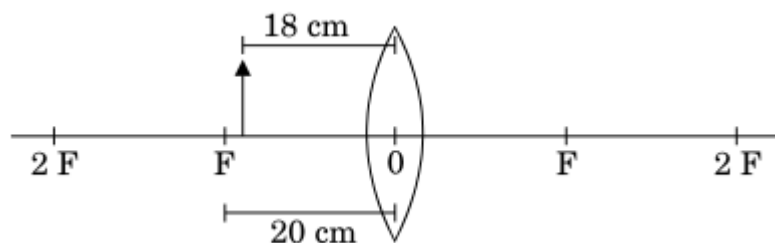5) (a) Draw and complete the following ray diagram on you answer sheet to show lateral displacement.

Incident ray

Air

Glass
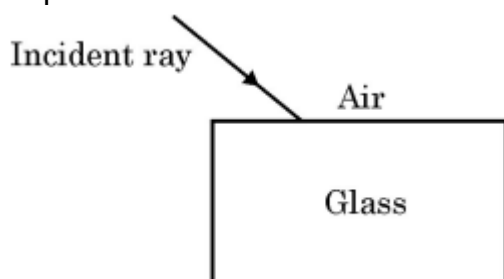
(b) Define absolute refractive index. Give its mathematical expression.
(c) Study the following diagrams:

Mirror 1   Mirror 2

O   I   O   I
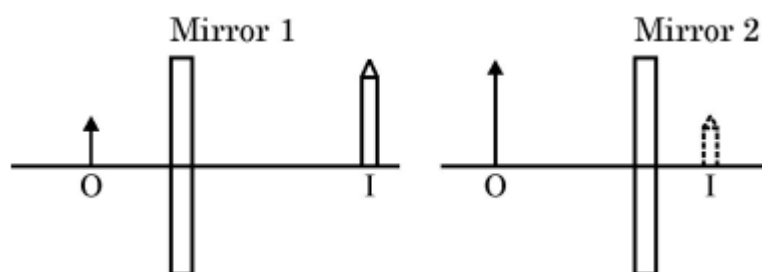
I = Image, O = Object Identify Mirror 1 and Mirror 2 and state one use of each   **[(31/2/3)]**

6) (a) Define power of a lens and write its SI unit. Name the type of lens whose power is negative.
(b) A convex lens forms a real and inverted image of finite size at a distance of 50 cm from it. Where is the object placed in front of the lens ? Give all possible positions of the object stating reason in each case.
(c) Draw labelled ray diagram for any one position of the object mentioned in (b) above. **[(31/2/3)]**

7) (a) A security mirror used in a big showroom has radius of curvature 5 m. If a customer is standing at a distance of 20 m from the cash counter, find the position, nature and size of the image formed in the security mirror.
(b) Neha visited a dentist in his clinic. She observed that the dentist was holding an instrument fitted with a mirror. State the nature of this mirror and reason for its use in the instrument used by dentist. **[(31/3/1); (31/3/2); (31/3/3)]**

8) Rishi went to a palmist to show his palm. The palmist used a special lens for this purpose.
(i) State the nature of the lens and reason for its use.
(ii) Where should the palmist place/hold the lens so as to have a real and magnified image of an object?
(iii) If the focal length of this lens is 10 cm and the lens is held at a distance of 5 cm from the palm, use lens formula to find the position and size of the image. **[(31/3/1); (31/3/2); (31/3/3)]**

9) (a) Draw a labelled ray diagram to show the path of a ray of light incident obliquely on one face of a glass slab.
(b) Calculate the refractive index of the material of a glass slab. Given that the speed of light through the glass slab is 2×10^8 m/s and in air is 3×10^8 m/s.
(c) Calculate the focal length of a lens, if its power is $-2·5$ D. **[(31/5/1); (31/5/2)]**

10) (a) Complete the following ray diagram :

(b) Find the nature, position and size of the image formed.
(c) Use lens formula to determine the magnification in this case.   **[(31/5/3)]**

11) (a) Complete the following ray diagram :
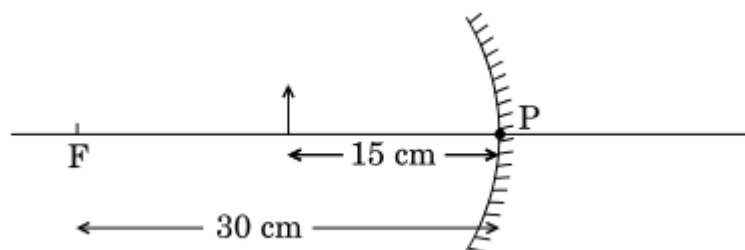
(b) Find the nature, position and size of the image formed.
(c) Use mirror formula to determine the magnification in this case.   **[(31/5/3)]**

Year 2019
Very Short Answer Type Questions [2 Marks]

1) The absolute refractive index of Ruby is 1·7. Find the speed of light in Ruby. The speed of light in vacuum is 3×10^8 m/s. **[(31/2/1)]**

2) The power of a lens is +5 diopters. What is the nature and focal length of this lens? At what distance from this lens should an object be placed so as to get its inverted image of the same size? **[(31/2/2)]**

3) State laws of reflection of light. **[(31/4/1)]**

4) Define absolute refractive index and express it mathematically. **[(31/4/1)]**

5) State laws of refraction of light. **[(31/4/2)]**

6) List four characteristics of the image formed by a concave mirror of focal length 40 cm when the object is placed in front of it at a distance of 20 cm from its pole. **[(31/4/2)]**

7) List four characteristics of the image formed by a convex lens of focal length 20 cm when the object is placed in front of it at a distance of 10 cm from its optical centre. **[(31/4/3)]**

8) Define refractive index of a transparent medium. The speed of light in a medium of absolute refractive index 1·5 is 2×10^8 ms^{-1}. What is the speed of light in vacuum? **[(31/4/3)]**

9) Draw a labelled ray diagram to show the path of the reflected ray corresponding to an incident ray of light parallel to the principal axis of a convex mirror. Mark the angle of incidence and angle of reflection on it. **[(31/5/1)]**

10) Draw a labelled ray diagram to show the path of the reflected ray corresponding to the ray which is directed towards the principal focus of a convex mirror. Mark the angle of incidence and angle of reflection on it. **[(31/5/2)]**

11) Draw a labelled ray diagram to show the path of the reflected ray corresponding to the ray which is incident obliquely to the principal axis, towards the pole of a convex mirror. Mark the angle of incidence and angle of reflection on it. **[(31/5/3)]**

Short Answer Type Questions [3 Marks]

1) A student holding a mirror in his hand, directed the reflecting surface of the mirror towards the Sun. He then directed the reflected light on to a sheet of paper held close to the mirror.
   (a) What should he do to burn the paper?
   (b) Which type of mirror does he have?
   (c) Will he be able to determine the approximate value of focal length of this mirror from this activity? Give reason and draw ray diagram to justify your answer in this case. **[(31/2/1); (31/2/2)]**

2) A 10 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 12 cm. The distance of the object from the lens is 18 cm. Find the nature, position and size of the image formed. **[(31/2/1); (31/2/2)]**

3) A concave mirror has a focal length of 20 cm. At what distance from the mirror should a 4 cm tall object be placed so that it forms an image at a distance of 30 cm from the mirror? Also calculate the size of the image formed. **[(31/5/1); (31/5/2); (31/5/3)]**

4) A real image $2/3^{rd}$ of the size of an object is formed by a convex lens when the object is at a distance of 12 cm from it. Find the focal length of the lens. **[(31/5/1); (31/5/2); (31/5/3)]**

Long Answer Type Questions [5 Marks]

1) An object is placed at a distance of 60 cm from a concave lens of focal length 30 cm.
   (i) Use lens formula to find the distance of the image from the lens.
   (ii) List four characteristics of the image (nature, position, size, erect/inverted) formed by the lens in this case.
   (iii) Draw ray diagram to justify your answer of part (ii). **[(31/1/1); (31/1/3)]**

2) An object is placed at a distance of 30 cm from a concave lens of focal length 30 cm.
   (i) Use lens formula to determine the distance of the image from the lens.
   (ii) List four characteristics of the image (nature position, size, erect/inverted) in this case.
   (iii) Draw a labelled diagram to justify your answer of part (ii). **[(31/1/2)]**

3) A 6 cm tall object is placed perpendicular to the principal axis of a concave mirror of focal length 30 cm. The distance of the object from the mirror is 45 cm. Use mirror formula to determine the position, nature and size of the image formed. Also draw labelled ray diagram to show the image formation in this case. **[(31/2/3)]**

4) An object 6 cm in size is placed at 50 cm in front of a convex lens of focal length 30 cm. At what distance from the lens should a screen be placed in order to obtain a sharp image of the object ? Find the nature and size of the image. Also draw labelled ray diagram to show the image formation in this case. **[(31/2/3)]**

5) (a) List four characteristics of the images formed by plane mirrors.
   (b) A 5 cm tall object is placed at a distance of 20 cm from a concave mirror of focal length 30 cm. Use mirror formula to determine the position and size of the image formed. **[(31/3/1); (31/3/3)]**

6) (a) List four characteristics of the image formed by a convex lens when an object is placed between its optical centre and principal focus.
   (b) Size of the image of an object by a concave lens of focal length 20 cm is observed to be reduced to $\frac{1}{3}$rd of its size. Find the distance of the object from the lens. **[(31/3/2); (31/3/3)]**

7) (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. **[(31/5/1); (31/5/3)]**

8) A concave lens of focal length 60 cm is used to form an image of an object of length 9 cm kept at a distance of 30 cm from it. Use lens formula to determine the nature, position and length of the image formed. Also draw labelled ray diagram to show the image formation in the above case. **[(31/5/2)]**

Year 2018

Very Short Answer Type Questions [2 Marks]

1) 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. **[All India]**

Short Answer Type Questions [3 Marks]

1) 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. **[All India]**

2) What is meant by power of a lens ? Write its SI unit. A student uses a lens of focal length 40 cm and another of –20 cm. Write the nature and power of each lens. **[All India]**

Long Answer Type Questions [5 Marks]

1) What are spherical lenses? What are two types of these lenses? Explain in brief the meanings of the following terms :
   (i) Principal axis
   (ii) Optical centre
   (iii) Aperture

   (b) A burning candle and a screen are placed 60 cm apart. When a spherical lens is placed exactly in the middle of the two, a distinct image of the flame is obtained on the screen. What is the nature and focal length of the lens ? Also state the nature and size of the image formed. **[For Blind Student]**

2) (a) In the context of spherical mirrors, define the following terms :
   (i) Pole
   (ii) Centre of curvature
   (iii) Principal axis
   (iv) Focal length

   (b) An object of size 4 cm is placed at a distance of 15 cm in front of a concave mirror of focal length 10 cm. Find the distance of the image from the mirror and size of the image formed. **[For Blind Student]**

Year 2017

Very Short Answer Type Questions [2 Marks]

1) An object is placed at a distance of 30 cm from a concave lens of focal length 15 cm. List four characteristics (nature, position, etc.) of the image formed by the lens. **[All India]**

2) An object is placed at a distance of 15 cm from a convex lens of focal length 20 cm. List four characteristics (nature, position, etc.) of the image formed by the lens. **[All India]**

3) An object is placed at a distance of 15 cm from a concave lens of focal length 30 cm. List four characteristics (nature, position, etc.) of the image formed by the lens. **[All India]**

4) An object is placed at a distance of 30 cm in front of a convex mirror of focal length 15 cm. Write four characteristics of the image formed by the mirror. **[Delhi]**

5) Redraw the following diagram on your answer-sheet and show the path of the reflected ray. Also mark the angle of incidence (∠i) and the angle of reflection (∠ r) on the diagram.
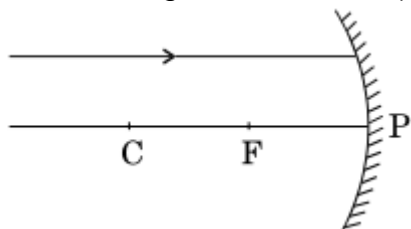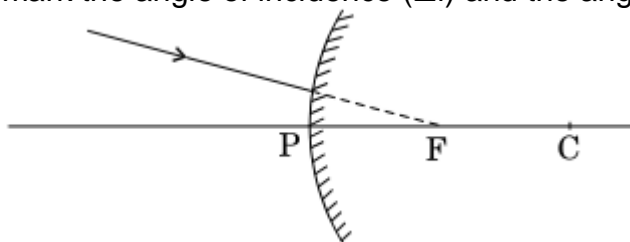

[Foreign]

6) Redraw the following diagram on your answer-sheet and show the path of the reflected ray. Also mark the angle of incidence (∠i) and the angle of reflection (∠ r) on the diagram.
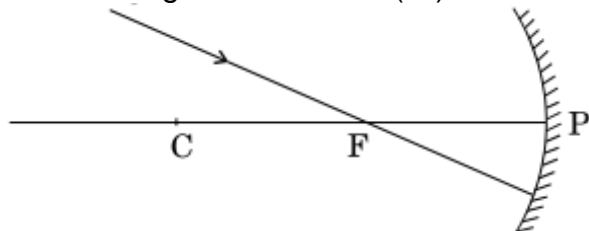
[Foreign]

7) Redraw the following diagram on your answer-sheet and show the path of the reflected ray. Also mark the angle of incidence (∠i) and the angle of reflection (∠ r) on the diagram.

[Foreign]

Short Answer Type Questions [3 Marks]

1) If the image formed by a lens for all positions of an object placed in front of it is always erect and diminished, what is the nature of this lens ? Draw a ray diagram to justify your answer. If the numerical value of the power of this lens is 10 D, what is its focal length in the Cartesian system? **[All India]**
2) Draw ray diagrams to show the formation of three times magnified (a) real, and (b) virtual image of an object by a converging lens. Mark the positions of O, F and 2F in each diagram.**[All India]**
3) ''A lens can form a magnified erect image as well as magnified inverted image of an object placed in front of it.'' State the nature of this lens and draw ray diagrams to justify the above statement. Mark the positions of O, F and 2F in the diagram. **[All India]**
4) 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. **[Delhi]**
5) The magnification of an image formed by a lens is –1. If the distance of the image from the optical centre of the lens is 25 cm, where is the object placed? Find the nature and focal length of the lens. If the object is displaced 15 cm towards the optical centre of the lens, where would the image be formed? Draw a ray diagram to justify your answer. **[Foreign]**
6) The magnification of an image formed by a lens is – 1. If the distance of the image from the optical centre of the lens is 35 cm, where is the object placed? What is the nature and focal length of the lens ? If the object is displaced 20 cm towards the optical centre of the lens, where

would the image be formed and what will be its nature? Draw a ray diagram to justify your answer. **[Foreign]**

7) The magnification of an image formed by a lens is – 1. If the distance between the object and its image is 60 cm, what is the distance of the object from the optical centre of the lens ? Find the nature and focal length of the lens. If the object is displaced 20 cm towards the optical centre of the lens, where would the image be formed and what would be its nature? Draw a ray diagram to justify your answer. **[Foreign]**

Long Answer Type Questions [5 Marks]

1) Analyse the following observation table showing variation of image-distance (v) with object-distance (u) in case of a convex lens and answer the questions that follow without doing any calculations :

S.No.	Object-Distance u (cm)	Image-Distance v (cm)
1	− 100	+ 25
2	− 60	+ 30
3	− 40	+ 40
4	− 30	+ 60
5	− 25	+ 100
6	− 15	+ 120

(a) What is the focal length of the convex lens ? Give reason to justify your answer.

(b) Write the serial number of the observation which is not correct. On what basis have you arrived at this conclusion ?

(c) Select an appropriate scale and draw a ray diagram for the observation at S.No.2. Also find the approximate value of magnification.   **[All India]**

2) (a) If the image formed by a mirror for all positions of the object placed in front of it is always diminished, erect and virtual, state the type of the mirror and also draw a ray diagram to justify your answer. Write one use such mirrors are put to and why.

(b) Define the radius of curvature of spherical mirrors. Find the nature and focal length of a spherical mirror whose radius of curvature is + 24 cm. **[All India]**

3) Analyse the following observation table showing variation of image distance (v) with object distance (u) in case of a convex lens and answer the questions that follow, without doing any calculations :

S. No.	Object distance u (cm)	Image distance v (cm)
1	− 90	+ 18
2	− 60	+ 20
3	− 30	+ 30
4	− 20	+ 60
5	− 18	+ 90
6	− 10	+ 100

(a) What is the focal length of the convex lens ? Give reason in support of your answer.
(b) Write the serial number of that observation which is not correct. How did you arrive at this conclusion ?
(c) Take an appropriate scale to draw ray diagram for the observation at S. No. 4 and find the approximate value of magnification.   **[Delhi]**

4) (a) To construct a ray diagram we use two rays which are so chosen that it is easy to know their directions after reflection from the mirror. List two such rays and state the path of these rays after reflection in case of concave mirrors. Use these two rays and draw ray diagram to locate the image of an object placed between pole and focus of a concave mirror.
(b) A concave mirror produces three times magnified image on a screen. If the object is placed 20 cm in front of the mirror, how far is the screen from the object? **[Delhi]**

5) Analyse the following observation table showing variation of image-distance (v) with object-distance (u) in case of a convex lens and answer the questions that follow without doing any calculations :

S. No.	Object-Distance u (cm)	Image-Distance v (cm)
1	− 60	+ 12
2	− 30	+ 15
3	− 20	+ 20
4	− 15	+ 30
5	− 12	+ 60
6	− 9	+ 90

(a) What is the focal length of the convex lens ? State reason for your answer.

(b) For what object-distance (u) is the corresponding image-distance (v) not correct ? How did you arrive at this conclusion ?

(c) Choose an appropriate scale to draw a ray diagram for the observation at S. No. 4 and find the approximate value of magnification. **[Foreign]**

6) (a) Define the following terms in the context of spherical mirrors :
    (i)   Pole
    (ii) Centre of curvature
    (iii) Radius of curvature
    (iv) Principal axis

(b) Draw ray diagrams to show the principal focus of (i) a concave mirror, and (ii) a convex mirror.

(c) In the following diagram, MM′ is a concave mirror and AB is an object. Draw on your answer-sheet a ray diagram to show the formation of image of this object.
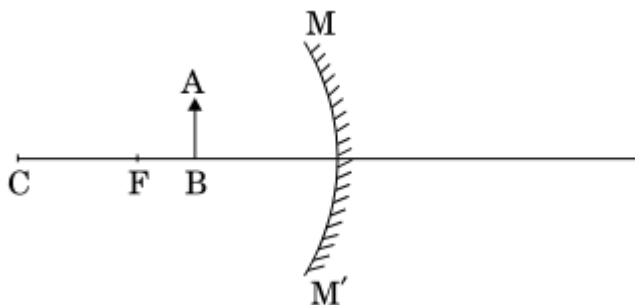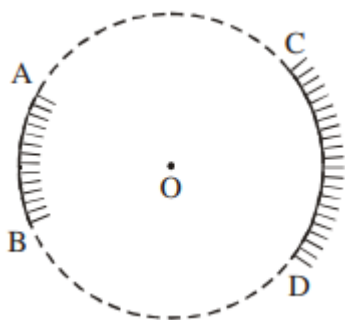

[Foreign]

Year 2016

Very Short Answer Type Questions [2 Marks]

1) Name the type of mirrors used in the design of solar furnaces. Explain how high temperature is achieved by this device. **[All India]**

2) An object of height 2.5 cm is placed at a distance of 15 cm from the optical centre 'O' of a convex lens of focal length 10 cm. Draw a ray diagram to find the position and size of the image formed. Mark optical centre 'O', principal focus F and height of the image on the diagram.**[All India]**

3) "The magnification produced by a spherical mirror is - 3". List four in formation you obtain from this statement about the mirror/image. **[All India]**

4) The refractive indices of glass and water with respect to air are 3/2 and 4/3respectively. If speed of light in glass is 2×10^8 m/s, find the speed of light in water.**[All India]**

5) State two positions in which a concave mirror produces a magnified image of a given object. List two differences between the two images. **[Delhi]**

6) A ray of light is incident on a convex mirror as shown. Redraw the diagram and complete the path of this ray after reflection from the mirror. Mark angle of incidence and angle of reflection on it.
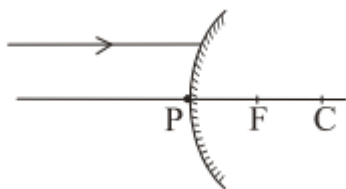
[Delhi]

7) What is meant by power of a lens? What does its sign (+ve or –ve) indicate? State its S.I. unit. How is this unit related to focal length of a lens? **[Delhi]**

8) A student focuses the image of a well illuminated distant object on a screen using a convex lens. After that he gradually moves the object towards the lens and each time focuses its image on the screen by adjusting the lens.
   (i) In which direction-towards the screen or away from the screen, does he move the lens?
   (ii) What happens to the size of the image-does it decrease or increase?
   (iii) What happens to the image on the screen when he moves the object very close to the lens?
   [Delhi]

9) An object of height 2.5 cm is placed at a distance of 15 cm from the optical centre 'O' of a convex lens of focal length 10 cm. Draw a ray diagram to find the position and size of the image formed. Mark optical centre 'O', principal focus F and height of the image on the diagram. **[All India]**

10) The linear magnification produced by a spherical mirror is +3. Analyse this value and state the (i) type of mirror and (ii) position of the object with respect to the pole of the mirror. Draw ray diagram to show the formation of image in this case. **[Foreign]**

11) AB and CD, two spherical mirrors, form parts of a hollow spherical ball with its centre at O as shown in the diagram. If arc AB = $\frac{1}{2}$ arc CD, what is the ratio of their focal lengths? State which of the two mirrors will always form virtual image of an object placed in front of it and why.

[Foreign]

12) To find the image distance for varying object distances in case of a convex lens of focal length 15 cm, a student obtains on a screen a sharp image of a bright object by placing it at 20 cm distance from the lens. After that he gradually moves the object away from the lens and each time focuses the image on the screen.
(a) In which direction-towards or away from the lens does he move the screen to focus the object ?
(b) How does the size of image change ?
(c) Approximately at what distance does he obtain the image of magnification –1 ?
(d) How does the intensity of image change as the object moves farther and farther away from the lens ? **[Foreign]**

13) List two properties of the images formed by convex mirrors. Draw ray diagram in support of your answer. **[Foreign]**

Short Answer Type Questions [3 Marks]

1) 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. **[All India]**

2) The image of an object formed by a lens is of magnification — 1. If the distance between the object and its image is 60 cm, what is the focal length of the lens? If the object is moved 20 cm towards the lens, where would the image be formed? State reason and also draw a ray diagram in support of your answer. **[All India]**

3) Draw the following diagram, in which a ray of light is incident on a concave/convex mirror, on your answer sheet. Show the path of this ray, after reflection, in each case.
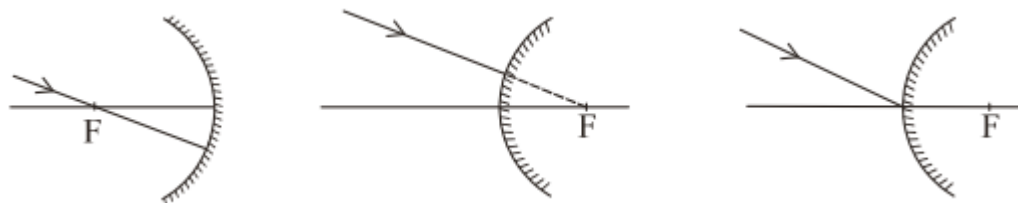
[Delhi]

4) (a) Draw a ray diagram to show the refraction of light through a glass slab and mark angle of refraction and the lateral shift suffered by the ray of light while passing through the slab.
(b) If the refractive index of glass for light going from air to glass is 3/2, find the refractive index of air for light going from glass to air. **[Delhi]**

5) An object is placed in front of a concave mirror of focal length 15 cm at the following distances from the mirror:
(i) 10 cm   (ii) 20 cm   (iii) 30 cm   (iv) 40 cm

Select the object - distance, stating reason, to obtain image of the following characteristics:

(a) An erect image of magnification more than +2

(b) An enlarged inverted image

(c) A real image of magnification —1. **[For Blind Candidate]**

6) If the image formed by a lens for all positions of the object placed in front of it is always virtual, erect and diminished, state the type of the lens. Draw a ray diagram in support of your answer. If the numerical value of focal length of such a lens is 20 cm, find its power in new cartesian sign conventions. **[Foreign]**

7) If the image formed by mirror for all positions of the object placed in front of it is always virtual and diminished, state the type of the mirror. Draw a ray diagram in support of your answer. Where are such mirrors commonly used and why ? **[Foreign]**

Long Answer Type Questions [5 Marks]

1) It is desired to obtain an erect image of an object, using concave mirror of focal length of 12 cm.
   (i) What should be the range of distance of an object placed in front of the mirror?
   (ii) Will the image be smaller or larger than the object. Draw ray diagram to show the formation of image in this case.
   (iii) Where will the image of this object be, if it is placed 24 cm in front of the mirror? Draw ray diagram for this situation also to justify your answer.
   Show the positions of pole, principal focus and the centre of curvature in the above ray diagrams. **[All India]**

2) (a) Define optical centre of a spherical lens.
   (b) A divergent lens has a focal length of 20 cm. At what distance should an object of height 4 cm from the optical centre of the lens be placed so that its image is formed 10 cm away from the lens. Find the size of the image also.
   (c) Draw a ray diagram to show the formation of image in above situation. **[All India]**

3) (a) Define focal length of a spherical lens.
   (b) A divergent lens has a focal length of 30 cm. At what distance should an object of height 5 cm from the optical centre of the lens be placed so that its image is formed 15 cm away from the lens ? Find the size of the image also.
   (c) Draw a ray diagram to show the formation of image in the above situation. **[All India]**

4) (a) Define focal length of a divergent lens.
   (b) A divergent lens of focal length 30 cm forms the image of an object of size 6 cm on the same side as the object at a distance of 15 cm from its optical centre. Use lens formula to determine the distance of the object from the lens and the size of the image formed.
   (c) Draw a ray diagram to show the formation of image in the above situation. **[All India]**

5) (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.
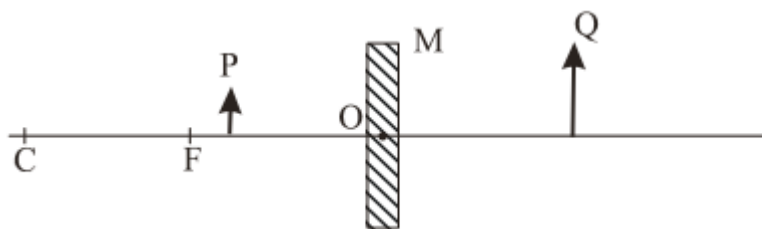
State the type of the mirror M and one characteristic property of the image Q.   **[Delhi]**

6) (a) Draw a ray diagram to show the formation of image by a convex lens when an object is placed in front of the lens between its optical centre and principal focus.
(b) In the above ray diagram mark the object-distance (u) and the image-distance (v) with their proper signs (+ve or – ve as per the new Cartesian sign convention) and state how these distances are related to the focal length (f) of the convex lens in this case.
(c) Find the power of a convex lens which forms a real, and inverted image of magnification –1 of an object placed at a distance of 20 cm from its optical centre. **[Delhi]**

7) (a) Draw a ray diagram to show the formation of image by a concave lens when an object is placed in front of it.
(b) In the above diagram mark the object-distance (u) and the image-distance (v) with their proper signs (+ve or –ve as per the new Cartesian sign convention) and state how these distances are related to the focal length (f) of the concave lens in this case.
(c) Find the nature and power of a lens which forms a real and inverted image of magnification –1 at a distance of 40 cm from its optical centre. **[Delhi]**

8) A student has focussed the image of a candle flame on a screen using a concave mirror. The situation is as given below.
Length of the flame = 2 cm
Focal length of the mirror = 14 cm
Distance of the flame from the mirror = 21 cm
If the flame is perpendicular to the principal axis of the mirror, calculate the following :
(i) distance of the screen from the mirror,
(ii) length of the image formed on the screen.
If the distance between the mirror and the flame is increased to 28 cm, where would the image be formed and what would be its size? Give reason to justify your answer. **[For Blind Candidate]**

9) (i) What is meant by refraction of light ? State its two laws.
(ii) Light enters from air into diamond which has a absolute refractive index of 2.42. If the speed of light in air is 3x 10^8 m/s, find the speed of light in diamond. **[For Blind Candidate]**

10) Suppose you have three concave mirrors A, B and C of focal lengths 10 cm, 15 cm and 20 cm. For each concave mirror you perform the experiment of image formation for three values of object distance of 10 cm, 20 cm and 30 cm. Giving reason answer the following :
(a) For the three object distances, identify the mirror/mirrors which will form an image of magnification – 1.
(b) Out of the three mirrors identify the mirror which would be preferred to be used for shaving purposes/makeup.
(c) For the mirror B draw ray diagram for image formation for object distances 10 cm and 20 cm.
[Foreign]

11) At what distance from a concave lens of focal length 20 cm a 6 cm tall object be placed so as to obtain its image at 15 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. **[Foreign]**

12) 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. **[Foreign]**

Year 2015

Very Short Answer Type Questions [1 Marks]
1) What is the magnification of images formed by plane mirrors and why? **[Delhi]**
2) What is meant by power of a lens?   **[Delhi]**

Very Short Answer Type Questions [2 Marks]
1) The absolute refractive indices of glass and water are 4/3 and 3/2 respectively. If the speed of light in glass is 2×10^8 m/s, calculate the speed of light in (i) vacuum, (ii) water. **[All India]**
2) A 4 cm tall object is placed on the principal axis of a convex lens. The distance of the object from the optical centre of the lens is 12 cm and its sharp image is formed at a distance of 24 cm from it on a screen on the other side of the lens. If the object is now moved a little away from the lens, in which way (towards the lens or away from the lens) will he have to move the screen to get a sharp image of the object on it again ? How will the magnification of the image be affected ? **[All India]**
3) Draw a ray diagram to show the path of the reflected ray corresponding to an incident ray of light parallel to the principal axis of a convex mirror and show the angle of incidence and angle of reflection on it.   **[All India]**
4) A student places a 8.0 cm tall object 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. He obtains a sharp image of the object on a screen placed on the other side of the lens. What will be the nature (inverted, erect, magnified, diminished) of the image he obtains on a screen ? Draw ray diagram to justify your answer. **[Foreign]**
5) List four characteristics of the images formed by plane mirrors.   **[Delhi]**
6) To find the image-distance for varying object-distances in case of a convex lens, a student obtains on a screen a sharp image of a bright object placed very far from the lens. After that he gradually moves the object towards the lens and each time focuses its image of the screen.
(a) In which direction — towards or away from the lens, does he move the screen to focus the object?
(b) What happens to the size of image — does it increase or decrease?
(c) What happen when he moves the object very close to the lens? **[Delhi]**
7) List four specific characteristics of the images of the objects formed by convex mirrors. **[Delhi]**

Short Answer Type Questions [3 Marks]
1) If the image formed by a 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 ray diagram to justify your answer. Where and why do we generally use this type of mirror?   **[All India]**
2) 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.   **[All India]**
3) A student wants to project the image of a candle flame on a screen 80 cm in front of a mirror by keeping the candle flame at a distance of 20 cm from its pole.
(i) Which type of mirror should the student use ?

(ii) Find the magnification of the image produced.

(iii) Find the distance between the object and its image.

(iv) Draw a ray diagram to show the image formation in this case and mark the distance between the object and its image.   **[Foreign]**

4) Draw a ray diagram to show the path of the reflected ray in each of the following cases. A ray of light incident on a convex mirror

(a) strikes at its pole making an angle θ from the principal axis.

(b) is directed towards its principal focus.

(c) is parallel to its principal axis.   **[Foreign]**

5) State the laws of refraction of light. If the speed of light in vacuum is 3×10^8 m/s, find the absolute refractive index of a medium in which light travels with a speed of $1\cdot4 \times 10^8$ m/s. **[Foreign]**

6) To construct a ray diagram we use two rays of light which are so chosen that it is easy to determine their directions after reflection from the mirror. Choose these two rays and state the path of these rays after reflection from a concave mirror. Use these two rays to find the nature and position of the image of an object placed at a distance of 15 cm from a concave mirror of focal length 10 cm.   **[Delhi]**

7) To construct a ray diagram, two rays of light are generally so chosen that it is easy to determine their directions after reflection from the mirror. Choose two rays and state the path/direction of these rays after reflection from a concave mirror. Use these two rays to find the position and nature of the image of an object placed at a distance of 8 cm from a concave mirror of focal length 12 cm.   **[Delhi]**

8) The image of a candle flame placed at a distance of 30 cm from a spherical lens is formed on a screen placed on the other side of a lens at a distance 60 cm from the optical centre of lens. Identify the type of lens and calculate its focal length. If the height of the flame is 3 cm, find the height of its image.   **[Delhi]**

Long Answer Type Questions [5 Marks]

1) What is meant by power of a lens? Define its S.I. unit.

You have two lenses A and B of focal lengths +10 cm and –10 cm respectively. State the nature and power of each lens. Which of the two lenses will form a virtual and magnified image of an object placed 8 cm from the lens? Draw a ray diagram to justify your answer. **[All India]**

2) One half of a convex lens of focal length 10 cm is covered with a black paper. Can such a lens produce an image of a complete object placed at a distance of 30 cm from the lens ? Draw a ray diagram to justify your answer.

A 4 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 15 cm. Find the nature, position and size of the image.   **[All India]**

3) What is meant by the power of a lens? What is its S.I. unit? Name the type of lens whose power is positive.

The image of an object formed by a lens is real, inverted and of the same size as the object. If the image is at a distance of 40 cm from the lens, what is the nature and power of the lens ? Draw ray diagram to justify your answer.   **[Foreign]**

4) A student has focused the image of a candle flame on a white screen using a concave mirror. The situation is as given below :

    Length of the flame = 1·5 cm

    Focal length of the mirror = 12 cm

    Distance of flame from the mirror = 18 cm

If the flame is perpendicular to the principal axis of the mirror, then calculate the following :
(a) Distance of the image from the mirror
(b) Length of the image
If the distance between the mirror and the flame is reduced to 10 cm, then what would be observed on the screen? Draw ray diagram to justify your answer for this situation.   **[Foreign]**

5) (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 2.0and 1.5 respectively. If the speed of light in medium 'B' is2 X 10^8 m/s, calculate the speed of light in :
(i) vacuum,
(ii) medium 'A'.   **[Delhi]**

6) "A convex lens can form a magnified erect as well as magnified inverted image of an object placed in front of it." Draw ray diagram to justify this statement stating the position of the object with respect to the lens in each case.
An object of height 4 cm is placed at a distance of 20 cm from a concave lens of focal length 10 cm. Use lens formula to determine the position of the image formed.   **[Delhi]**

Year 2014
Very Short Answer Type Questions [2 Marks]

1) List two possible ways in which a concave mirror can produce a magnified image of an object placed in front of it. State the difference, if any, between these two images.   **[All India]**

2) The image formed by a concave mirror is observed to be virtual, erect and larger than the object. Where should the position of the object be relative to the mirror ? Draw ray diagram to justify your answer.   **[All India]**

3) ''A concave mirror of focal length 15 cm can form a magnified erect as well as inverted image of an object placed in front of it.'' Justify this statement stating the position of the object with respect to the pole of the mirror in both cases for obtaining the images. **[All India]**

4) The linear magnification produced by a spherical mirror is $+\frac{1}{3}$. Analysing this value state the (i) type of mirror and (ii) position of the object with respect to the pole of the mirror. Draw ray diagram to justify your answer.   **[Foreign]**

5) The linear magnification produced by a spherical mirror is –1. Analysing this value state the (i) type of mirror and (ii) position of the object with respect to the pole of the mirror. Draw ray diagram to justify your answer.   **[Foreign]**

6) The linear magnification produced by a spherical mirror is $-\frac{1}{5}$. Analysing this value state the (i) type of spherical mirror and (ii) the position of the object with respect to the pole of the mirror. Draw ray diagram to justify your answer.   **[Foreign]**

7) Draw a ray diagram to show the path of the reflected ray corresponding to an incident ray which is directed towards the principal focus of a convex mirror. Mark on it the angle of incidence and the angle of reflection.   **[Delhi]**

8) Draw a ray diagram to show the path of the reflected ray corresponding to an incident ray which is directed parallel to the principal axis of a convex mirror. Mark on it the angle of incidence and the angle of reflection.   **[Delhi]**

9) Draw a ray diagram to show the path of the reflected ray corresponding to an incident ray of light parallel to the principal axis of a concave mirror. Mark the angle of incidence and angle of reflection on it.   **[Delhi]**

Short Answer Type Questions [3 Marks]

1) 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.   **[All India]**

2) Draw a ray diagram to show the path of the refracted ray in each of the following cases : A ray of light incident on a concave lens is
   (i) passing through its optical centre.
   (ii) parallel to its principal axis.
   (iii) directed towards its principal focus.   **[All India]**

3) A student wants to project the image of a candle flame on a screen 48 cm in front of a mirror by keeping the flame at a distance of 12 cm from its pole.
   (a) Suggest the type of mirror he should use.
   (b) Find the linear magnification of the image produced.
   (c) How far is the image from its object ?
   (d) Draw ray diagram to show the image formation in this case. **[All India]**

4) A student wants to project the image of a candle flame on a screen 90 cm in front of a mirror by keeping the flame at a distance of 15 cm from its pole.
   (a) Suggest the type of mirror he should use.
   (b) Determine the linear magnification in this case.
   (c) Find the distance between the object and its image.
   (d) Draw ray diagram to show the image formation in this case.   **[All India]**

5) A student wants to obtain an erect image of an object using a concave mirror of 12 cm focal length. What should be the range of distance of the object from the mirror ? State the nature and size of the image he is likely to observe. Draw a ray diagram to justify your answer. **[Foreign]**

6) The image of a candle flame placed at a distance of 40 cm from a spherical lens is formed on a screen placed on the other side of the lens at a distance of 40 cm from the lens. Identify the type of lens and write its focal length. What will be the nature of the image formed if the candle flame is shifted 25 cm towards the lens ? Draw a ray diagram to justify your answer. **[Foreign]**

7) A student wants to obtain an erect image of a candle flame using a concave mirror of focal length 15 cm. What should be the range of distance of the candle flame from the mirror ? State the nature and size of the image he is likely to observe. Draw a ray diagram to show the image formation in this case. **[Foreign]**

8) A student has a concave mirror of 20 cm focal length and he wants to see an erect image of his face in the mirror. What should be the range of distance of the mirror from his face ? State the nature and size of the image he is likely to observe. Draw a ray diagram to justify your answer. **[Foreign]**

9) 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.   **[Delhi]**

10) State the laws of refraction of light. If the speed of light in vacuum is 3×10^8 ms^{-1}, find the speed of light in a medium of absolute refractive index 1.5. **[Delhi]**

11) A spherical mirror produces an image of magnification —1 on a screen placed at a distance of 40 cm from the mirror :
(i) Write the type of mirror.
(ii) What is the nature of the image formed?
(iii) How far is the object located from the mirror?
(iv) Draw the ray diagram to show the image formation in this case.   **[Delhi]**

12) A spherical mirror produces an image of magnification —1.0 on a screen placed at a distance of 30 cm from the pole of the mirror.
(i) Write the type of mirror in this case.
(ii) What is the focal length of the mirror ?
(iii) What is the nature of the image formed ?
(iv) Draw the ray diagram to show the image formation in this case.   **[Delhi]**

Long Answer Type Questions [5 Marks]
1) (a) Explain the following terms related to spherical lenses :
    (i) optical centre
    (ii) centres of curvature
    (iii) principal axis
    (iv) aperture
    (v) principal focus
    (vi) focal length
(b) A converging lens has focal length of 12 cm. Calculate at what distance should the object be placed from the lens so that it forms an image at 48 cm on the other side of the lens.**[All India]**

2) Explain the following terms related to spherical lenses :
    (a) Centres of curvature
    (b) Principal axis
    (c) Optical centre
    (d) Principal focus
At what distance from a concave lens of focal length 20 cm, should a 6 cm tall object be placed so that it forms an image at 15 cm from the lens? Also determine the size of the image formed.
    [All India]

3) What is meant by power of a lens? Name and define its S.I. unit.
One student uses a lens of focal length +50 cm and another of –50 cm. State the nature and find the power of each lens. Which of the two lenses will always give a virtual, erect and diminished image irrespective of the position of the object?   **[Foreign]**

4) A student wants to project the image of a candle flame on the walls of school laboratory by using a lens :
(a) Which type of lens should he use and why?
(b) At what distance in terms of focal length 'f' of the lens should he place the candle flame so as to get (i) a magnified, and (ii) a diminished image respectively on the wall ?
(c) Draw ray diagram to show the formation of the image in each case.   **[Delhi]**

5) A student wants to project the image of a candle flame on the walls of school laboratory by using a mirror.
(a) Which type of mirror should he use and why?
(b) At what distance in terms of focal length 'f' of the mirror should he place the candle flame so as to get the magnified image on the wall?
(c) Draw a ray diagram to show the formation of image in this case.

(d) Can he use this mirror to project a diminished image of the candle flame on the same wall ? State 'how' if your answer is 'yes' and 'why not' if your answer is 'no.'   **[Delhi]**

Year 2013
Very Short Answer Type Questions [2 Marks]
1) "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.   **[Delhi]**

Short Answer Type Questions [3 Marks]
1) Mention the types of mirrors used as (i) rear view mirrors, (ii) shaving mirrors. List two reasons to justify your answers in each case.   **[Delhi]**
2) An object of height 6 cm is placed perpendicular to the principal axis of a concave lens of focal length 5 cm. Use lens formula to determine the position, size and nature of the image if the distance of the object from the lens is 10 cm.   **[Delhi]**

Long Answer Type Questions [5 Marks]
1) (a) State the laws of refraction of light. Give an expression to relate the absolute refractive index of a medium with speed of light in vacuum.
   (b) The refractive indices of water and glass with respect to air are 4/3and 3/2 respectively. If the speed of light in glass is 2×10^8 ms^{-1}, find the speed of light in (i) air, (ii) water. **[Delhi]**

Year 2012
Very Short Answer Type Questions [2 Marks]
1) To construct ray diagram we use two light rays which are so chosen that it is easy to know their directions after reflection from- the mirror. List these two rays and state the path of these rays after reflection. Use these rays to locate the image of an object placed between centre of curvature and focus of a concave mirror. **[All India]**
2) List four properties of the image formed by a plane mirror. **[Delhi]**
3) List four properties of the image formed by a convex mirror. **[Delhi]**
4) List four properties of the image formed by a concave mirror, when object is placed between focus and pole of the mirror. **[Delhi]**
5) 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. **[Foreign]**

Short Answer Type Questions [3 Marks]
1) State the types of mirrors used for (i) headlights and (ii) rear view mirrors in cars and motorcycles. Give reason to justify your answer in each case. **[All India]**
2) A 4 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 24 cm. The distance of the object from the lens is 16 cm. Find the position, size and nature of the image formed, using the lens formula. **[All India]**
3) State the type of mirror preferred as (i) rear view mirror in vehicles, (ii) shaving mirror. Justify your answer giving two reasons in each case. **[Delhi]**

4) The image of a candle flame placed at a distance of 45 cm from a spherical lens is formed on a screen placed at a distance of 90 cm from the lens.
Identify the type of lens and calculate its focal length. If the height of the flame is 2 cm, find the height of its image. **[Delhi]**

5) A 6 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 15 cm. The distance of the object from the lens is 10 cm. Find the position, size and nature of the image formed, using the lens formula. **[Foreign]**

6) Name the type of mirror used in the following situations :
(i) Headlights of a car
(ii) Rear-view mirror of a vehicle
(iii) Solar furnace
Support your answer with reason. **[Foreign]**

Long Answer Type Questions [5 Marks]

1) List the new Cartesian sign convention for reflection of light by spherical mirrors. Draw a diagram and apply these conventions for calculating the focal length and nature of a spherical mirror which forms a 1/3 times magnified virtual image of an object placed 18 cm in front of it. **[All India]**

2) With the help of a ray diagram, state what is meant by refraction of light. State Snell's law for refraction of light and also express it mathematically.
The refractive index of air with respect to glass is 2/3 and the refractive index of water with respect to air is 4/3. If the speed of light in glass is 2×10^8 m/s, find the speed of light in (a) air, (b) water. **[All India]**

3) 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 a three times magnified real image of an object placed 16 cm in front of it. **[Delhi]**

4) State the law of refraction of light that defines the refractive index of a medium with respect to the other. Express it mathematically. How is refractive index of any medium 'A' with respect to a medium 'B' related to the speed of propagation of light in two media A and B? State the name of this constant when one medium is vacuum or air.
The refractive indices of glass and water with respect to vacuum are 3/2 and 4/3 respectively. If the speed of light in glass is 2×10^8 m/s, find the speed of light in (i) vacuum, (ii) water. **[Delhi]**

5) 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. **[Foreign]**

6) State the laws of refraction of light. Write an expression to relate absolute refractive index of a medium with speed of light in vacuum.
The refractive index of a medium 'x' with respect to 'y' is 2/3 and the refractive index of medium 'y' with respect to 'z' is 4/3. Calculate the refractive index of medium 'z' with respect of 'x'.
[Foreign]

7) To construct a ray diagram, we use two light rays which are so chosen that it is easy to know their directions after reflection from the mirror. List these two rays and state the path of these rays after reflection. Use these rays to locate the image of an object placed between centre of curvature and focus of a concave mirror. **[All India]**

Year 2011

Very Short Answer Type Questions [2 Marks]

1) State any four characteristics of the image of an object formed by a plane mirror.**[All India]**
2) State the two laws of reflection of light.   **[Delhi]**
3) Define the focus of a concave mirror. If the radius of curvature of a convex mirror is 30 cm, what would be its focal length? **[Foreign]**
4) 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? **[Foreign]**
5) Define and show on a diagram, the following terms relating to aconcave mirror :
   (i) Aperture
   (ii) Radius of curvature   **[Foreign]**

Short Answer Type Questions [3 Marks]

1) An object is placed between infinity and the pole of a convex mirror. Draw a ray diagram and also state the position, the relative size and the nature of the image formed. **[All India]**
2) What is the principle of reversibility of light? Show that the incident ray of light is parallel to the emergent ray of light when light falls obliquely on a side of a rectangular glass slab. **[All India]**
3) Draw the ray diagram and also state the position, the relative size and the nature of image formed by a concave mirror when the object is placed at the centre of curvature of the mirror. **[Delhi]**
4) Define, 'refractive index of a transparent medium." What is its unit? Which has a higher refractive index, glass or water? **[Delhi]**
5) A ray of light travelling in air enters obliquely into water. Does the light ray bend towards or away from the normal? Why? Draw a ray diagram to show the refraction of light in this situation. **[Delhi].**
6) (a) "The refractive index of diamond is 2.42". What is the meaning of this statement?
   (b) Name a liquid whose mass density is less than that of water but it is optically denser than water. **[Delhi]**
7) With the help of a ray diagram explain why a convex mirror is preferred for rear view mirrors in motor cars. **[Foreign]**
8) What is understood by lateral displacement of light ? Illustrate it with the help of a diagram. List any two factors on which the lateral displacement in a particular substance depends. **[Foreign]**
9) Draw the ray diagram and also state the position, relative size and nature of the image formed by a concave mirror when the object is placed between its centre of curvature, C and focus, F. **[Foreign]**

Long Answer Type Questions [5 Marks]

1) (a) What is meant by 'power of a lens' ?
   (b) State and define the S.I. unit of power of a lens.
   (c) A convex lens of focal length 25 cm and a concave lens of focal length 10 cm are placed in close contact with each other. Calculate the lens power of this combination. **[All India]**
2) (a) Draw a ray diagram to show the formation of image of an object placed between infinity and the optical centre of a concave lens.
   (b) A concave lens of focal length 15 cm forms an image 10 cm from the lens. Calculate
   (i) the distance of the object from the lens
   (ii) the magnification for the image formed
   (iii) the nature of the image formed   **[All India]**

3) (a) If the image formed by a lens is diminished in size and erect, for all positions of the object, what type of lens is it?

(b) Name the point on the lens through which a ray of light passes undeviated.

(c) An 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 (i) the position (ii) the magnification and (iii) the nature of the image formed.   **[Delhi]**

4) (a) One-half of a convex lens is covered with a black paper. Will such a lens produce an image of the complete object ? Support your answer with a ray diagram.

(b) An object 3 cm high is held 25 cm away from a converging lens of focal length 10 cm.

(i) Draw the ray diagram and

(ii) Calculate the position and size of the image formed.

(iii) What is the nature of the image ?   **[Delhi]**

5) (a) Under what condition will a glass lens placed in a transparent liquid become invisible?

(b) Describe and illustrate with a diagram, how we should arrange two converging lenses so that a parallel beam of light entering one lens emerges as a parallel beam after passing through the second lens.

(c) An object is placed at a distance of 3 cm from a concave lens of focal length 12 cm. Find the (i) position and (ii) nature of the image formed.   **[Foreign]**

6) (a) With the help of a ray diagram explain why a concave lens diverges the rays of a parallel beam of light.

(b) A 2.0 cm tall object is placed perpendicular to the principal axis of a concave lens of focal length 15 cm. At what distance from the lens, should the object be placed so that it forms an image 10 cm from the lens? Also find the nature and the size of image formed. **[Foreign]**

Year 2010

Very Short Answer Type Questions [1 Mark]

1) Explain why a ray of light passing through the centre of curvature of a concave mirror gets reflected along the same path. **[Delhi]**

2) What is the nature of the image formed by a concave mirror if themagnification produced by the mirror is +3 ? **[Delhi]**

3) Between which two points of a concave mirror should an object be placed to obtain a magnification of - 3? **[Delhi]**

4) "The refractive index of carbon disulphide is 1.63." What is the meaning of this statement in relation to speed of light? **[Delhi]**

5) The outer surface of a hollow sphere of aluminium of radius 50 cm is to be used as a mirror. What will be the focal length of this mirror? Which type of spherical mirror will it provide? **[Delhi]**

6) How should a ray of light be incident on a rectangular glass slab so that it comes out from the opposite side of the slab without being displaced ? **[Foreign]**

7) A girl was playing with a thin beam of light from her laser torch by directing it from different directions on a convex lens held vertically. She was surprised to see that in a particular direction the beam of light continues to move along the same direction after passing through the lens. State the reason for this observation. **[Foreign]**

8) A ray of light enters a rectangular glass slab of refractive index 1.5. It is found that the ray emerges from the opposite face of the slab without being displaced. If its speed in air is 3 x 108 ms-1 then what is its speed in glass? **[Foreign]**

9) The speed of light in a transparent medium is 0.6 times that of its speed in vacuum. What is the refractive index of the medium? **[Foreign]**

10) Between which two points related to a concave mirror should an object be placed to obtain on a screen an image twice the size of the object? **[All India]**

Very Short Answer Type Questions [2 Marks]

1) In an experiment with a rectangular glass slab, a student observed that a ray of light incident at an angle of 55° with the normal on one face of the slab, after refraction strikes the opposite face of the slab before emerging out into air making an angle of 40° with the normal. Draw a labelled diagram to show the path of this ray. What value would you assign to the angle of refraction and angle of emergence? **[All India]**

2) An object is kept at a distance of 4 m in front of a spherical mirror which forms its erect image at a distance of 1.0 m from the mirror. What is the magnification ? Is the mirror concave or convex? **[Foreign]**

Short Answer Type Questions [3 Marks]

1) At what distance should an object be placed from a convex lens of focal length 18 cm to obtain an image at 24 cm from it on the other side. What will be the magnification produced in this case ? **[Delhi]**

2) The image of an object placed at 60 cm in front of a lens is obtained on a screen at a distance of 120 cm from it. Find the focal length of the lens. What would be the height of the image if the object is 5 cm high ? **[Foreign]**

3) How far should an object be placed from a .convex lens of focal length 20 cm to obtain its image at a distance of 30 cm from the lens? What will be the height of the image if the object is 6 cm tall? **[All India]**

Year 2009
Very Short Answer Type Questions [1 Mark]

1) Why does a ray of light bend when it travels from one medium into another ? **[Delhi]**

2) Draw the given diagram in your answer book and complete it for the path of ray of light beyond the lens.   **[Delhi]**
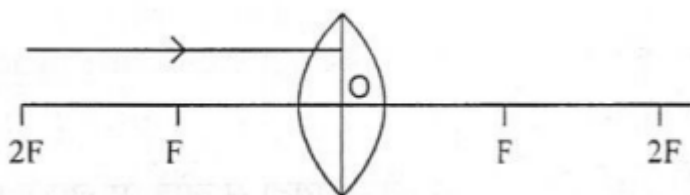

3) What kind of mirrors are used in big shopping stores to watch activities of customers ?**[Foreign]**

4) Draw a ray diagram to determine the position of image formed of an object placed between the pole and the focus of a concave mirror.   **[Foreign]**

5) Draw the following diagram in your answer-book and show the formation of image of the object AB with the help of suitable rays.
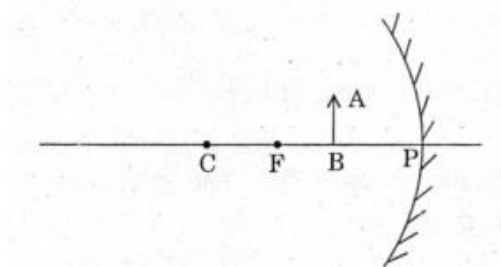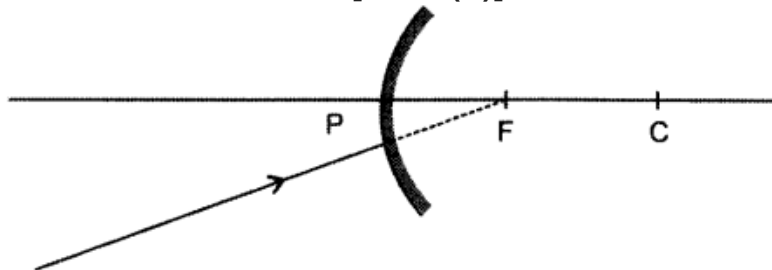
6) Redraw the diagram given below in your answer book and show the direction of the light ray after reflection from the mirror. **[Delhi (C)]**
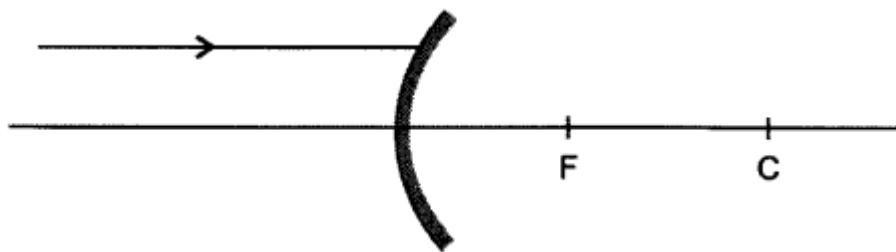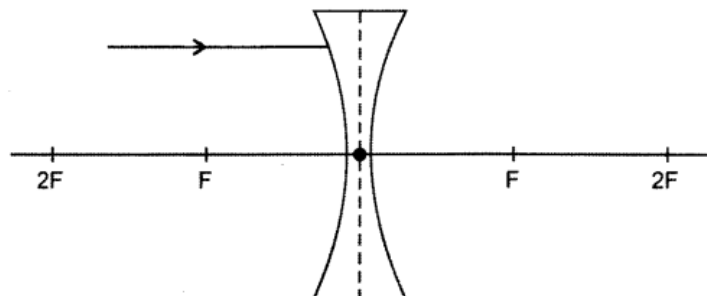
7) Redraw the diagram given below in your answer book and show the direction of the light ray after reflection from the mirror. **[Delhi (C)]**
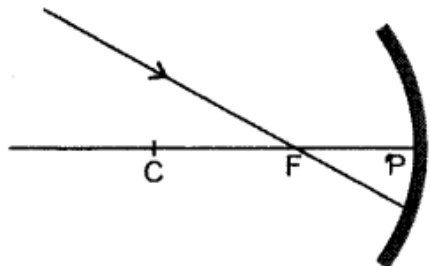
8) Redraw the diagram given below in your answer book and show the direction of the light ray after reflection from the mirror. **[Delhi (C)]**

9) Redraw the diagram given below in your answer book and show the direction of the light ray after refraction from the lens. **[Delhi, All India(C)]**

10) Why does a ray of light bend when it travels from one medium into another? [Delhi]
11) Redraw the diagram given below in your answer book and show the direction of the light ray after refraction from the lens. [All India (C)]
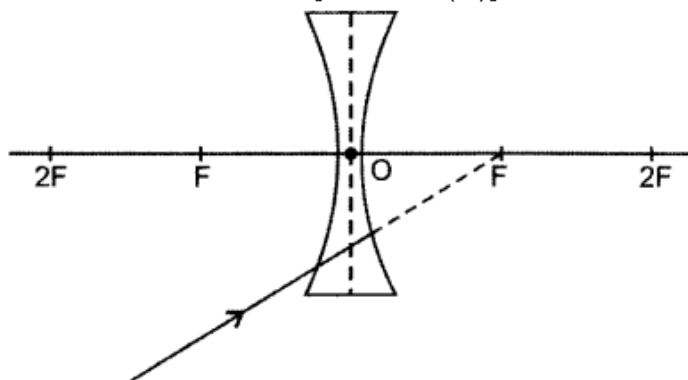
Very Short Answer Type Questions [2 Marks]
1) Draw ray diagrams to represent the nature, position and relative size of the image formed by a convex lens for the object placed :
   (a) at $2F_1$.
   (b) between F_1 and the optical centre O of lens.
2) What is the minimum number of rays required for locating the image formed by a concave mirror for an object. Draw a ray diagram to show the formation of a virtual image by a concave mirror. **[Delhi]**
3) The refractive index of water is 1.33 and the speed of light in air is 3 x 108 ms-1. Calculate the speed of light in water. **[Foreign]**
4) The refractive index of glass is 1.50 and the speed of light in air is 3 x 108 ms-1. Calculate the speed of light in glass. **[Foreign]**
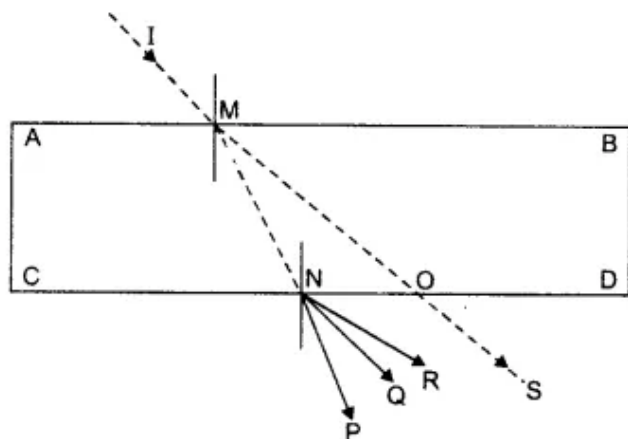
Short Answer Type Questions [3 Marks]
1) For which position of the object does a convex lens form a virtual and erect image? Explain with the help of a ray diagram. **[All India]**

# Year 2008
Very Short Answer Type Questions [1 Mark]
1) If a light ray IM is incident on the surface AB as shown, identify the correct emergent ray. **[Delhi (C)]**

2) The refractive indices of four media A, B, C and D are given in the following table:

| Medium	A	B	C	D
Refractive Index	1.33	1.50	1.52	2.40

3) If light, travels from one medium to another, in which case the change in speed will be (i) minimum, (ii) maximum? **[Delhi(C)]**

4) "The refractive index of diamond is 2.42". What is the meaning of this statement in relation to speed of light? **[Delhi]**

5) Redraw the given diagram and show the path of the refracted ray: **[All India(C)]**
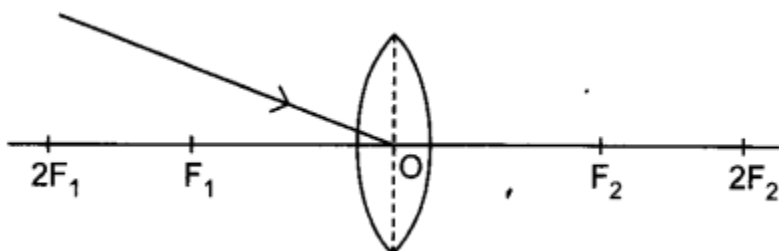
6) Redraw the given diagram and show the path of the refracted ray: **[All India(C)]**
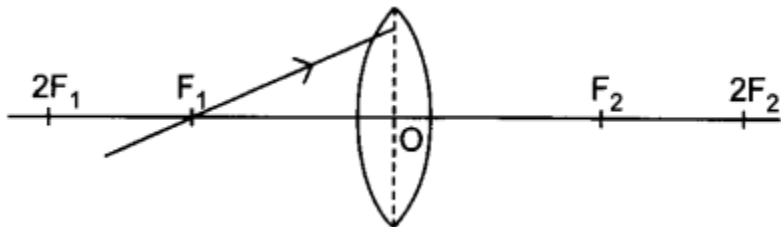
7) Draw the following diagram in your answer book and show the formation of image of the object AB with the help of suitable rays. **[All India]**
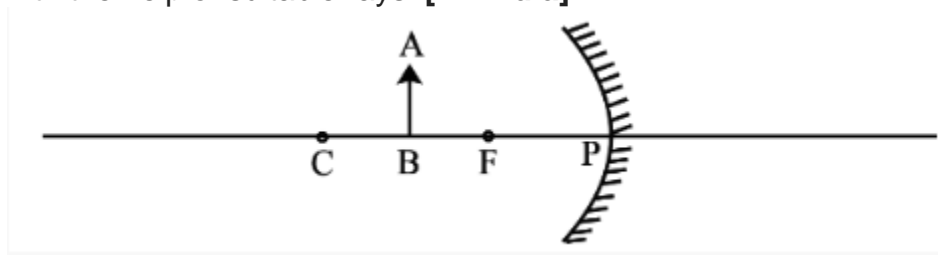
8) Which kind of mirrors are used in the headlights of a motor-car and why? **[Foreign]**

Very Short Answer Type Questions [2 Marks]

1) Explain with the help of a diagram, why a pencil partly immersed in water appears to be bent at the water surface. **[Delhi]**

2) Draw ray diagrams to represent the nature, position and relative size of the image formed by a convex lens for the object placed:
   (a) at $2F_1$
   (b) between F_1 and the optical centre O of lens: **[All India]**

3) A ray of light, incident obliquely on a face of a rectangular glass slab placed in air, emerges from the opposite face parallel to the incident ray. State two factors on which the lateral displacement of the emergent ray depends. **[Foreign]**

Short Answer Type Questions [3 Marks]

1) 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? What will be the nature and the size of the image formed? Draw a ray diagram to show the formation of the image in this case. **[Delhi(C)]**

2) An object 2 cm high is placed at a distance of 64 cm from a white screen. On placing a convex lens at a distance of 32 cm from the object it is found that a distinct image of the object is formed on the screen. What is the focal length of the convex lens and size of the image formed on the screen? Draw a ray diagram to show the formation of the image in this position of the object with respect to the lens. **[Delhi(C)]**

3) A convex lens has a focal length of 10 cm. At what distance from the lens should the object be placed so that it forms a real and inverted image 20 cm away from the lens? What would be the size of the image formed if the object is 2 cm high? With the help of a ray diagram show the formation of the image by the lens in this case. **[All India (C)]**

Long Answer Type Questions [5 Marks]

1) (a) 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.
(b) One half a convex lens of focal length 20 cm is covered with a black paper.
(i) Will the lens produce a complete image of the object?
(ii) Show the formation of image of an object placed at $2F_1$ of such covered lens with the help of a ray diagram.
(iii)How will the intensity of the image formed by half-covered lens compare with non-covered lens? **[Foreign]**

Year 2007

Short Answer Type Questions [3 Marks]

1) A concave lens has focal length of 20 cm. At what distance from the lens a 5 cm tall object be placed so that it forms an image at 15 cm from the lens? Also calculate the size of the image formed. **[Delhi]**

2) An object 50 cm tall is placed on the principal axis of a convex lens. Its 20 cm tall image is formed on the screen placed at a distance of 10 cm from the lens. Calculate the focal length of the lens. **[All India]**

Long Answer Type Question [5 Marks]

1) Draw the ray diagram in each case to show the position and nature of the image formed when the object is placed:
(i) at the centre of curvature of a concave mirror
(ii) between the pole P and focus F of a concave mirror
(iii) in front of a convex mirror
(iv) at 2F of a convex lens
(v) in front of a concave lens