

Q. When an object is kept within the focus of a concave mirror, an enlarged image is formed behind the mirror. This image is

[CBSE 2020]

- (a) real
- (b) inverted
- (c) virtual and inverted
- (d) virtual and erect

Ans. (d) When an object is placed between the principal focus and pole of a concave mirror, an enlarged virtual and erect image is formed behind the mirror.

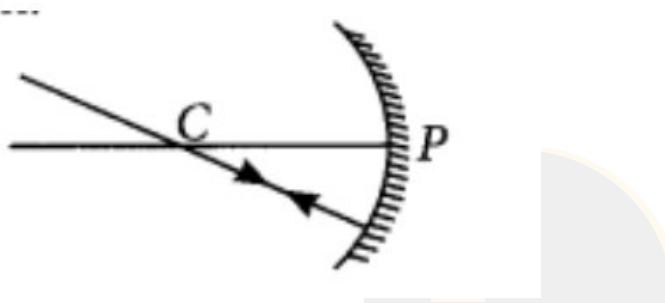
Q. Draw ray diagrams for the following cases when a ray of light:

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

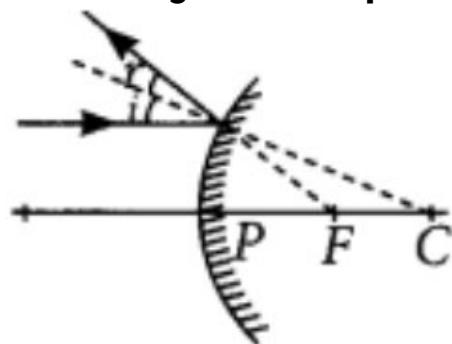
(ii) parallel to principal axis is incident on convex mirror.

(iii) is passing through focus of a concave mirror incident on it. [CBSE 2020]

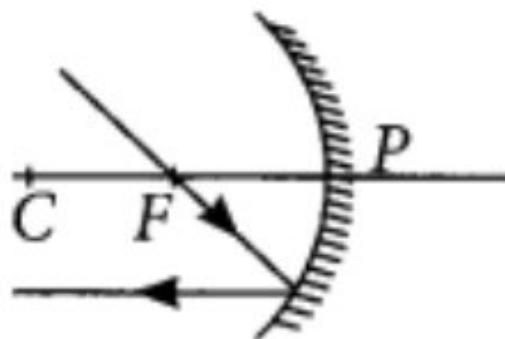
Ans. (i) Ray of light passing through centre of curvature of concave mirror, after reflection.



(ii) Ray of light parallel to the principal axis is incident on a convex mirror after reflection appear to diverge from the principal focus of a convex mirror.



(iii) Ray of light passing through focus of a concave mirror after reflection will emerge parallel.



Q. List in proper sequence the steps of the experiment for determining the approximate focal length of a given concave mirror by obtaining the image of a distant object. [CBSE 2019]

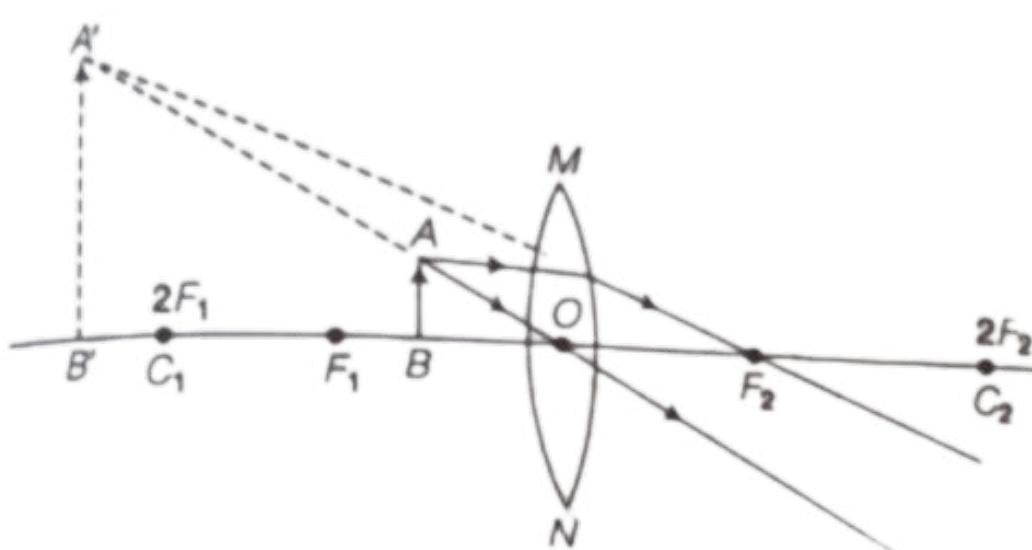
- Ans. (i) Fix the concave mirror on the stand and place it on table facing towards a distant object.
(ii) Arrange the screen on the table so that the image of the distant object is obtained on it.
(iii) Measure the distance between the mirror and the screen using a metre scale. This distance is the focal length (F) of the mirror.

Q. List four precautions which a student should observe while determining the focal length of a given convex lens by obtaining image of a distant object on a screen. [CBSE 2019]

- Ans. (i) The lens should be held in vertical position with its face parallel to screen.
(ii) A clear and sharpest image of the distant object should be obtained by suitably adjusting the position of lens.
(iii) At least three observation should be taken.
(iv) Measure the distance between the convex lens and the screen carefully.

Q. The image of an object formed by 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. [CBSE (AI) 2016]

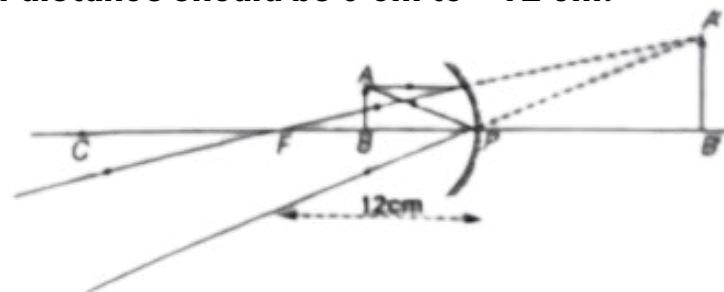
Ans. Image with magnification -1, means image is inverted and of the same size. Therefore, object is at $2f$ and the image is also at $2f$ on the other side of the lens. Therefore, distance between the object and its image is $4f=60$ cm $f=15$ cm object distance $2f=30$ cm.
If the object shifted towards the lens by 20 cm, the new object distance = 30 cm - 20 cm = 10 cm. This distance is less than the focal length, and the image formed in this case would be virtual, erect and will form the same side as the object.



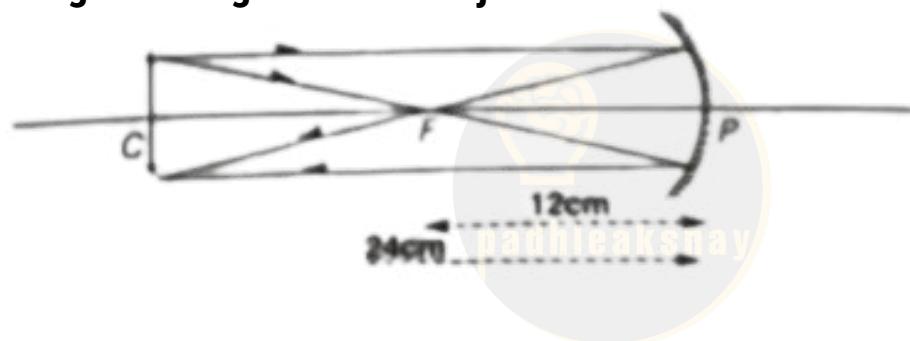
Q. It is desired to obtain an erect image of an object, using concave mirror of focal length of 12 cm.

- (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. [CBSE (AI) 2016]

Ans. (i) Range of distance should be 0 cm to < 12 cm.

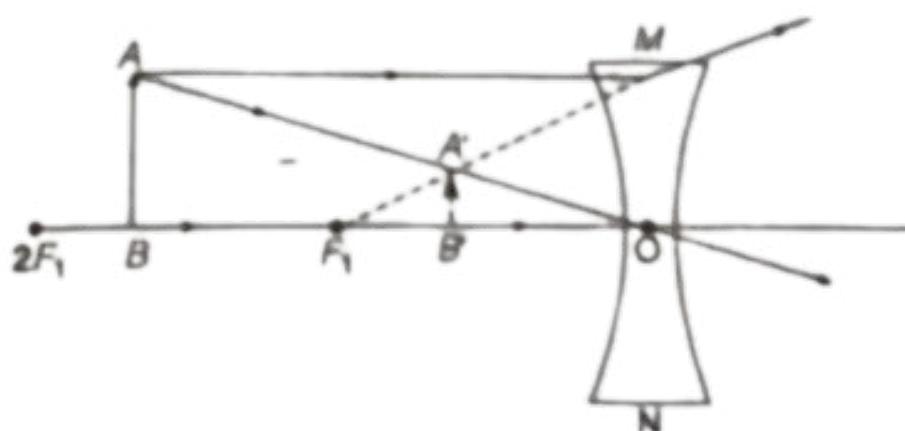


(ii) The image will be larger than the object.



Q. 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. [CBSE (F) 2016]

Sol. It is diverging lens or concave lens.



Focal length = -20 cm

(lens is concave, hence f is -ve)

Power = $P = 1/f = 100/-20 \text{ cm} = -5 \text{ D}$

Q. What is the radius of curvature of a plane mirror?

[CBSE 2015]

Ans. The radius of curvature of plane mirror is infinity.

Q. Discuss the position and nature of the image formed by a concave mirror when the object is moved from infinity towards the pole of the mirror. [CBSE 2015]

Ans. As the object is moved from infinity towards the pole of a concave mirror the image shifts from the focus of the mirror to infinity. When the object is at infinity, the image is formed at the principal focus or in the focal plane. As the object is shifted, further the image is formed between the principal focus and centre of curvature, then at the centre of curvature, then beyond the centre of curvature, then at infinity and finally the image is formed behind the mirror. The size of the image goes on increasing.

Q. A concave mirror and a convex lens are held in water. What changes, if any, do you expect in their focal length? [CBSE 2014]

Ans. The focal length of a mirror does not depend upon the nature of the medium in which it is placed whereas the focal length of a lens depends upon the medium in which it is placed. Thus, there will be no change in the focal length of the concave mirror whereas the focal length of the convex lens will change.

Q. An object is situated at 8 cm from a convex lens of focal length 10 cm. Find the position and nature of image. Draw ray diagram to illustrate the formation of image (not to scale) [CBSE 2015]

Ans. Given, $f=+10\text{cm}$, and $u = -8\text{cm}$

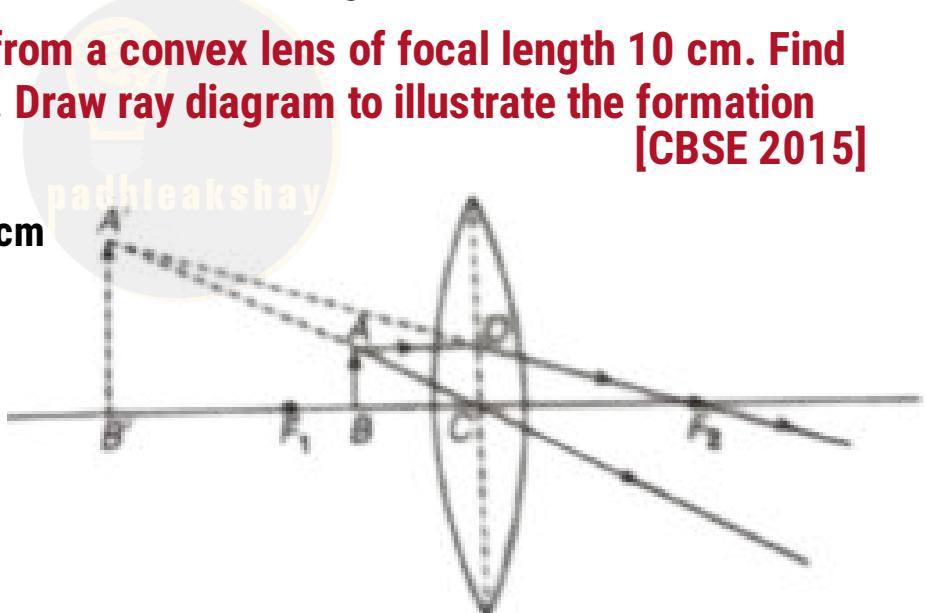
According to lens formula

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

$$\text{so., } \frac{1}{v} = \frac{1}{10} - \frac{1}{8}$$

$$v = -40\text{ cm}$$

$$v = +40\text{ cm}$$



Hence, we conclude that magnified image (larger in size than the object) is formed on the same side of lens. The image will be virtual and erect.

Q. Define the term principal focus for a convex mirror.

[CBSE 2012]

Ans. It is a point on the principal axis at which the rays parallel to the principle axis from where the rays of light seem to come after reflection.

Q. What is a prism?

[CBSE 2012, 15, 16, 17]

Ans. Prism is a glass object with two triangular bases and three rectangular lateral surfaces inclined at an angle.

Q. Name the type of mirror used in the following situations

[NCERT, CBSE 2013]

(a) Headlights of a car.

(b) Side/rear-view mirror of a vehicle

(c) Solar furnace.

Support your answer with reason.

Ans.(a) In headlights of a car concave mirrors are used to get powerful parallel beams of light.

(b) In side/rear-view mirror of a vehicle the convex mirrors are used because they always give an erect, though diminished image.

(c) In solar furnace the concave mirror are used to concentrate sunlight to produce heat.

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

[NCERT, CBSE 2011, 13]

Ans. The positive sign means image formed by a plane mirror is virtual and erect. The size of image is equal to the size of object.

Q. What is the focal length of a plane mirror?

[CBSE 2011]

Ans. Infinity.

Q. Draw a labelled ray diagram to locate the image of an object formed by a convex lens of focal length 20 cm when the object is placed 30 cm away from the lens.

[CBSE 2016]

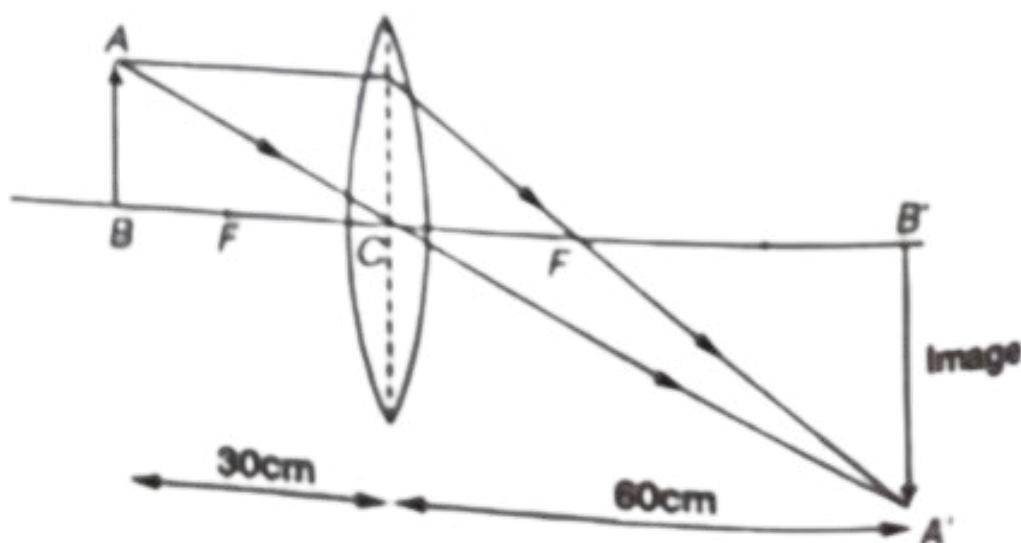
Ans. Given, $f=20\text{ cm}$, $u=-30\text{ cm}$, $v = ?$

Using the lens formula,

$$\frac{1}{v} = \frac{1}{u} + \frac{1}{f} = \frac{1}{-30} + \frac{1}{20} = \frac{1}{60}$$

Hence,. $v=60$

The labelled diagram is as shown below:



Q. 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:

- (i) position**
- (ii) nature**
- (iii) size of the image formed.**

Ans. Given object size = 5 cm object distance from lens $u = -30 \text{ cm}$, focal length $f = 20 \text{ cm}$,

We have to find $v = ?$ Using the lens formula $= 1/v = 1/u + 1/f$

we get, $V = 60\text{cm}$.

magnification

$$v/u = -60/30 = -2$$

magnification = image size/ object size = -2

here, object size = 5

so, image size = -10 cm

The image is real inverted and magnified.



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NO BAKWAS

- 1. If an opaque object on the path of light becomes very small, light has a tendency to bend around it and not walk in a straight line an effect known as?**
- a) Scattering
 - b) Emersion
 - c) Dispersion
 - d) Diffraction
- 2. ____mirrors are fitted on the sides of the vehicle, enabling the driver to see traffic behind him/her to facilitate safe driving.**
- a) Convex mirror
 - b) Biconcave mirror
 - c) Concave mirror
 - d) Plane mirror
- 3. The ability of a medium to refract light is also expressed in terms of its?**
- a) visible density
 - b) material density
 - c) optical density
 - d) refractive density
- 4. In case of a rectangular glass slab, the refraction takes place at both air-glass interface and glass-air interface. The emergent ray is to the direction of incident ray.**
- a) perpendicular
 - b) refracted
 - c) reflected
 - d) parallel
- 5. Power of a lens is the reciprocal of its focal length. The SI unit of power of a lens is?**
- a) Ohm
 - b) Dioptrē
 - c) Dioptrē per metre
 - d) Dioptrē metre
- 6. The image formed by a concave mirror is observed to be virtual, erect and larger than the object. Where should be the position of the object?**
- a) Between the principal focus and the centre of curvature
 - b) At the centre of curvature
 - c) Beyond the centre of curvature
 - d) Between the pole of the mirror and its principal focus.

7. Where should an object be placed in front of a convex lens to get a real image of the size of the object?

- a) At the principal focus of the lens
- b) At twice the focal length
- c) At infinity
- d) Between the optical centre of the lens and its principal focus.

8. No matter how far you stand from a mirror, your image appears erect. The mirror is likely to be

- a) only plane.
- b) only concave.
- c) only convex.
- d) either plane or convex

9. A spherical mirror and a thin spherical lens have each a focal length of -15 cm. The mirror and the lens are likely to be

- a) both concave
- b) both convex
- c) the mirror is concave and the lens is convex
- d) the mirror is convex, but the lens is concave.

10. Which of the following lenses would you prefer to use while reading small letters found in a dictionary?

- a) A convex lens of focal length 50 cm.
- b) A concave lens of focal length 50 cm.
- c) A convex lens of focal length 5 cm
- d) A concave lens of focal length 5 cm.

11. One-half of a convex lens is covered with a black paper. Will this lens produce a complete image of the object? Mark the correct comment regarding this.

- a) Yes, with full intensity
- b) Yes, with half intensity
- c) No, image will not be formed
- d) None of the above

12. A doctor has prescribed a corrective lens of power +1.5 D. Is the prescribed lens diverging or converging?

- a) Diverging
- b) Converging
- c) Both
- d) none