Important Questions for CBSE Class 10 Science Chapter 10 Light Reflection and Refraction

MULTIPLE CHOICE QUESTIONS

Q.1. Rays from the sun converge at a point 15 cm in front of a concave mirror. Where should an object be placed so that the size of its image is equal to the size of the object?

(a) 15 cm in front of the mirror

(b) 30 cm in front of the mirror

(c) between 15 cm and 30 cm in front of the mirror

(d) more than 30 cm in front of the mirror

Q.2. No matter how far you stand from a mirror, your image appears erect. The mirror islikely to be

(a) Plane

(b) Concave

(c) Convex

(d) Either plane or convex

Q.3. You are given water, mustard oil, glycerine and kerosene. In which of these media, a ray of light incident obliquely at same angle would bend the most?

(a) Kerosene

(b) Water

(c) Mustard oil

(d) Glycerine

Q.4. As light travels from a rarer to a denser medium it will have

(a) Increased velocity

(b) Decreased velocity

(c) Decreased wavelength

(d) both (b) and (c)

Q.5. How will the image formed by a convex lens be affected if the upper half of the lens is wrapped with a black paper?

(a) The size of the image is reduced to one-half.

(b) The upper half of the image will be absent.

(c) The brightness of the image is reduced.

(d) There will be no effect

Q.6. The velocity of light is maximum in a medium of

(a) glass

(b) water

(c) vacuum

(d) diamond

Q.7. A full length image of a distant tall building can definitely be seen by using:

(a) a concave mirror

(b) a convex mirror

(c) a plane mirror

(d) both concave as well as plane mirror

8. A student conducts an activity using a flask of height 15 cm and a concave mirror. He finds that the image formed is 45 cm in height. What is the magnification of the image?

(a) 45 times

(b) 1/ 45 times

(c) 1/ 3 times

(d) 3 times

Q.9. A student determines the focal length of a device 'X' by focusing the image of a distant object on a screen placed 20 cm from the device on the same side as the object. The device 'X' is

(a) Concave lens of focal length 10 cm

(b) Convex lens of focal length 20 cm

(c) Concave mirror of focal length 10 cm

(d) Concave mirror of focal length 20 cm

Q.10.. A student conducts an experiment using a convex lens of focal length 20 cm and an object of height 15 cm. He placed the object at 25 cm from the lens. Can the image be formed on a screen?

(a) yes, because a real image will be formed

(b) no, because a virtual image will be formed

(c) yes, because an erect image will be formed

(d)No because the image is Inverted

ASSERTION AND REASON
Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

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

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

(c) If assertion is true but reason is false.

(d) If both assertion and reason are false.

Q.1. Assertion: A ray incident along normal to the mirror retraces its path.

Reason: In reflection, angle of incidence is always equal to angle of reflection.

2. Assertion: A convex lens is made of two different materials. A point object is placed on the principal axis. The number of images formed by the lens will be two.

Reason :The image formed by convex lens is always virtual.

Q.3. Assertion: When a concave mirror is held in water, its focal length will decrease.

Reason: The focal length of a concave mirror depends on the density the medium in Which it is placed.

Q.4. Assertion: Full length image of a distant object, such as a tall building, can be seen in a convex mirror.

Reason: A convex mirror has a greater focal length than a concave mirror of the same aperture.

Q.5. Assertion: Higher is the refractive index of the medium, lesser is the velocity of light in that medium.

Reason: Refractive index of a medium is inversely proportional to the velocity of light.

Case Study Based Questions

Q.1. Light is a form of energy which induces sensation of vision to our eyes. It becomes visible when it bounces off on surfaces and hits our eyes. The phenomenon of bouncing back of light rays in the same medium on striking a smooth surface is called reflection of light. If parallel beam of incident rays remains parallel even after reflection and goes only in one direction is known as regular reflection. It takes place mostly in plane mirrors or highly polished metal surfaces. The mirror outside the driver side of a vehicle is usually a spherical mirror and printed on such a mirror is usually the warning "vehicles in this mirror are closer than they appear."

(i) Which type of mirror is used outside the driver's side of a vehicle?
1. a) Plane mirror

(b) Concave mirror

(c) Convex mirror

(d) Magic mirror

(ii) No matter how far you stand from a mirror, your image appears erect. The mirror can be

(a) Plane

(b) Concave

(c) convex

(d) Either plane or convex

(iv) If an object is placed at 10 cm from a convex mirror of radius of curvature 60 cm, then find the position of image.

(a) 4 cm

(b) 7.5 cm

(c) 10 cm

(d) 12.5 cm

(v) The focal length of mirror is 12 cm. The radius of curvature is

(a) 12 cm

(b) 24 cm

(c) 20 cm

(d) 36 cm

Q.2. We know that lenses form different types of images when objects are kept at varying positions. When a ray is incident parallel to the principal axis, then after refraction, it passes through the focus or appears to come from the focus.When a ray goes through the optical centre of the lens, it passes without any deviation. If the objectis placed between the focus and optical center of the convex lens, erect and magnified image is formed. As the object is brought closer to the convex lens from infinity to focus, the image moves away from the convex lens from focus to infinity. Also the sizeof the image goes on increasing and the image is always real and inverted. A concave lens always gives a virtual, erect and diminished image irrespective of the position of the object.

i. The location of image formed by a convex lens when the object is placed at infinity is

(a) at focus

(b) at 2F

(c) at optical center

(d) betweenFand 2F

ii. When the object is placed at the focus of concave lens, the image formed is

(a)real and smaller

(b) virtual and smaller

(c) virtual and inverted

(d) real and erect

iii. The size of image formed by a convex lens when the object is placed at the focus of convex lens is

(a) highly magnified

(b) point in size

(c) small

(d) same as that of object

iv. When the object is placed at 2F in front of convex lens, the location of image is

(a) at F

(b) between F and optical center

(c) at infinity

(d) none of the above

Q.3. The refractive index of a medium with respect to vacuum is called the absolute refractive index of the medium. It is given by, $\mu = \sin i/\sin r$
Absolute refractive indices of some of the materials A, B, C and D are given in the following table:

Medium	Refractive Index
A	1.54
B	1.33
C	2.42
D	1.65

i) How is absolute refractive index related to speed of light?

(a)$\mu = C/vm$

(b)$\mu = cvm$

(c)$\mu = Vm$

(d)$v\mu = c$

(ii) In which of the materials given in the above table, light travels fastest?

(a) A

b) B

(c) C

(d) D

(iii) The speed of light in air is 3x108 ms-1 and that in medium A is 2.5 x 10 ms-1. The refractive index of A will be

(a) 1.2

(b) 0.5

(c)4.5

(d)1.5

(iv) When light travels from air to glass,

(a) angle of incidence > angle of refraction

(b) angle of incidence < angle of refraction

(c) angle of incidence = angle of refraction

(d) Can't say

(v) The refractive index of P with respect to Qis 2. Find the refractive index of Q with respect to P.

(a) 0.5

(b) 0.2

(c) 2

(d) 2.5

VERY SHORT ANSWER QUESTIONS (2 marks)

Q.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.

Q.2. State the two laws of reflection of light.

Q.3. 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.

Q.4. A fish under water is viewing obliquely a fisherman standing on the bank of lake.Does the man look taller or shorter?

Q.5. Which phenomenon occurs when light falls on

(a) highly polished surface

(b) a transparent medium?

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

Q.1. 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.

Q.2. (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.

Q.3. Three mirrors, one plane, one concave and one convex are lying on the table. identify them without touching them or using any other apparatus or device?

Q.4. A convex lens of focal length 25 cm and a concave lens of focal length 10 cm are placed in closed contact with each other. Calculate the lens power of the combination.

Q.5. An object is placed at a distance of 12 cm in front of a concave mirror of radius ofcurvature 30 cm. List four characteristics of the image formed by the mirror

Q.6. A convex lens of focal length 2.0 m can produce a magnified virtual as well as real image. Is this a correct statement? If yes, where shall the object be placed in each case for obtaining these images?

Q.7. "The magnification produced by a spherical mirror is -3". List all information you obtain from this statement about the mirror/ image.

LONG ANSWER TYPE QUESTIONS (4 MARKS)

Q.1. (i) A doctor has prescribed a corrective lens of power +1.5 D. Find the focal length of the lens. Is the prescribed lens diverging or converging?

(ii) A concave lens of focal length 15 cm forms an image 10 cm from the lens. How far is the object placed from the lens? Draw the ray diagram.

Q.2. (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.

Answers to Important Questions for CBSE Class 10 Science Chapter 10 Light Reflection and Refraction

Unit III: Natural Phenomena

CHAPTER 10

LIGHT-REFLECTION AND REFRACTION

MULTIPLE CHOICE QUESTIONS

Q.1. Rays from the sun converge at a point 15 cm in front of a concave mirror. Where should an object be placed so that the size of its image is equal to the size of the object?

(a) 15 cm in front of the mirror

(b) 30 cm in front of the mirror

(c) between 15 cm and 30 cm in front of the mirror

(d) more than 30 cm in front of the mirror

Answer- (b) 30 cm in front of the mirror

Q.2. No matter how far you stand from a mirror, your image appears erect. The mirror islikely to be

(a) Plane

(b) Concave

(c) Convex

(d) Either plane or convex

Answer- (d) Either plane or convex

Q.3. You are given water, mustard oil, glycerine and kerosene. In which of these media, a ray of light incident obliquely at same angle would bend the most?

(a) Kerosene

(b) Water

(c) Mustard oil

(d) Glycerine

Answer- (d) Glycerine

Q.4. As light travels from a rarer to a denser medium it will have

(a) Increased velocity

(b) Decreased velocity

(c) Decreased wavelength

(d) both (b) and (c)

Answer- (b) Decreased velocity

Q.5. How will the image formed by a convex lens be affected if the upper half of the lens is wrapped with a black paper?

(a) The size of the image is reduced to one-half.

(b) The upper half of the image will be absent.

(c) The brightness of the image is reduced.

(d) There will be no effect

Answer- (c) The brightness of the image is reduced.

Q.6. The velocity of light is maximum in a medium of

(a) glass

(b) water

(c) vacuum

(d) diamond

Answer- (c) vacuum

Q.7. A full length image of a distant tall building can definitely be seen by using:

(a) a concave mirror

(b) a convex mirror

(c) a plane mirror

(d) both concave as well as plane mirror

Answer- (b) a convex mirror

8. A student conducts an activity using a flask of height 15 cm and a concave mirror. He finds that the image formed is 45 cm in height. What is the magnification of the image?

(a) 45 times

(b) 1/ 45 times

(c) 1/ 3 times

(d) 3 times

Answer- (d) 3 times

Q.9. A student determines the focal length of a device 'X' by focusing the image of a distant object on a screen placed 20 cm from the device on the same side as the object. The device 'X' is
(a) Concave lens of focal length 10 cm

(b) Convex lens of focal length 20 cm

(c) Concave mirror of focal length 10 cm

(d) Concave mirror of focal length 20 cm

Answer- (d) Concave mirror of focal length 20 cm

Q.10.. A student conducts an experiment using a convex lens of focal length 20 cm and an object of height 15 cm. He placed the object at 25 cm from the lens. Can the image be formed on a screen?

(a) yes, because a real image will be formed

(b) no, because a virtual image will be formed

(c) yes, because an erect image will be formed

(d)No because the image is

Inverted

Answer- (a) yes, because a real image will be formed

ASSERTION AND REASON

Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

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

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

(c) If assertion is true but reason is false.

(d) If both assertion and reason are false.

Q.1. Assertion: A ray incident along normal to the mirror retraces its path.
Reason: In reflection, angle of incidence is always equal to angle of reflection.

Answer- (a)

2. Assertion: A convex lens is made of two different materials. A point object is placed on the principal axis. The number of images formed by the lens will be two.

Reason :The image formed by convex lens is always virtual.

Answer- (c)

Q.3. Assertion: When a concave mirror is held in water, its focal length will decrease.

Reason: The focal length of a concave mirror depends on the density the medium in Which it is placed.

Answer- (d)

Q.4. Assertion: Full length image of a distant object, such as a tall building, can be seen in a convex mirror.

Reason: A convex mirror has a greater focal length than a concave mirror of the same aperture.

Answer- (c)

Q.5. Assertion: Higher is the refractive index of the medium, lesser is the velocity of light in that medium.

Reason: Refractive index of a medium is inversely proportional to the velocity of light.

Answer- (a)

Case Study Based Questions:

Q.1. Light is a form of energy which induces sensation of vision to our eyes. It becomes visible when it bounces off on surfaces and hits our eyes. The phenomenon of bouncing back of light rays in the same medium on striking a smooth surface is called reflection of light. If parallel beam of incident rays remains parallel even after reflection and goes only in one direction is known as regular reflection. It takes place mostly in plane mirrors or highly polished metal surfaces. The mirror outside the driver side of a vehicle is usually a spherical mirror and printed on such a mirror is usually the warning "vehicles in this mirror are closer than they appear."

(i) Which type of mirror is used outside the driver's side of a vehicle?

a) Plane mirror

(b) Concave mirror

(c) Convex mirror

(d) Magic mirror

Answer: C

(ii) No matter how far you stand from a mirror, your image appears erect. The mirror can be

(a) Plane

(b) Concave

(c) convex

(d) Either plane or convex

Answer: D

(iii) If an object is placed at 10 cm from a convex mirror of radius of curvature 60 cm, then find the position of image.

(a) 4 cm

(b) 7.5 cm

(c) 10 cm

(d) 12.5 cm

Answer: B

(iv) The focal length of the mirror is 12 cm. The radius of curvature is

(a) 12 cm

(b) 24 cm

(c) 20 cm

(d) 36 cm

Answer: B

Q.2. We know that lenses form different types of images when objects are kept at varying positions. When a ray is incident parallel to the principal axis, then after refraction, it passes through the focus or appears to come from the focus.When a ray goes through the optical centre of the lens, it passes without any deviation. If the object is placed between the focus and optical center of the convex lens, erect and magnified image is formed. As the object is brought closer to the convex lens from infinity to focus, the image moves away from the convex lens from focus to infinity. Also the sizeof the image goes on increasing and the image is always real and inverted. A concave lens always gives a virtual, erect and diminished image irrespective of the position of the object.

i The location of image formed by a convex lens when the object is placed at infinity is

(a) at focus

(b) at 2F

(c) at optical center

(d) between Fand 2F

Answer: A

ii When the object is placed at the focus of concave lens, the image formed is

(a)real and smaller

(b) virtual and smaller

(c) virtual and inverted

(d) real and erect

Answer: B

iii The size of image formed by a convex lens when the object is placed at the focus of convex lens is

(a) highly magnified

(b) point in size

(c) small

(d) same as that of object

Answer: A

iv When the object is placed at 2F in front of convex lens, the location of image is

(a)at F

(b) between F and optical center

(c) at infinity

(d) none of the above

Answer: D

Q.3. The refractive index of a medium with respect to vacuum is called the absolute refractive index of the medium. It is given by, $\mu = \sin i / \sin r$

Absolute refractive indices of some of the materials A, B, C and D are given in the following table:

Medium	Refractive Index
A	1.54
B	1.33
C	2.42
D	1.65

i) How is absolute refractive index related to speed of light?

(a)$\mu = C/vm$

(b)$\mu = cvm$

(c)$\mu = Vm$

(d)$v\mu = c$

Answer: D

(ii) In which of the materials given in the above table, light travels fastest?

(a) A

b) B

(c) C

(d) D

Answer: B

(iii) The speed of light in air is 3x108 ms-1 and that in medium A is 2.5 x 10 ms-1. The refractive index of A will be

(a) 1.2

(b) 0.5

(c)4.5

(d)1.5

Answer: A

(iv) When light travels from air to glass,

(a) 0.5

(b) 0.2

(c) 2

(d) 2.5

Answer: A

VERY SHORT ANSWER QUESTIONS (2 marks)

Q.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.
Answer- If the image formed by a spherical mirror is always erect and diminished then it is convex mirror.
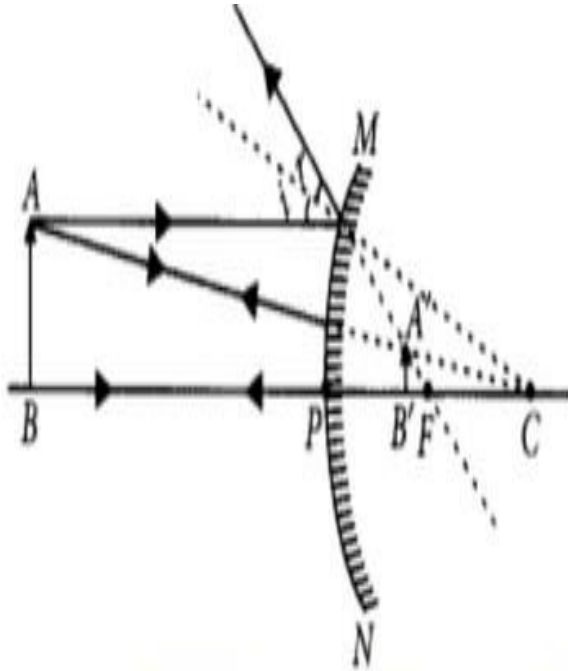
Q.2. State the two laws of reflection of light.
Answer-

Laws of reflection of light states that

(i) The angle of incidence is equal to the angle of reflection.

(ii) The incident ray, the reflected ray and the normal to the mirror at the point of incidence all lie in the same plane.

Q.3. 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.

Answer- (a) Laws of refraction of light:

(i) The incident ray, the refracted ray and the normal to the interface of two transparent media at the point of incidence, all lie in the same plane.

(ii) The ratio of sine of angle of incidence to the sine of the angle of refraction is constant, for the light of a given colour and for the given pair of media.
This law is also known as Snell's law of refraction.
sini/sinr = constant,

where i is the angle of incidence and r is the angle of refraction.
This constant value is called refractive index of the second medium with respect to the first when the light travels from first medium to second medium.
⇒ constant = n21 = v1/v2 ∴sini/sinr = v1/v2

If n is the absolute refractive index of the medium, c is the velocity of light in vacuum and v is the speed of light in a given medium, then n = c/v.

Q.4. A fish under water is viewing obliquely a fisherman standing on the bank of lake.Does the man look taller or shorter?

Ans. As light travels from rarer to denser medium, it bends towards normal and appears to come from greater height. Therefore, to fish under water, man looks taller.

Q.5. Which phenomenon occurs when light falls on

(a) highly polished surface

(b) a transparent medium?

Ans. (a) Reflection of light.

(b) Refraction of light.

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

Q.1. 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.

Answer- Given f = -20 cm v = -30 cm, u = ?
Using 1/v + 1/u = 1/f
1/u = 1/f − 1/v = 1/(−20) − /(−30) = (−3+2)/60
⇒ u = -60 cm

∴ Object placed at 60 cm from the mirror.

Also magnification, m = h′/h = −v/u

⇒ h' = −(−30)/−60 × 4 = -2 cm

**∴ The size of the image is 2 cm.**

Q.2. (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.

Answer- (a) Here, alcohol is optically denser medium as its refractive index is higher than that of water. When we compare the two media, the one with larger refractive index is called the optically denser medium than the other as the speed of light is lower in this medium.
(b) Since light is travelling from water (rarer medium) to alcohol (denser medium), it slows down and bends towards the normal.
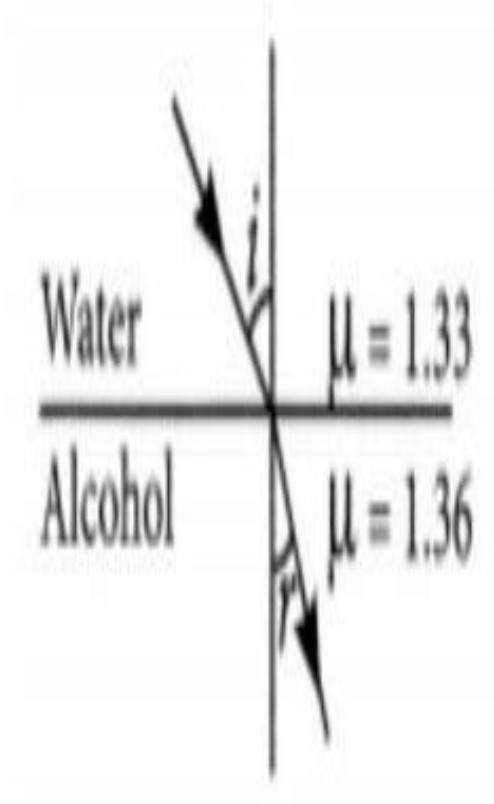
where i = angle of incidence and r = angle of refraction.

(c) According to Snell's law,

sini/sinr=µalcohol /µwater =1.36/1.33 = 1.0225

∴ sin i = 1.0225 × sin r

Q.3. Three mirrors, one plane, one concave and one convex are lying on the table. identify them without touching them or using any other apparatus or device?

Ans. Plane mirror produces the image of same size. Concave mirror produced the magnified image while the convex mirror will produce a diminished image

Q.4. A convex lens of focal length 25 cm and a concave lens of focal length 10 cm

are placed in closed contact with each other. Calculate the lens power of the combination.

Ans:

f1=25cm=0.25 m

f2= -10cm= - 0.1m

Power of convex lens, P1 = 1/f1=1/0.25=+4D
Power of concave lens, P2 = 1/f2=1/ - 0.1m=-10D
power of combination, P = P1 +P2 = 4D − 10D = -6D

Q.5. An object is placed at a distance of 12 cm in front of a concave mirror of radius ofcurvature 30 cm. List four characteristics of the image formed by the mirror

Ans: Radius of curvature (R) = 30 cm, object distance is 12 cm in front of the mirror.Thus we can say that object is placed between focus and pole. Four characteristics of the image formed by die given concave mirror when object is placed between pole and focus are:

(i) Virtual

(ii) Erect

(iii) Enlarged

(iv) Image is formed behind the mirror

Q.6. A convex lens of focal length 2.0 m can produce a magnified virtual as well as real image. Is this a correct statement? If yes, where shall the object be placed in each case for obtaining these images?

Ans: Yes, it is correct. If the object is placed within 2.0 m from the lens in the it forms magnified virtuaL image Between 2 m and 4 m it will form a real inverted and magnified image.

Q.7. "The magnification produced by a spherical mirror is -3". List all information youobtain from this statement about the mirror/ image.

Ans. Negative sign of magnification indicates that the image is real and inverted. Since the image is real and inverted, the mirror is concave and magnification of -3 indicates that the image is magnified.

LONG ANSWER TYPE QUESTIONS

P = 1.5D

$f = 1/1.5 = 10/15 = 0.66$ m

A convex lens has a positive focal length. Therefore, it is a convex lens or a converging lens.

(ii) Focal length of concave lens (OF_1), $f = -15$ cm
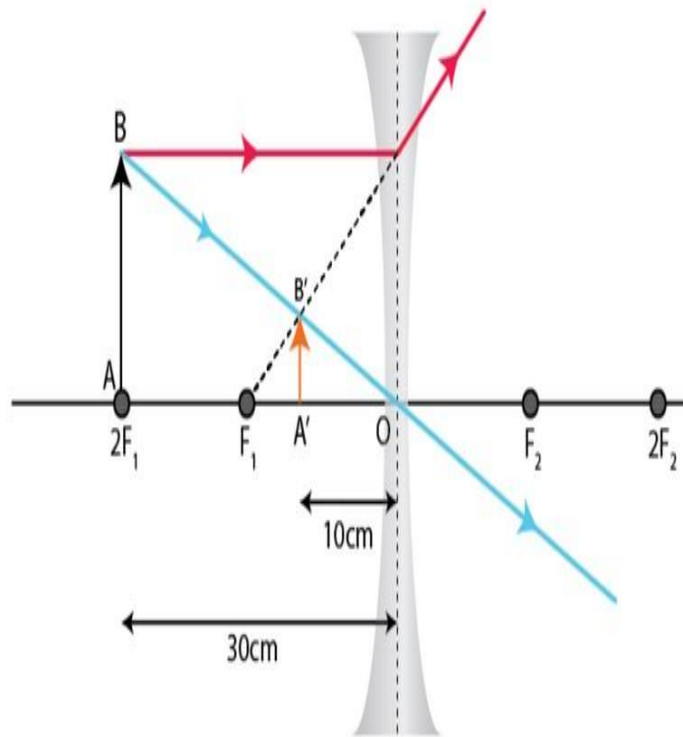
Image distance, $v = -10$ cm

According to the lens formula,

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

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f} = -\frac{1}{10} - \frac{1}{-15} = -\frac{1}{10} + \frac{1}{15}$$

$$v = -\frac{5}{150} = -30cm$$

The negative value of u indicates that the object is placed 30 cm in front of the lens.

This is shown in the following ray diagram.

Q.2. (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.

Answer- (a) Given, h = 5 cm, f = 20 cm, u = -30 cm

Using lens formula, 1/v − 1/u = 1/f

1/v=1/u+1/f=1/(−30)+1/20=(−2+3)/60=1/60

⇒ v = 60 cm

Now, magnification, m = h'/h = v/u
⇒ h' = v/u × h = 60/(−30) × 5 = -10 cm

Hence, the image formed at 60 cm, which is real and magnified.

(b)