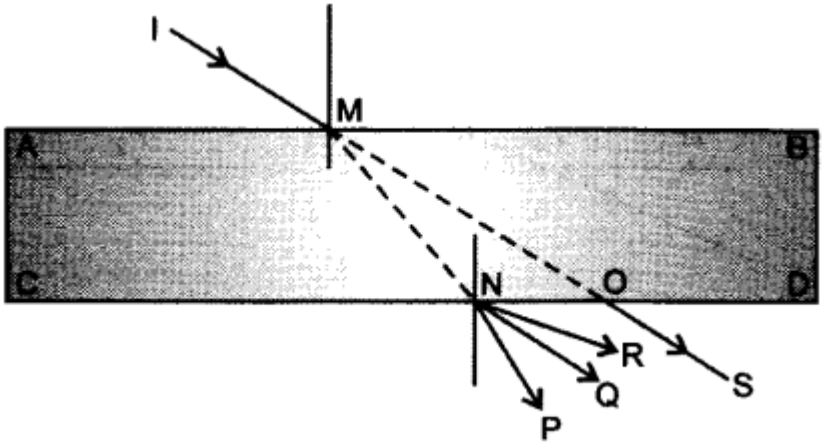
Class – X Physics

Light - Reflection and Refraction

Q -1 . If a light ray IM is incident on the surface AB as shown, identify the correct emergent ray. [Delhi (C)]



Answer. Ray NQ, as it has to be parallel to ray OS.

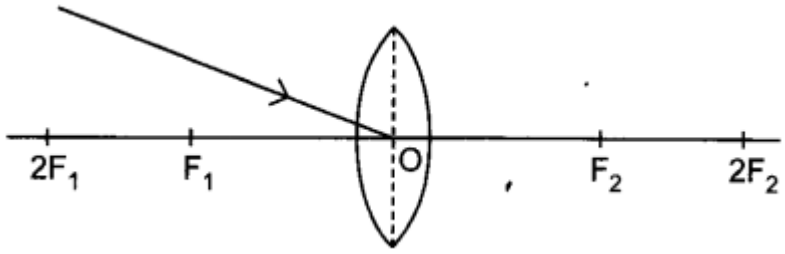
Q -2 **The refractive indices of four media A, B, C and D are given in the following table:**

Medium	A	B	C	D
Refractive Index	1.33	1.50	1.52	2.40

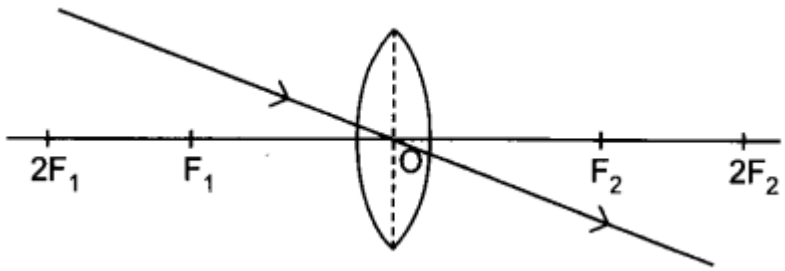
If light, travels from one medium to another, in which case the change in speed will be (i) minimum, (ii) maximum? [Delhi(C)]

Answer. (i) Minimum change is seen as light moves between 1.50 and 1.52, i.e. B and C.
(ii) Maximum change when light moves between 1.33 and 2.40, i.e. A and D.

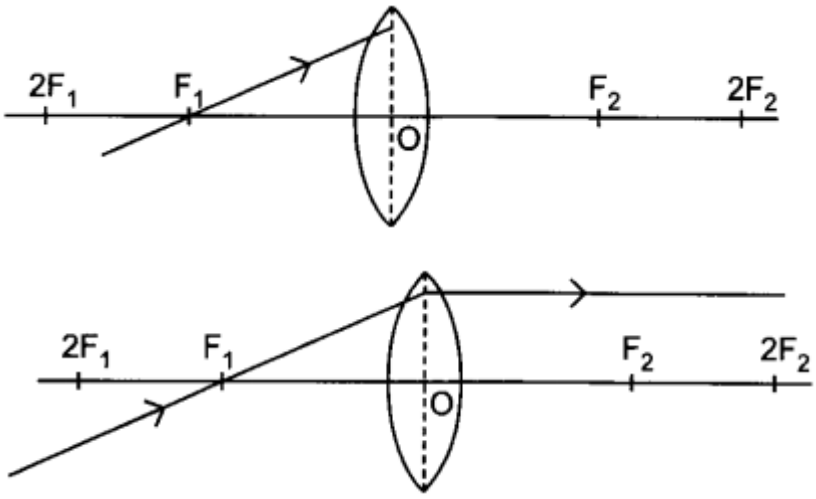
Q -3 **Redraw the given diagram and show the path of the refracted ray: [All India(C)]**



Answer.



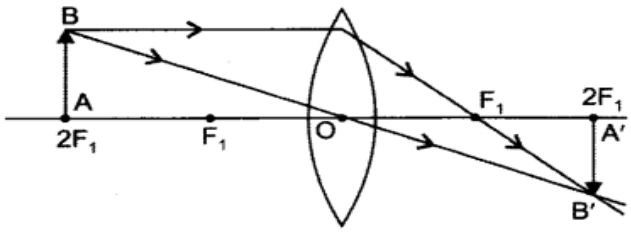
Q -4 Redraw the given diagram and show the path of the refracted ray: [All India(C)



Q -5 Which kind of mirrors are used in the headlights of a motor-car and why? [Foreign]
Answer. Concave mirror, to get the parallel beam of light.

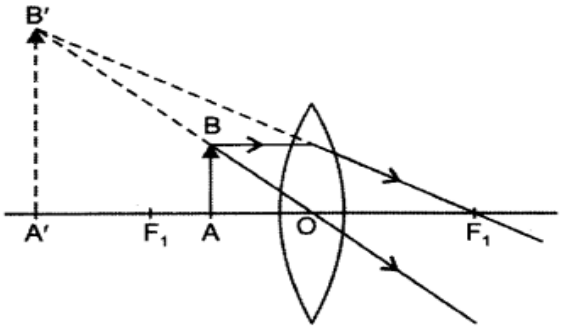
Q -6 Draw ray diagrams to represent the nature, position and relative size of the image formed by a convex lens for the object placed:
(a) at $2F_1$
(b) between F_1 and the optical centre O of lens: [All India]
Answer.

(*a*) At $2F_1$



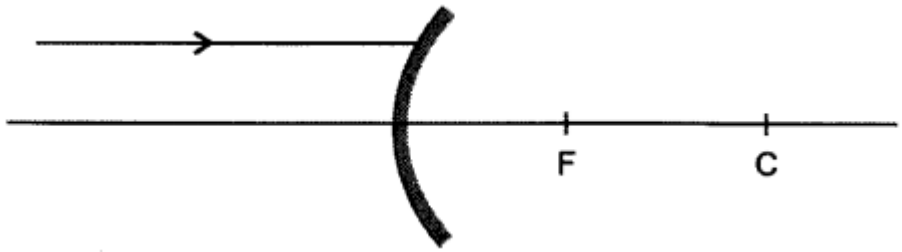
Nature: Real, inverted, size to size.
Position: At 2F.

(*b*) Between F_1 and the optical centre O of lens

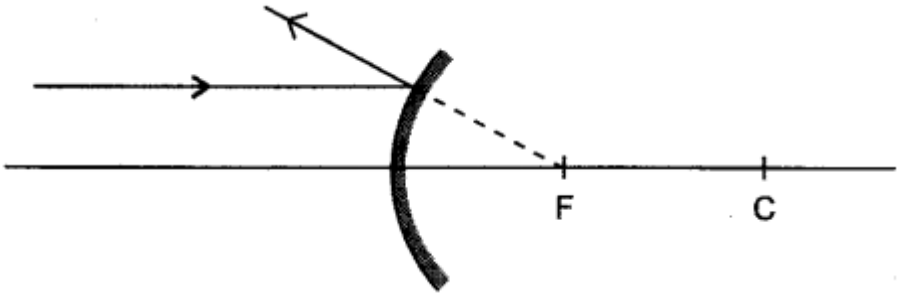


Nature: Virtual, erect, enlarged.
Position: On the same side of the lens.

Q -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)]



Answer.



Q -8 Why does a ray of light bend when it travels from one medium into another? [Delhi]
Answer. Due to change in velocity in the medium and to reduce the time taken to travel the same.

Q -9 **The refractive index of water is 1.33 and the speed of light in air is 3 x 10^8 ms-1. Calculate the speed of light in water. [Foreign]**
Answer.

$$\text{Since, refractive index} = n = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in medium}} = \frac{c}{v}$$

$$\text{we get, } v = \frac{c}{n} = \frac{3 \times 10^8}{1.33}$$

$$= 2.25 \times 10^8 \text{ ms}^{-1}.$$

Q -1 0 **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 10^8 ms-1 then what is its speed in glass? [Foreign]**
Answer.

$$\text{Since, } n = \frac{c}{v}$$

$$\text{we get, } v = \frac{c}{n} = \frac{3 \times 10^8}{1.5} = 2 \times 10^8 \text{ m/s.}$$

Q -11 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]
Answer.

$$f = +18 \text{ cm}, \; v = 24 \text{ cm}$$

Using, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$, we get, $\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$

$$= \frac{1}{24} - \frac{1}{18} = \frac{3-4}{72}$$

$$\Rightarrow \quad u = -72 \text{ cm}.$$

Object should be kept at a distance of 72 cm on the left side of the convex lens.

Magnification, $m = +\frac{v}{u} = \frac{24}{-72} = \frac{-1}{3}$

Image is inverted, real and diminished.

Q -12 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]
Answer.

$$u = -60 \text{ cm}, \; v = +120 \text{ cm}$$

Using, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$, we get

$$\frac{1}{f} = \frac{1}{120} - \frac{1}{-60} = \frac{1+2}{120}$$

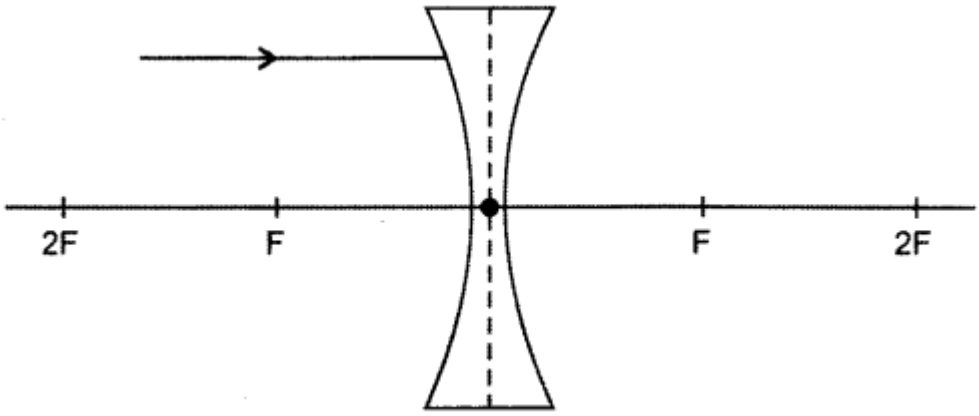
$$\Rightarrow \qquad f = 40 \text{ cm}$$

$$m = \frac{v}{u} = \frac{h_I}{h_o}$$

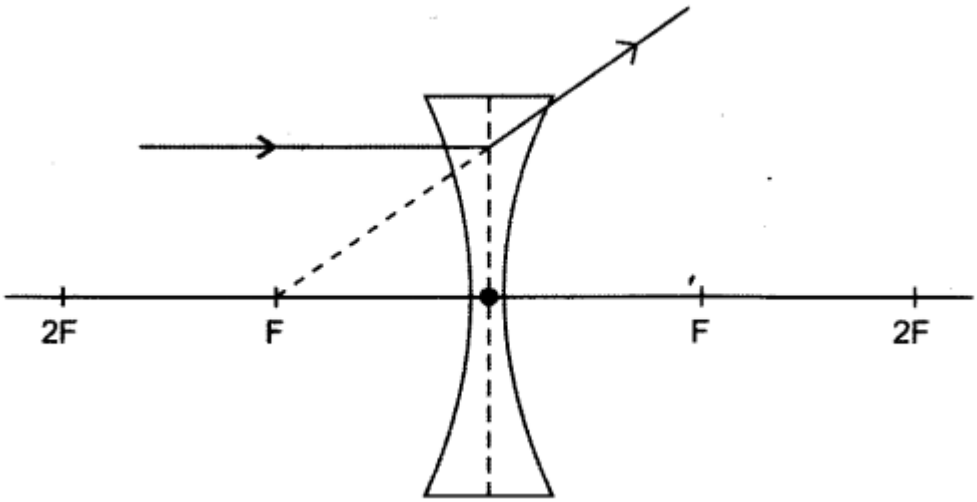
$$\therefore \qquad h_I = h_o \times \frac{v}{u}$$

$$= 5 \times \frac{120}{60} = 10 \text{ cm}.$$

13. 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)]



Answer.



14) Why does a ray of light bend when it travels from one medium into another? [Delhi]
Answer. Due to change in velocity in the medium and to reduce the time taken to travel the same.

15) **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]**
Answer. When the object is placed between the focus and the optical centre, a virtual and erect image is formed.

Position of Object	Position of Image	Nature of Image	Ray Diagram
Between F and optical centre	On the same side of the lens	Virtual, erect and enlarged