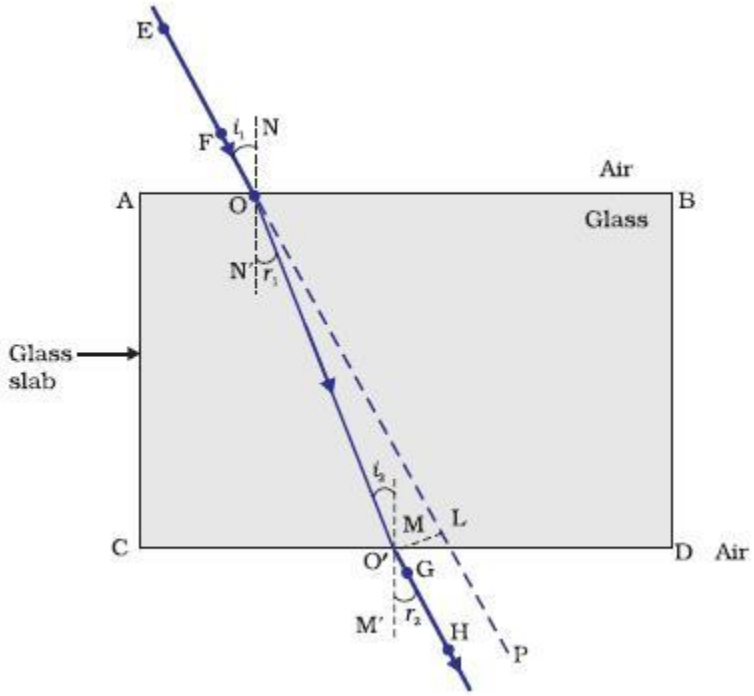
Refraction of Light

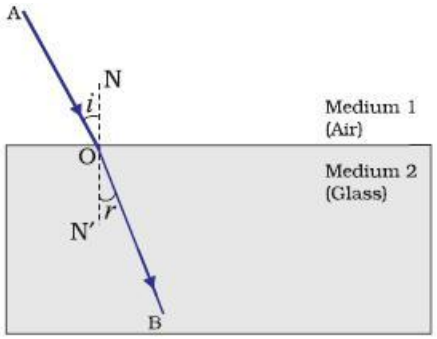
1) Refraction through a rectangular slab



2) Laws of refraction

- The incident ray, the refracted ray and the normal – all lie in the same plane
- Snell's law of refractive index

$$\frac{\sin i}{\sin r} = \mu$$



$$\mu_{21} = \frac{speed\ of\ light\ in\ medium\ 1}{peed\ of\ light\ in\ medium\ 2} = \frac{v_1}{v_2}$$

$$\mu_{12} = \frac{speed\ of\ light\ in\ medium\ 2}{peed\ of\ light\ in\ medium\ 1} = \frac{v_2}{v_1}$$

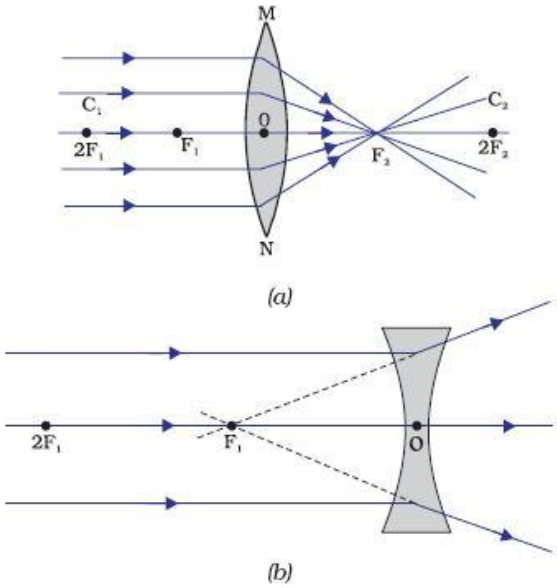
3) Absolute refractive index (μ_m)

When the first medium is air or vacuum and the refractive index of the second medium is called absolute refractive index of the medium.

$$\mu_m = \frac{speed\ of\ light\ in\ air}{peed\ of\ light\ in\ medium} = \frac{c}{v}$$

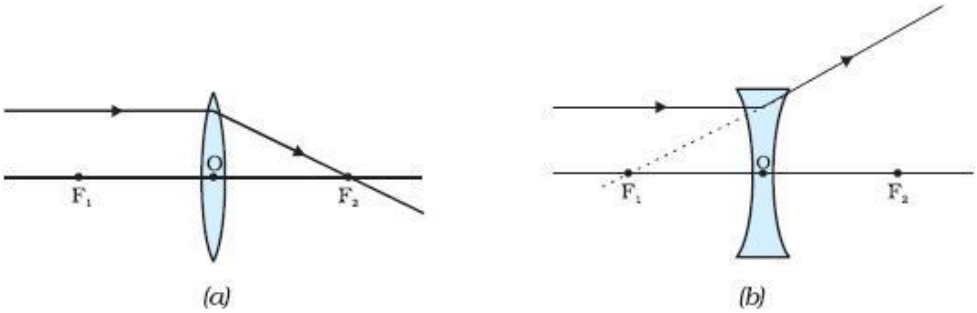
Air: 1.003; Water: 1.33; Fused quartz: 1.47; Crown glass: 1.52; Ruby: 1.71; Diamond: 2.42

Image formation in convex and concave lenses

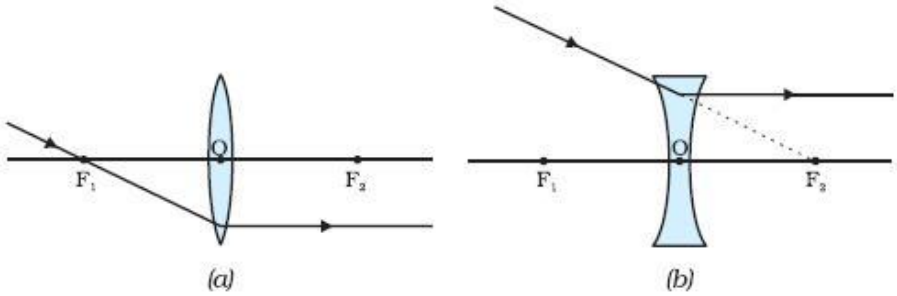


Ray Diagrams of convex and concave lenses

1. Ray travelling from infinity and passing through
    a. convex lens
    b. concave lens



2. Ray passing through principal focus (F)
    a. In a convex lens
    b. In a concave lens



3. Ray passing through optic centre (O)
    a. In a convex lens
    b. In a concave lens

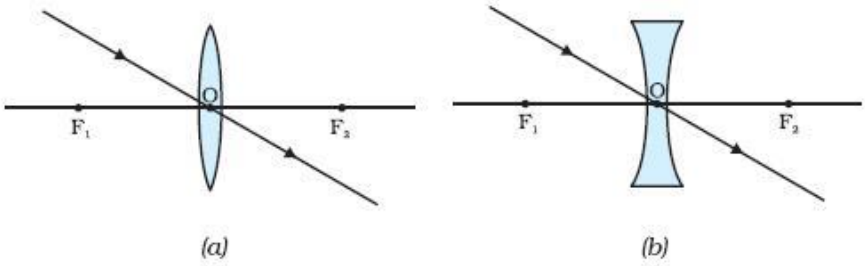
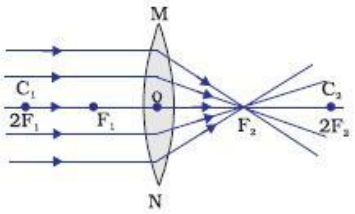
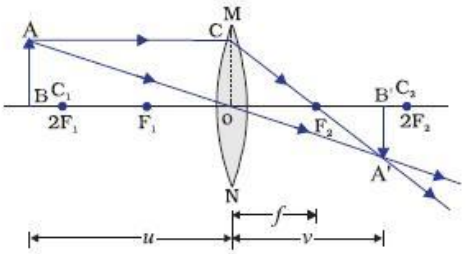


Image formation in a convex lens based on various positions

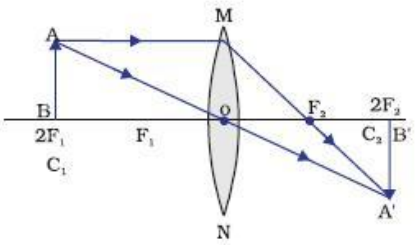
a) From infinity; b) Beyond 2F1; c) At 2F1; d) Between 2F1 and F1; e) At F1; f) Between F1 and O



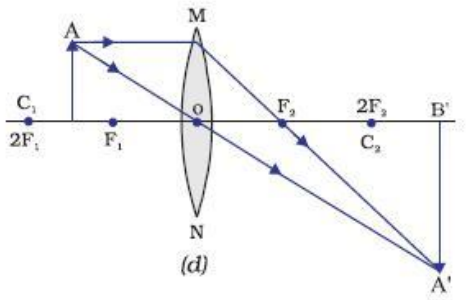
(a)



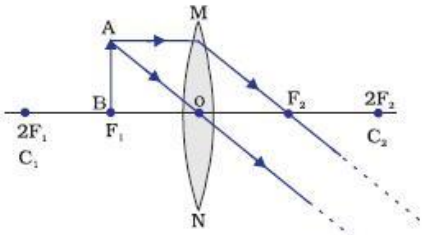
(b)



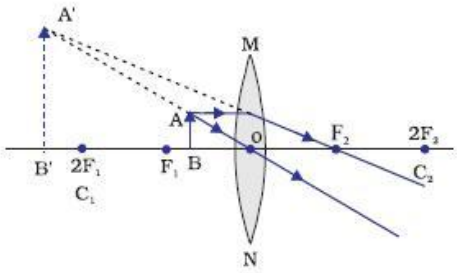
(c)



(d)



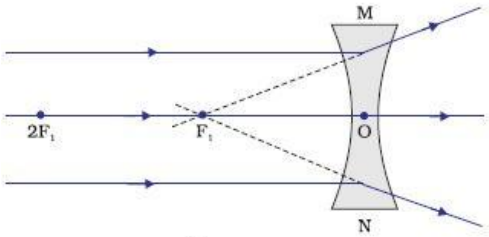
(e)



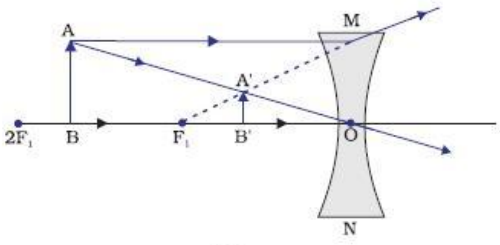
(f)

Image formation in a concave lens based on various positions

a) From infinity; b) Between 2F1 and O



(a)



(b)

Power of Lens

- It is the reciprocal of focal length.

$$D = \frac{1}{f}$$

- Represented by the unit Dioptre (D)
- 1 D = 1 m^{-1}
- D is positive for convex lens
- D is negative for concave lens

Mirror formula

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

Magnification

$$m = \frac{h'}{h} = -\frac{v}{u}$$