

**BCM SCHOOL, BASANT AVENUE, DUGRI
ROAD, LUDHIANA**

CLASS – XII

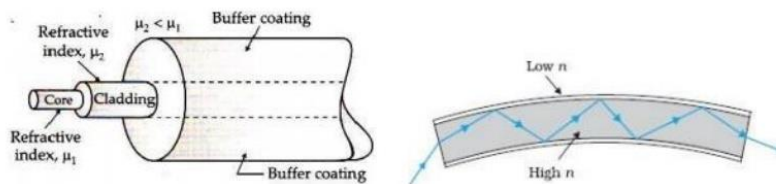
SUBJECT – PHYSICS

CHAPTER – RAY OPTICS

CASE STUDY BASED QUESTIONS

CASE STUDY QUESTION

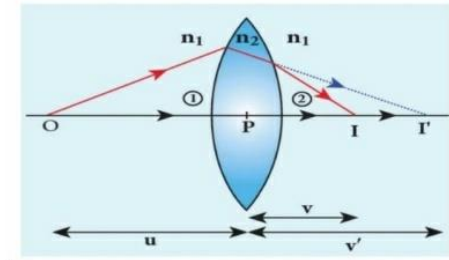
CASE STUDY 1. Optical fibres: Now-a-days optical fibres are extensively used for transmitting audio and video signals through long distances. Optical fibres too make use of the phenomenon of total internal reflection. Optical fibres are fabricated with high quality composite glass/quartz fibres. Each fibre consists of a core and cladding. The refractive index of the material of the core is higher than that of the cladding. When a signal in the form of light is directed at one end of the fibre at a suitable angle, it undergoes repeated total internal reflections along the length of the fibre and finally comes out at the other end. Since light undergoes total internal reflection at each stage, there is no appreciable loss in the intensity of the light signal. Optical fibres are fabricated such that light reflected at one side of inner surface strikes the other at an angle larger than the critical angle. Even if the fibre is bent, light can easily travel along its length. Thus, an optical fibre can be used to act as an optical pipe.



- i) Which of the following statement is not true.
 - a) Optical fibres is based on the principle of total internal reflection.
 - b) The refractive index of the material of the core is less than that of the cladding.
 - c) an optical fibre can be used to act as an optical pipe.
 - d) there is no appreciable loss in the intensity of the light signal while propagating through an optical fibre
- ii) What is the condition for total internal reflection to occur?
 - a) angle of incidence must be equal to the critical angle.
 - b) angle of incidence must be less than the critical angle.
 - c) angle of incidence must be greater than the critical angle.
 - d) None of the above.
- iii) Which of the following is not an application of total internal reflection?
 - a) Mirage
 - b) Sparkling of diamond
 - c) Splitting of white light through a prism.
 - d) Totally reflecting prism.
- iv) Optical fibres are used extensively to transmit
 - a) Optical Signal
 - b) current
 - c) Sound waves
 - d) None of the above
- v) Mirage is found due to,
 - a.) Refraction of light
 - b.) Total internal reflection
 - c.) Reflection of light
 - d.) All

CASE STUDY 7. Lens maker's formula.

The lens maker's formula relates the focal length of a lens to the refractive index of its material and the radii of curvature of its two surfaces. This formula is used to manufacture a lens of particular focal length from the glass of a given refractive index. For this reason, it is called the lens maker's formula.



1. For a plano-convex lens of radius of curvature 10 cm the focal length is 30 cm . If the refractive index of the material of the lens is

- (i). 2.0 (ii). 1.33 (iii). 1.66 (iv). 1.5

2. An image is formed on the screen by a convex lens when upper half part of lens is covered with black paper then

- (i). half image is formed (ii). full image is formed
(iii). intensity of image is enhanced (iv). all of the above

3. A convex lens of focal length 20 cm is placed in contact with a diverging lens of unknown focal length. The lens combination acts as a converging lens and has a focal length of 30 cm . What is the focal length of diverging lens

- (i). -90 cm (ii). -60 cm
(iii). -30 cm (iv). -10 cm

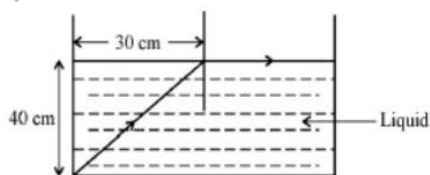
4. The focal length of a lens, made up of glass, is 5 cm in air. What would be the focal length of the same lens in water? The refractive indices of glass and water are $\frac{3}{2}$ and $\frac{4}{3}$ respectively. (i). 12cm

- (ii). -12 cm (iii). 16 cm (iv). -16cm

5. Two thin lenses of focal length 60 and -20 cm in contact have a resultant focal length of

- (i). -30 (ii). +15 (iii). -15 (iv). +30

CASE STUDY 3. TOTAL INTERNAL REFLECTION



(i) What is refractive index of a medium (in terms of speed of light)

a) Speed of light in medium/speed of light in vacuum

b) Speed of light in vacuum/speed of light in medium speed of light in vacuum

c) Speed of light in medium

d) None of the above.

(ii) In the above diagram, calculate the speed of light in the liquid of unknown refractive index.

a) 1.2×10^8 m/s

b) 1.4×10^8 m/s

c) 1.6×10^8 m/s

d) 1.8×10^8 m/s

(iii) What is refractive index of a medium (in terms of real and apparent depth).

a) Real depth/ App depth

b) App/ Real depth

c) App Real x depth

d) Real + App depth

(iv) What is the relation between refractive index and critical angle for a medium.

a) $n = 1/\sin i_c$

b) $n = \sin i_c$

c) $1 = n/\sin i_c$

d) None of the above

(v) What is the value of angle of incidence for ray of light travelling from a medium of refractive index $\sqrt{2}$ into the medium of refractive index 1 so that it just grazes along the surface of separation.

a) 0°

(b) 45°

(c) 30°

(d) 90°

