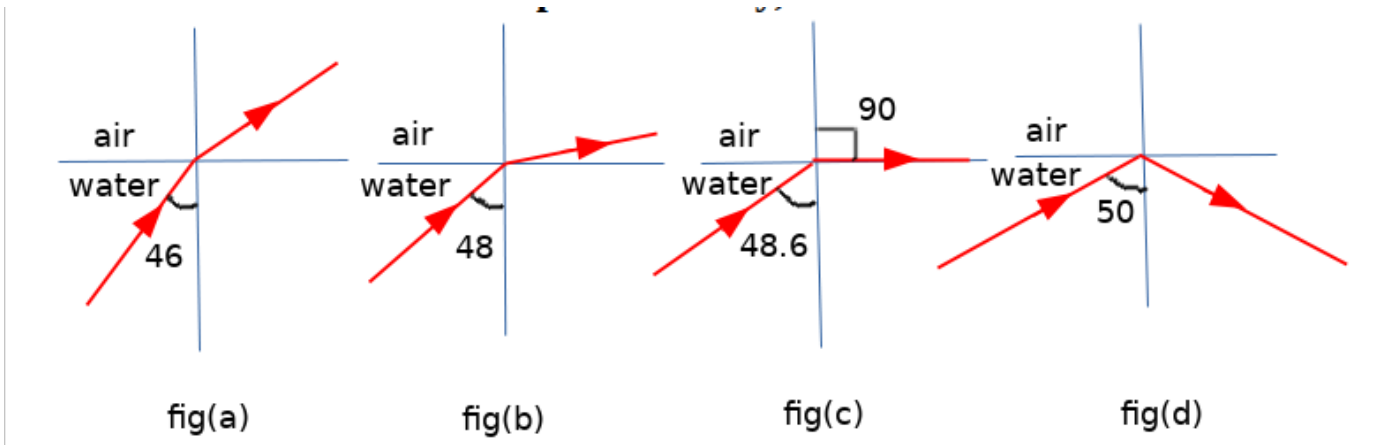


## PHYSICS - X-PART-4 CLASS 42

Total Internal Reflection

When a ray of light passes from a medium of greater optical density to that of lower optical density, (ray of light passes from water to air)



Fig(a) angle of incidence =  $46^\circ$

- Refraction is taking place

Fig(b) angle of incidence =  $48^\circ$

- Refraction is taking place,
- The refracted ray approaches the surface of the water

Fig(c) angle of incidence =  $48.6^\circ$  (Critical angle).

- Refraction is taking place,
- Refracted ray passes along the surface of water
- Now the angle of refraction is  $90^\circ$

Fig(d) angle of incidence =  $50^\circ$

- Refraction doesn't taking place,
- The ray is reflected back to the same medium without undergoing refraction.

Critical angle

When a ray of light passes from a medium of greater optical density to that of lower optical density, the angle of incidence at which the angle of refraction becomes  $90^\circ$  is the critical angle.

- \* The critical angle in water is  $48.6^\circ$
- \* The critical angle in glass is  $42^\circ$

**Total internal reflection**

When a ray of light passes from a medium of higher optical density to a medium of lower optical density at an angle of incidence greater than the critical angle, the ray is reflected back to the same medium without undergoing refraction. This phenomenon is known as total internal reflection.

\* The path of light in different media is shown in the figures. Analyse them and answer the following questions.

• Which are the figures that show total internal reflection?

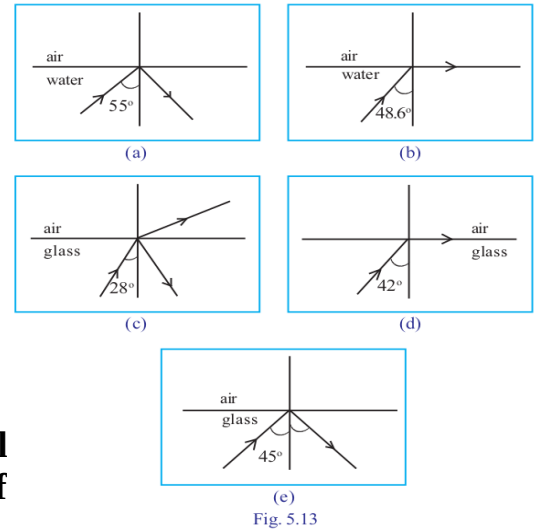
\* Fig (a) and (e)

• What is the critical angle of glass?

\*  $42^\circ$

• Will total internal reflection take place when light passing through water is incident on the surface of separation with air at an angle of incidence of  $45^\circ$ ? Why?

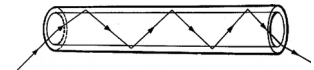
\* No. The critical angle of water is  $48.6^\circ$ . Total internal reflection will take place only if the angle of incidence is greater than the critical angle.



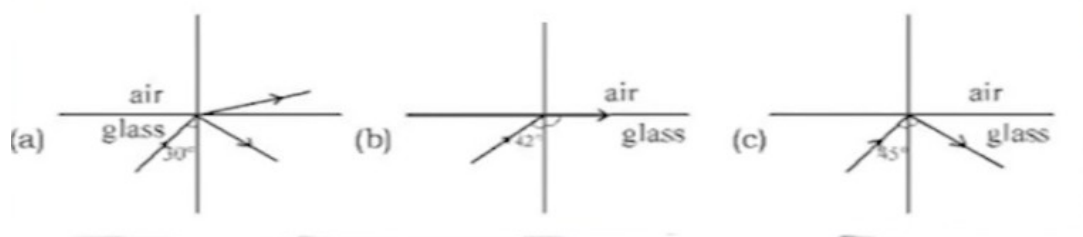
\* Find out the practical applications of total internal reflection in our day to day life.

Medical field → Endoscope.

In the field of telecommunications → Optical fibre cables.



**Worksheet**



Observe the above figure and answer the following questions.

1. What is the critical angle of glass?

2. Define critical angle?

3. Write the condition under which a light ray undergoes total internal reflection?

4. Write any two practical applications of total internal reflection in our day to day life.