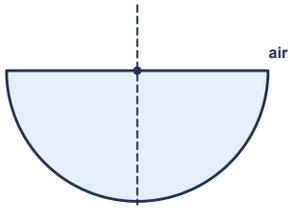
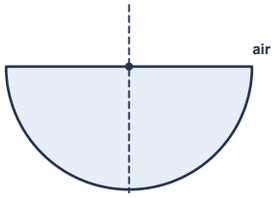
# Critical Angle and Optical Fibres

## Semicircular glass blocks — draw the ray in each



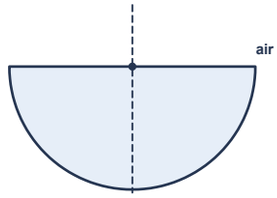

$i < c$

**WHAT HAPPENS?**




$i = c$

**WHAT HAPPENS?**




$i > c$

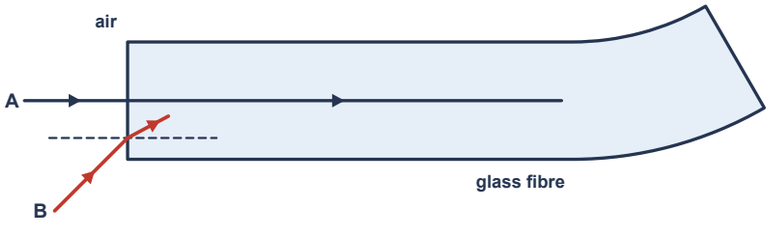
**WHAT HAPPENS?**

**Define the critical angle**

**KEY WORDS TO USE**

- ☐ angle of incidence
- ☐ angle of refraction
- ☐ critical angle
- ☐ 90°
- ☐ denser
- ☐ optically dense

## Example — light in an optical fibre



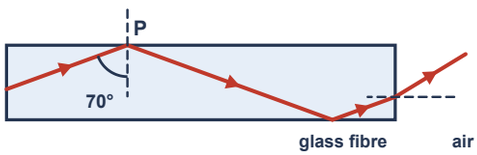

Ray **A** enters along the normal, so it does **not** change direction. Ray **B** enters at an angle.

1. Measure the angle of incidence of ray B. ____ °
2. Measure the angle of refraction of ray B. ____ °
3. Calculate the refractive index, ***n***.
4. Calculate the critical angle, ***c***.
5. Continue ray B until it hits the edge of the fibre. Draw the normal and measure the angle of incidence. ____ °
6. Describe what happens to ray B next.

## Exam-style question

**QUESTION**

Doctors use an **endoscope** to see inside a patient's body. It contains bundles of glass optical fibres. The diagram shows a ray of light inside one fibre.




*Not to scale. The ray meets the edge of the fibre at P with an angle of incidence of 70°.*

**EXPLAIN**

**(a)** Name the process that keeps the light inside the fibre. **(1)**

**(b)** State **two** conditions needed for this process. **(2)**

**(c)** Describe how light travels from one end of the fibre to the other. **(2)**

**CALCULATE**

**(d)** The glass has a refractive index of 1.52. Calculate the critical angle of the glass. **(3)**

**(e)** The fibre is bent too sharply and the angle of incidence at P falls to 35°. State and explain what happens to the ray at P. **(2)**