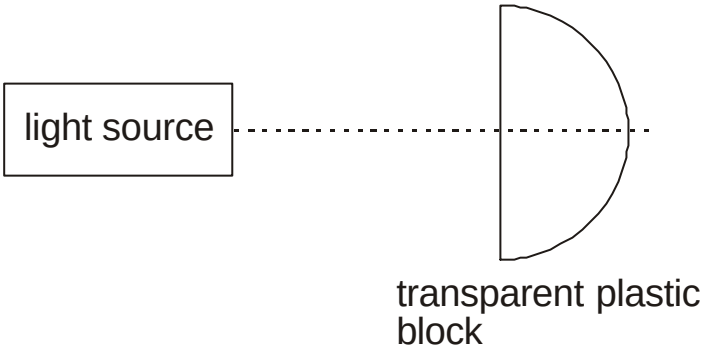
4W

Experiment to Verify Snell's Law of Refraction and to Estimate the Speed of Light inside a Transparent Plastic Block

1. **Preparation:**
   a) Read about refraction of waves and Snell's Law.
   b) Find the relation between the refractive index of a medium and the speed of light in that medium.
   c) Read about total internal reflection; especially the definition of the “critical angle of incidence”.

2. Using the special apparatus provided, measure the angles of refraction corresponding to a wide range of angles of incidence. Remember, the angles of incidence and refraction are always measured from a normal line.



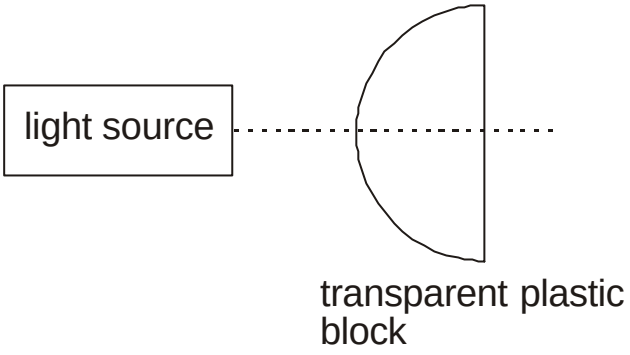
Apparatus arranged to verify Snell's Law and measure refractive index

Adjust the position of the light source carefully to ensure that when the angle of incidence is zero, the angle of refraction is also zero

Plot a suitable graph to verify Snell's Law.

Use the graph to find the refractive index of the plastic and hence calculate the speed of light inside the plastic. (Assume that the speed of light in air is the same as the speed of light in a vacuum, $3 \times 10^8\ m s^{-1}$.)

3. Estimate the critical angle of incidence for light passing from this plastic to air.



Apparatus arranged to measure the critical angle of incidence

In your report, explain

a) why it is convenient to have a *semi-circular* plastic block

b) why the block must be turned through 180° (as shown in the second diagram) to measure the critical angle of incidence

c) what is the main difficulty in measuring the angles of refraction (especially noticeable when the angle of refraction is large).