

Objectives

SP5.1P Explain, with the aid of ray diagrams, reflection, refraction and total internal reflection (TIR), including the law of reflection and critical angle.

SP5.9 *Investigate refraction in rectangular glass blocks in terms of the interaction of electromagnetic waves with matter.*

Maths requirements

2g Use a scatter diagram to identify a correlation between two variables.

4c Plot two variables from experimental or other data.

5a Use angular measures in degrees.

5b Visualise and represent 2D and 3D forms, including two dimensional representations of 3D objects.

Learning outcomes

 **SP5.1P** Recall the law of reflection.

 **SP5.1P** Draw ray diagrams to show how a mirror forms images.

 **SP5.1P** Draw ray diagrams to show what happens when light is refracted.

 **SP5.1P** Describe what total internal reflection is and when it happens.

 **SP5.1P** Explain the significance of the critical angle in total internal reflection.

Exploring

1. Investigating refraction

This practical forms part of the core practical requirement of the specification. See Students' sheet CP3 (Investigating refraction in rectangular glass block) for a full method for this practical.

Support: Help students with the measuring of angles by providing them with a printed protractor that they can put their blocks on; these are widely available on the Internet. Use one with 0 in the centre, to ensure students measure their angles from the normal.

Stretch: Ask students to investigate refraction in glass blocks of different shapes or in different materials.

Expected results

Both sets of results should produce smooth curves on a scatter graph, with the angle of refraction less than the angle of incidence for light going from air to glass, and the angle of refraction greater than the angle of incidence for light going from glass to air. The ray emerging from the block should be parallel to the ray entering the block.



Safety

Warn students that the ray boxes can become very hot.

Course resources

Phys students' sheet CP3

Equipment

ray box and slit, low voltage power supply, protractor, rectangular glass block, plain paper, ruler