In this experiment, we will be calculating the refractive index of a medium, in this case, glass.

The refractive index of a medium is a measure of the change in the speed of light as it passes from a vacuum into the material.

We can find an approximate value for the refractive index by shining a light beam from air into the medium at different angles and measuring how much the angle of the beam changes.

To do this we need:
A ray box with a single slit & filter.
A power supply.
A paper protractor.
A glass semi-circular block.

Draw up a table to record your results. This will have headings for angle of incidence, angle of refraction, sine angle of incidence, and sine angle of refraction.

Let's start the experiment. Place the semi-circular block on the centre of the protractor, with its straight edge along the centre line. Position the lightbox facing the semi-circular side of the block.

When the light beam shines along a line at zero degrees it continues as a straight line through the block. This line is the normal. We measure all the angles from the normal. These will be the angles of incidence.

Position the ray box so that the incident ray is at five degrees from the normal and record this and the angle of refraction. In this case, the ray is refracted to a value of 188 degrees on the protractor. So the angle of refraction is eight degrees from the normal.

Move the light box so the beam is at 10 degrees to the normal and record your results.

Repeat the experiment by increasing the angle by five degrees each time so you find results for 15 degrees. 20 degrees. 25 degrees. 30 degrees. 35 degrees, and 40 degrees.

At around 42 degrees, the light no longer moves from the glass to the air on the straight side of the block. Instead, it is reflected back through the block.

The light beam has reached the critical angle. At this angle, the light is no longer refracted at the surface between the glass and air. At this point, we see total internal reflection.

Use a calculator to work out the sine for each angle. You can then plot these on a graph of sine angle of incidence against sine angle of refraction.

Draw a line of best fit through the results. You can find the refractive index by calculating the gradient of the line.

You can use this line of best fit to work out the refractive index of glass. For this, you use the equation: n equals sine theta one divided by sine theta 2.

Where n is the refractive index. Theta one is the angle of incidence, and theta two is the angle of refraction.