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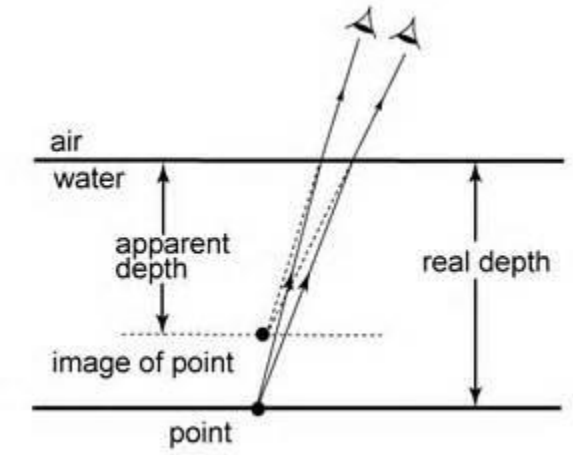
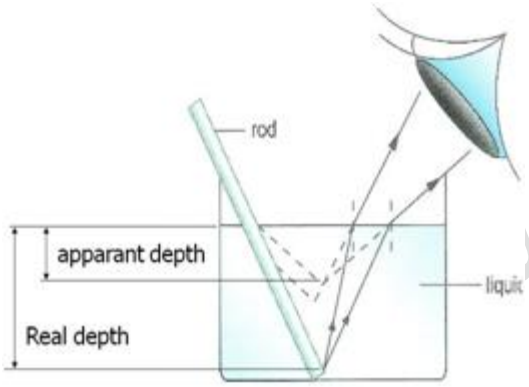
CRITICAL ANGLE

Real and Apparent Depth





Critical Angle

This is the angle of incidence found in the denser medium that produces an angle of refraction of 90°.

The critical angle can be used to determine the refractive index using the following formula:

$$a^n g = \frac{1}{\sin c}$$

Where c is the critical angle and $a^n g$ is the refractive index for light passing from air to glass.

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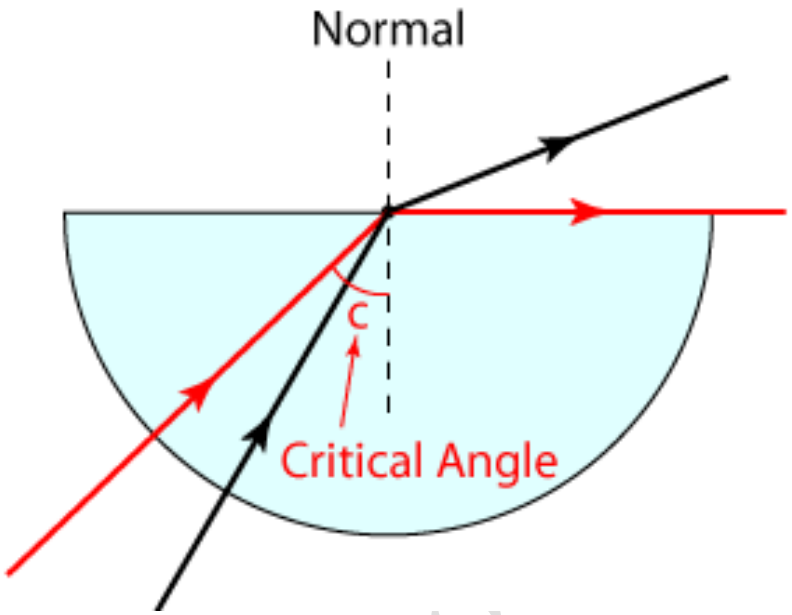
Experiment to Determine the Critical Angle of Glass



The experiment is set up as shown above in a darkened room. The ray of light that is emitted from the ray box is directed to the centre of the curvature of the semicircle glass block.

A semi-circular glass block is used and the ray of light is pointed to the centre of curvature to ensure that when the light enters the glass block no refraction takes place. It therefore becomes easier to measure the angle of incidence within the glass block.

The ray box is then moved so that the angle of refraction is 90°. The angle of incidence at this point (critical angle) can be measured.

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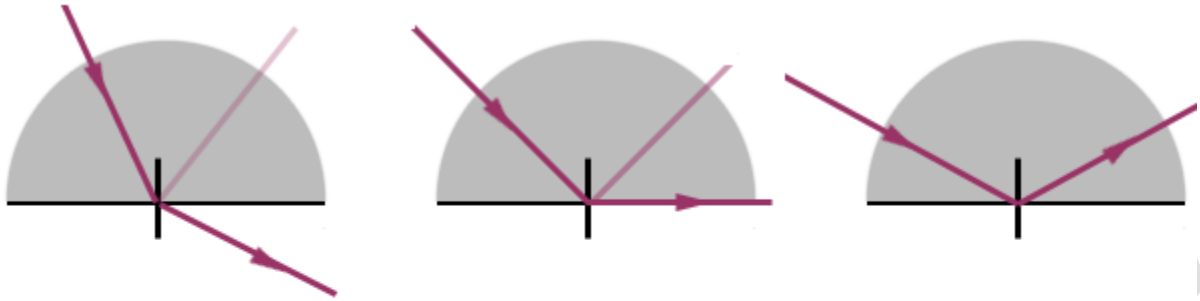
Total Internal Reflection



The angle of incidence is less than the critical angle.
Ray is refracted with a very small reflection.

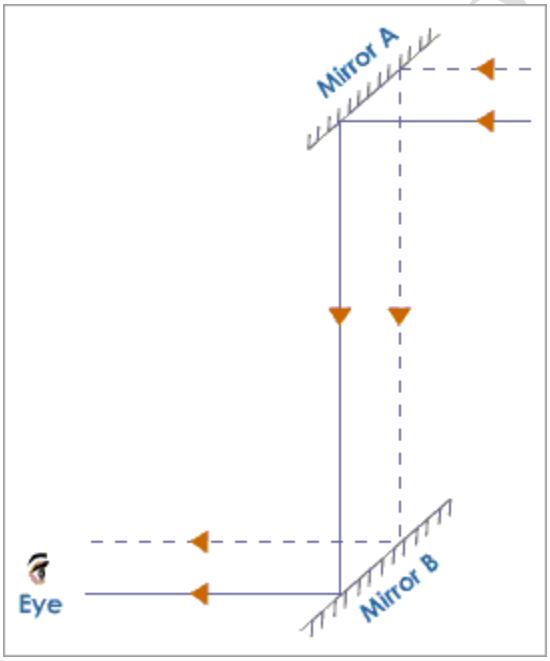
The angle of incidence is equal to the critical angle.
Ray emerges along the edge of the block.

The angle of incidence is greater than the critical angle.
The ray is totally internally reflected.

Total internal reflection occurs when the angle of incidence exceeds the critical angle.

Critical angle for glass - 42°

Applications



The angle of incidence is equal to 45° which exceed the critical angle for glass and therefore total internal reflection occurs.

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Fibre Optics – Communication, Endoscope, Christmas trees