

WJEC (Eduqas) Physics A Level

SP3.3 - Measurement of the Refractive Index of a Material

Practical Flashcards

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What is refraction?



What is refraction?

Refraction is the changing of speed of a wave as it passes into a new medium of different optical density. This change of speed may result in a change in the direction of wave propagation.



What quantity doesn't change when light undergoes refraction?



What quantity doesn't change when light undergoes refraction?

Frequency remains constant when a wave undergoes refraction. Therefore so does the wave's period.



What happens when light enters a more optically dense medium?



What happens when light enters a more optically dense medium?

Refraction will occur. The light will slow down, the wavelength will decrease, and the direction in which the light propagates will bend towards the normal.



Suggest a suitable light source to investigate refraction through a glass block.



Suggest a suitable light source to investigate refraction through a glass block.

A ray box can be used to produce a thin beam of light suitable for investigating refraction. This is lower risk than using a laser.



What is the risk of using a laser to investigate refraction through a glass-block?



What is the risk of using a laser to investigate refraction through a glass-block?

The glass-block may reflect some of the light and this could enter your or someone else's eye, potentially causing retinal damage.



What safety precautions should be taken when using a ray box?



What safety precautions should be taken when using a ray box?

The bulb and surrounding metal parts can become very hot. Allow it to cool after use, avoid touching metal regions and switch it off when it is not being used. Never look directly into the light.



What is a refractive index?



What is a refractive index?

A refractive index is the ratio of the speed of light in a vacuum to the speed of light of in a given medium.



How can the angle of refraction be measured in this experiment?



How can the angle of refraction be measured in this experiment?

Draw around the glass block. Mark the ray entering and leaving the block and then remove the block. Connect the two lines with a straight line and measure the angle that this line makes with the normal.



Describe the path of the light when it enters the glass block along the normal.



Describe the path of the light when it enters the glass block along the normal.

If the light enters along the normal, the light will continue travelling in a straight line through the block.



How can the refractive index be obtained from a graph of $\sin(i)$ against $\sin(r)$?



How can the refractive index be obtained from a graph of $\sin(i)$ against $\sin(r)$?

$$n = \sin(i)/\sin(r)$$

This means that the refractive index of the block is equal to the gradient of the graph.



What do the equations used in this experiment assume about the incident ray?



What do the equations used in this experiment assume about the incident ray?

The equation $\sin(i) = n \sin(r)$ assumes that the incident ray is travelling through medium of low optical density (not much greater than a vacuum), such as air.



What equation can be used to calculate the refractive index of a medium given the speed of light passing through it?



What equation can be used to calculate the refractive index of a medium given the speed of light passing through it?

Refractive Index = Speed of Light in Vacuum / Speed of Light in Medium

$$n = c/v$$



What is the speed of light in a vacuum?



What is the speed of light in a vacuum?

$$3 \times 10^8 \text{ ms}^{-1}$$

