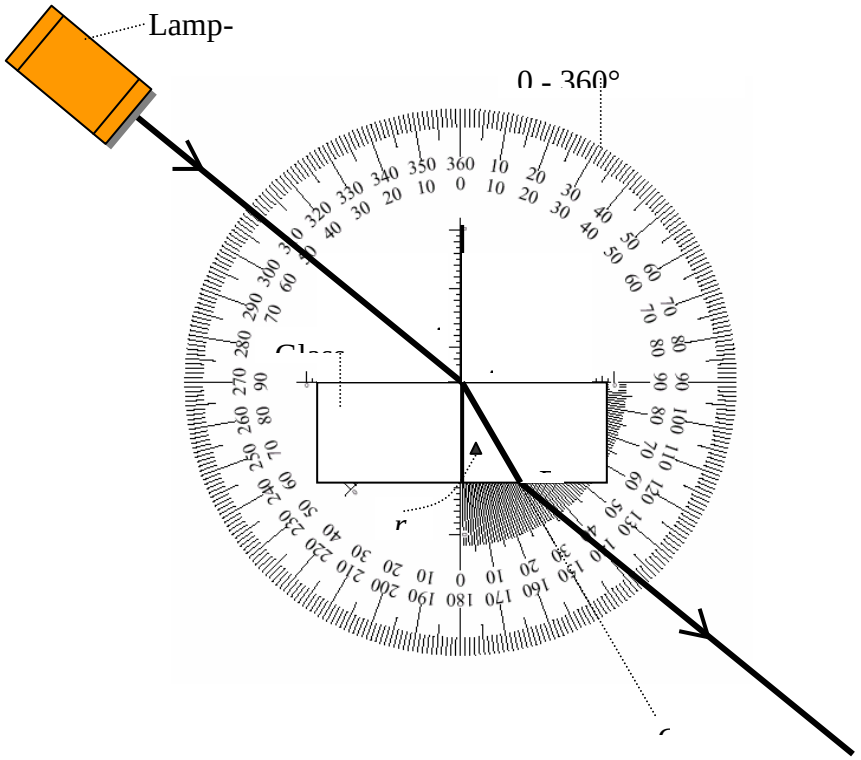
VERIFICATION OF SNELL'S LAW OF REFRACTION

Apparatus

Glass block, lamp-box, 0-360^0 protractor.

Theory.

When a ray of light passes from one substance to another, it gets bent. This is called refraction. In this experiment, light is passing from air into glass. We can see it bend as it enters the glass and as it exits it. Because the light is entering the dense substance (glass), it gets slowed down and this causes its change in direction. As it exits, it speed up again and continues in its original direction.



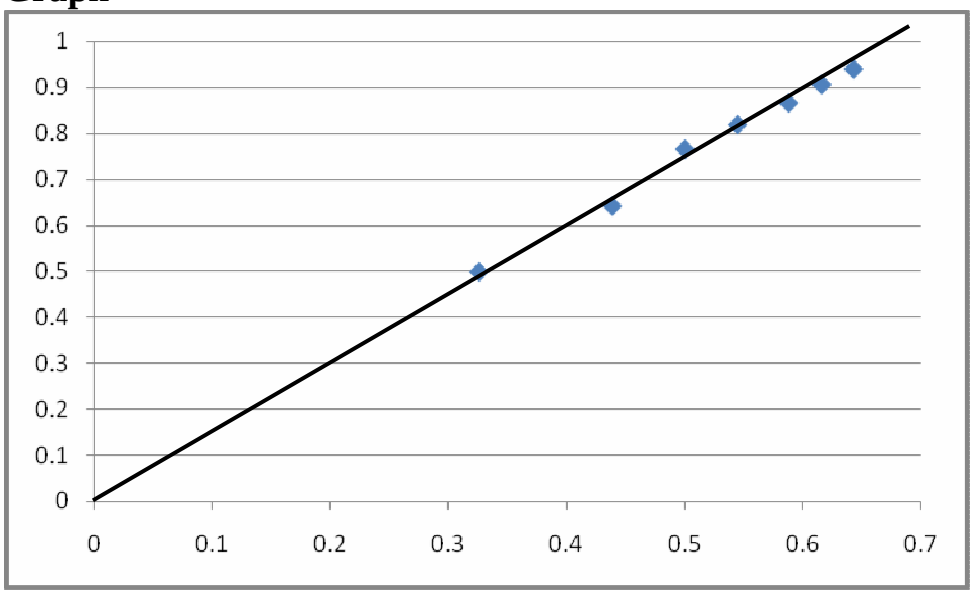
Procedure

1. Place a glass block on the 0-360^0 protractor in the position shown on the diagram and mark its outline.
2. Shine a ray of light from a lamp-box at a specified angle to the near side of the block and note the angle of incidence.
3. Observe the ray of light leaving the glass block and similarly mark the exact point B where it leaves the glass block.
4. Remove the glass block. Join BA and extend to C.
5. Note the angle of refraction *r*.
6. Repeat for different values of *i*.
7. Draw up a table as shown.
8. Plot a graph of sin *i* against sin *r*.

Results

i / °	r / °	sin i	sin r	n
30	19	0.5	0.3256	1.535627
40	26	0.6428	0.4384	1.466241
50	30	0.766	0.5	1.532
55	33	0.8192	0.5446	1.504223
60	36	0.866	0.5878	1.47329
65	38	0.9063	0.6157	1.471983
70	40	0.9397	0.6428	1.461886

Graph



A straight line through the origin verifies Snell's law of refraction i.e. $\sin i \propto \sin r$.

The slope of the line gives a value for the refractive index of glass.

The refractive index of glass is equal to the average value of $\frac{\sin i}{\sin r}$.

Calculations.

Find the slope of the line by using $(y_2 - y_1)/(x_2 - x_1)$.
This will give the refractive index n.

Errors/Notes

Look directly down through the glass or plastic block to measure the angle of refraction.

Errors occur when measuring the exact angle, sometimes the reflected ray is between two degrees.

Conclusion

A straight line through the origin proves that $\sin i \propto \sin r$.