

## State Examination Commission – Physics Higher Level, 2010

### Question 3

In an experiment to verify Snell's law, a student recorded the following data.

$i / ^\circ$	30	40	50	55	60	65	70
$r / ^\circ$	19	26	30	33	36	38	40

Draw a labelled diagram of the apparatus used.

On your diagram, indicate an angle  $i$  and its corresponding angle  $r$ .

(12)

Using the recorded data, draw a suitable graph and explain how your graph verifies Snell's law.

(22)

Using your graph, calculate the refractive index of the substance used in the experiment.

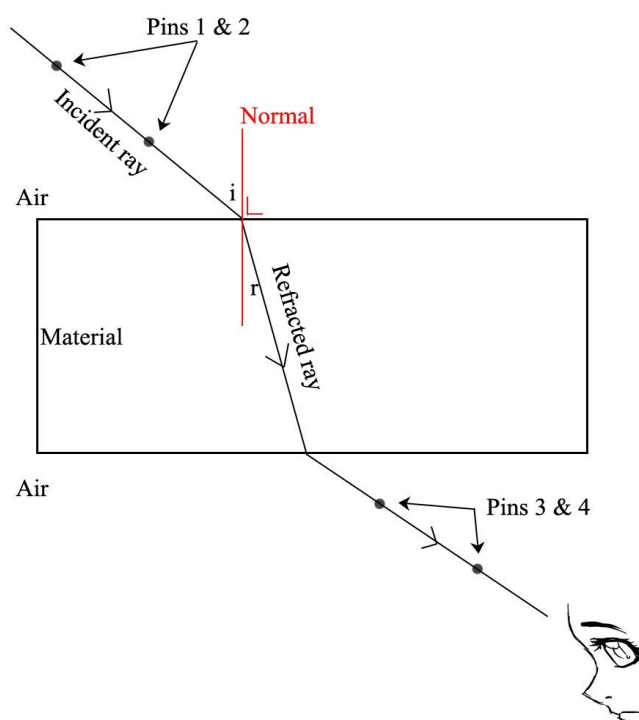
(6)

The student did not record any values of the angle  $i$  below  $30^\circ$ . Give two reasons why.

Draw a labelled diagram of the apparatus used.

On your diagram, indicate an angle  $i$  and its corresponding angle  $r$ .

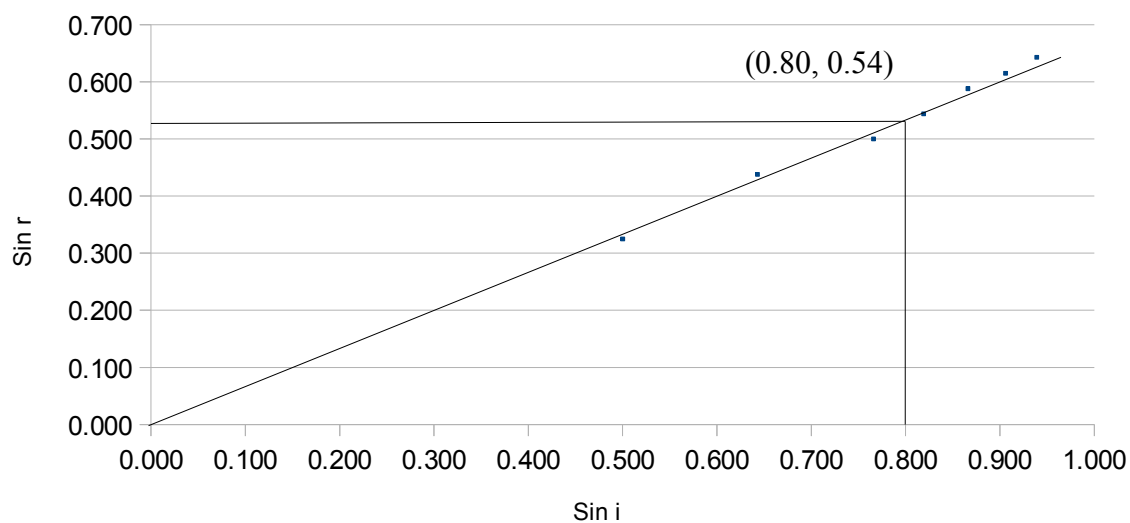
(12)



Using the recorded data, draw a suitable graph and explain how your graph verifies Snell's law.

$i / ^\circ$	30	40	50	55	60	65	70
$r / ^\circ$	19	26	30	33	36	38	40
$\sin i$	0.500	0.643	0.766	0.819	0.866	0.906	0.939
$\sin r$	0.325	0.438	0.500	0.544	0.588	0.615	0.643

### sin i vs sin r



The graph verifies Snell's law as it shows that sin i is proportional to sin r (straight line through origin).

Using your graph, calculate the refractive index of the substance used in the experiment. (22)

$$n = \sin i / \sin r = 0.80/0.54 = 1.48$$

The student did not record any values of the angle  $i$  below  $30^\circ$ . Give two reasons why. (6)

Smaller angles are more difficult to measure, and when measured will have larger possible percentage errors