11 A light ray can undergo total internal reflection.

(a) (i) State two uses of total internal reflection.

(2)

1 .....

.....

2 .....

.....

(ii) Describe the conditions required for total internal reflection to occur.

(2)

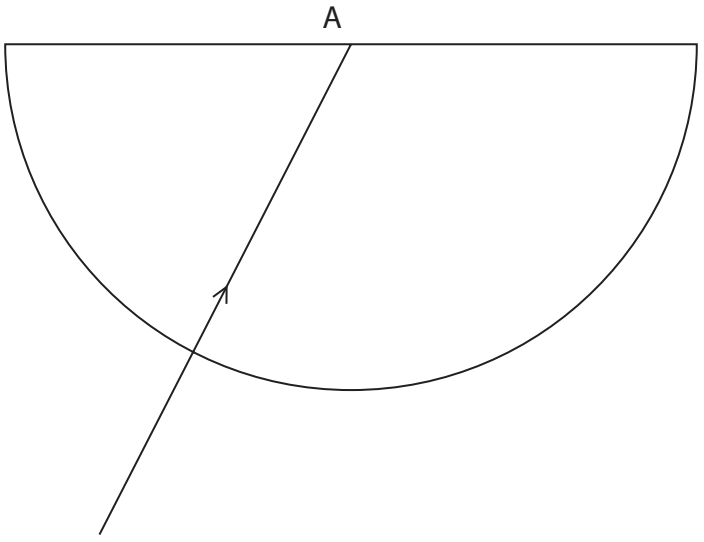
.....

.....

.....

.....

(b) The diagram shows a light ray entering a glass block from air and then incident on the flat side of the block at position A.



(i) Draw the normal line where the light ray is incident on the flat side of the block.

(1)

(ii) Measure the angle of incidence.

(1)

angle of incidence = ...

(iii) The critical angle of the glass block is 40°

Continue the path of the light ray after it reaches position A.

(2)

(iv) State the equation linking critical angle and refractive index.

(1)

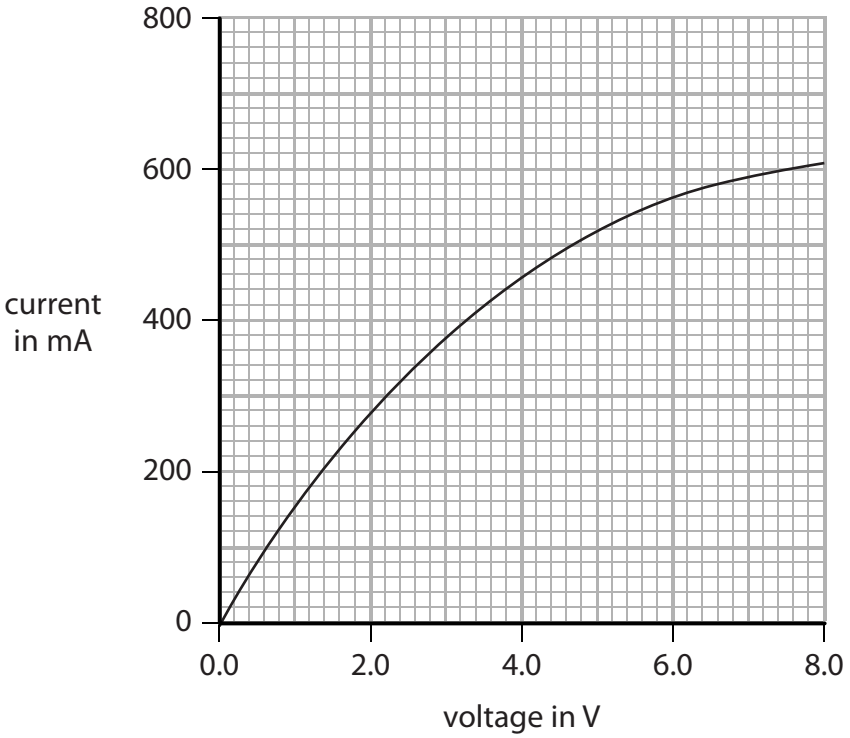
(v) Calculate the refractive index of the glass block.

(2)

refractive index = ...

(Total for Question 11 = 11 marks)

12 The graph shows how the current in a filament lamp varies as the voltage across it is changed.



(a) Draw a circuit diagram to show a circuit that could be used to make the measurements required to plot this graph.

(4)