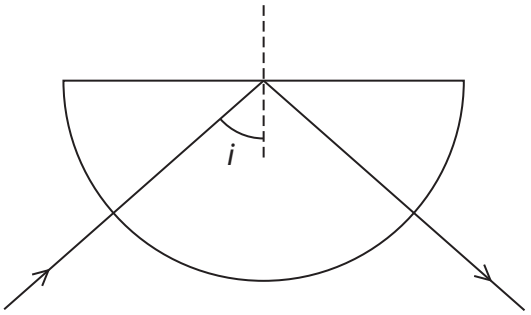
7 A student watches a demonstration of the total internal reflection of light in a semicircular glass block.



i = angle of incidence

(a) He takes notes, but some of his notes are wrong.

Place a tick (✓) or a cross (✗) in the table to show which statements are right or wrong.

The first statement is right and has been done for you.

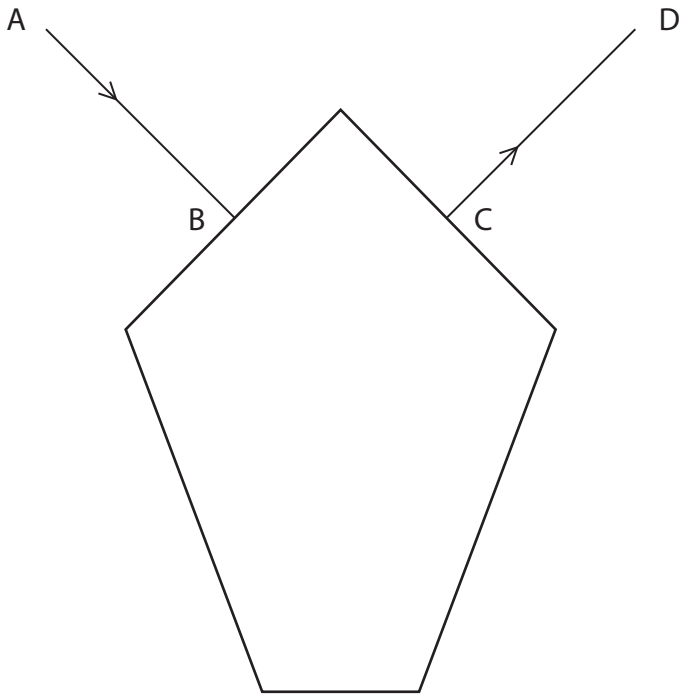
(2)

Notes about the total internal reflection of light	Right or wrong
the angle of incidence equals the angle of reflection	✓
light changes speed when it is internally reflected	
every ray entering the semicircular glass block is reflected by total internal reflection	
if *i* = 0 then the ray does not deviate	
the refractive index of glass is bigger than the refractive index of air	

(b) Jewellers cut jewels so that total internal reflection is more likely.

Light enters a jewel along the normal AB and leaves along the normal CD as shown.

Between B and C there are **two** total internal reflections.



Complete the path of the light through the jewel.

(3)

(c) (i) Show, by calculation, that the critical angle for a refractive index of 1.5 is about 42°.

(3)

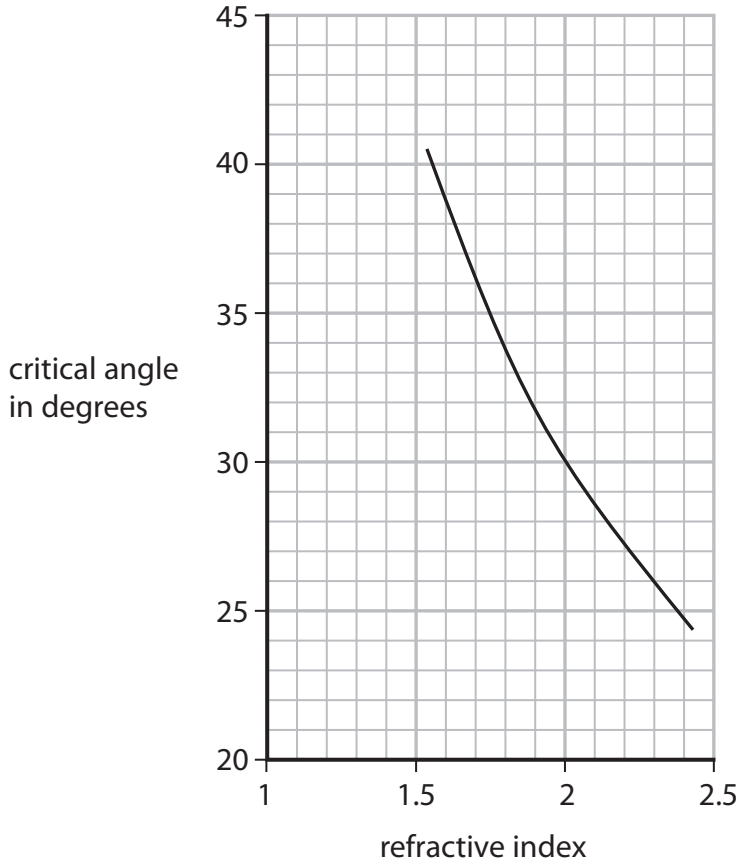
(ii) Explain why the quantity called refractive index has no unit.

(2)

(d) The graph shows how critical angle varies with refractive index.

(i) Add the point (1.5, 42°) to the graph.

(1)



(ii) How can you tell that the point (1.5, 42°) is **not** anomalous?

(1)

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(iii) Suggest two reasons why the axes of the graph do not start from zero.

(2)

1 .....

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2 .....

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(Total for Question 7 = 14 marks)