

Question number	Answer	Notes	Marks
4 (a)	change in direction of waves at a boundary	ALLOW change in speed ALLOW idea of 'boundary' such as changing medium, or examples such as 'going from air into a glass block'	1
(b)	correct label for i correct label for r	ALLOW labels written out in full as "incidence" or "angle of incidence" etc REJECT if angles are the wrong way around	2
(c) (i)	refractive index = $\sin i / \sin r$	ALLOW 'n' for refractive index REJECT speed in 1/speed in 2	1
(ii)	Method max 4 marks: draw around block; mark positions of incident and emergent rays; (remove block and) draw refracted ray; measure i ; measure r ; measure angle(s) to the normal; range of values; Data max 2 marks: (graph of) $\sin i$ against $\sin r$; graph is straight line; DOP gradient gives refractive index; DOP	Accept pin or pencil method Ignore mention of protractor i.e. different values of i not just repeating	MAX 6