

Question			Expected response	Max mark	Additional guidance
11.	(a)		$n = \frac{\sin \theta_1}{\sin \theta_2} \quad (1)$ $1.47 = \frac{\sin \theta_1}{\sin 37.0} \quad (1)$ $\theta_1 = 62.2^\circ \quad (1)$	3	Accept: 62, 62.21, 62.211 Accept: $\frac{n_2}{n_1} = \frac{\sin \theta_1}{\sin \theta_2} \quad (1)$ $\frac{1.47}{1} = \frac{\sin \theta_1}{\sin 37.0} \quad (1)$ $\theta_1 = 62.2^\circ \quad (1)$
	(b)		$\sin \theta_c = \frac{1}{n} \quad (1)$ $\sin \theta_c = \frac{1}{1.47} \quad (1)$ $\theta_c = 42.9^\circ \quad (1)$	3	Accept: 43, 42.86, 42.865
	(c)		(point) P (1) The (absolute) refractive index of the vegetable oil (for this light) is the same as the (absolute) refractive index of the glass (therefore there is no refraction/change in speed/wavelength/direction). (1)	2	Look for this statement first - if incorrect or missing then (0) marks. Indication of point P being selected on the diagram can be accepted as an alternative for a statement. Accept: The refractive indices/indexes are the same. The refractive index is the same. The (value of) refractive index has not changed.