Question number			Answer	Notes	Marks
6	(a)	(i)	**angle** of incidence;	ignore incident ray	1
		(ii)	recognising 67 (degrees) as anomalous; evaluation of a mean; e.g. mean angle = (22 + 23) / 2 = 23 (degrees)	allow 1 mark if anomalous result included e.g. 37, 37.3… (degrees) allow 22, 22.5 (degrees)	2
		(iii)	n calculated for multiple angles; mean value obtained **for n**; OR idea of graph plotted of sin(i) against sin(r); n found from gradient of (sin(i)-sin(r)) graph;		2
	(b)	(i)	substitution into n = sin(i) ÷ sin(r) ; evaluation; e.g. refractive index = sin(82) ÷ sin(47) (refractive index =) 1.4	 1.3 scores 1 mark only allow 1.35…	2
		(ii)	sin(c) = 1/n;	allow any correct rearrangement	1
		(iii)	substitution and rearrangement; evaluation; e.g. c = $\sin^{-1}(1/1.7) = \sin^{-1}(0.588…)$ (critical angle =) 36 (degrees)	 allow 36.03… (degrees)	2
	(c)		light undergoes TIR; (because) angle (of incidence) is greater than critical angle;		2

Total for Question 6 = 12 marks

Question number	Answer	Notes	Marks
7 (a)	idea that extension increases as force increases; idea of a linear relationship;	ignore positive correlation allow "force is proportional to extension" for 2 marks if no other marks scored then mention of Hooke's law scores 1 mark	2
(b)	substitution into moment = force × distance; evaluation of moment to at least 3s.f.; e.g. moment = 480 × (0.)84 moment = 403 (Nm)	ignore units 1 mark max. for reverse calculation e.g. calculating the force or the distance allow 403.2 (Nm)	2
(c)	idea of principle of moments; moment of push force = F × 3.2; rearrangement; evaluation; e.g. 403.2 = F × 3.2 F = 403.2 / 3.2 (F =) 130 (N)	implied by substitution or written in words seen anywhere in calculation -1 for POT error allow use of 400 Nm, giving 125 N allow use of 403 Nm, giving 125.9…, 126 (N) clockwise moment = anti-clockwise moment allow 126 (N)	4
(d)	idea of spring exceeding/reaching elastic limit; idea of permanent deformation / not returning to original shape / permanent stretching;	ignore idea of spring losing elasticity / stop stretching allow limit of proportionality for elastic limit ignore spring breaking	2

Total for Question 7 = 10 marks