

7	The only correct answer is A B is not correct because an incorrect equation has been used C is not correct because the useful power output has been taken incorrectly to be 9.8 W	1
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	D is not correct because an incorrect value for useful power output of 9.8 W has been used with the reciprocal of the correct equation	
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Question Number	Answer	Mark
13a	Use of $I = P/A$ (1) Use of $A = 4\pi r^2$ (1) $r = 1.47 \times 10^{11} \text{ m}$ (1) (MP3 can only be awarded if 1410 W m^{-2} has been used) <u>Example of calculation</u> $4\pi r^2 = (3.83 \times 10^{26} \text{ W}) / 1410 \text{ W m}^{-2}$ $r = 1.47 \times 10^{11} \text{ m}$.	3
13b	Mars orbits at a greater distance from the Sun than the Earth as the intensity is lower (1) Mars has a more elliptical orbit than the Earth (1) The (relative) difference between the maximum and minimum intensity for Mars is greater. (1) (All 3 marking points need to be comparisons)	3
Total for question 13		6

Question Number	Answer	Mark
17(a)(i)	Higher percentage of sugar has a larger refractive index (1) So greater refraction or smaller angle of refraction (1) (accept converse)	2
17(a)(ii)	Use of $\mu_2 = \frac{\sin i}{\sin r}$ with $i = 40^\circ$ and $r = 26^\circ$. (1) $\mu = 1.47$ (1) reads correct percentage sugar for their value of μ (1) (MP3 is dependent on MP1 being awarded) 3 <u>Example of Calculation</u> $\mu = \frac{\sin 40}{\sin 26} = 1.47$ From graph percentage sugar = 72 %	
17(b)(i)	(The) single plane containing the oscillations/vibrations (of the polarised wave) (1) And the direction of the propagation (1) (MP2 is dependent on MP1 being awarded) 2 (accept energy transfer or wave travel for propagation) (do not accept wave motion for propagation)	
17(b)(ii)	(Plane of polarisation of) filter A is perpendicular to (the plane of polarisation) of filter B (1) Or the (polarised) light from filter A is perpendicular to (the plane of polarisation) of filter B (1) (So all) the polarised light (from A) is absorbed by filter B (1) Or light transmitted by A is not transmitted by filter B 2	
17(b)(iii)	The (plane of polarisation of the) light is rotated by a small angle (do not accept 90°) (1) only a <u>component</u> of the (polarised) light is transmitted by filter B (1) Or a <u>component</u> of the light is not absorbed by filter B 2	
17(b)(iv)	(one) filter is rotated (1) until no light is detected (1) measure/record the angle through which the filter is rotated Or links the angle of rotation of the filter with the angle of the plane of polarisation (1)	3
Total for question 17		14