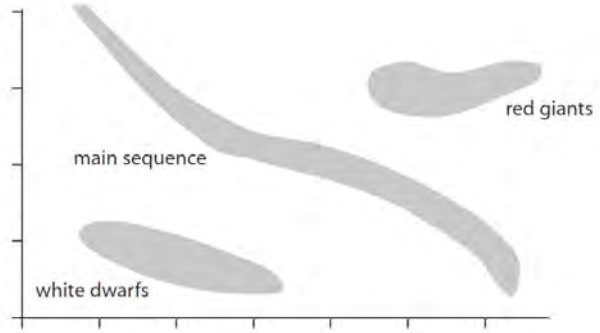
Question number	Answer	Notes	Marks
1 (a) (i)	B – main sequence stars; A is not correct as black holes do not appear on the HR diagram C is not correct as neutron stars are not part of the main sequence. D is not correct as protostars are not part of the main sequence		1
(ii)	bottom left area of the HR diagram;	unlabelled scores 0	1
(iii)	top right hand area of HR diagram;  	unlabelled scores 0	1
(iv)	a measure of brightness/luminosity; idea that a star would be at a standard distance (10 parsecs/32(.6) light years);	accept power ignore lack of or incorrect value for distance	2
(b) (i)	C – ultraviolet; A is not correct as microwaves cause internal heating B is not correct as radio waves do not give skin burns D is not correct as visible light cannot harm skin cells.		1
(ii)	A – sunbathing; B, C and D are not correct as all reduce the absorption of UV by skin.		1

Total for Question 1: 7 marks

Question number	Answer	Notes	Marks
6 (a)	creation of a (large) nucleus from small **nuclei**; resulting in a loss of mass; and the release of energy;	condone "fusing of two nuclei" accept reference to $E=mc^2$ condone "converted to energy"	3
(b) (i)	electrical working;	condone 'electrically'	1
(ii)	substitution in $V_{in}I_{in} = V_{out}I_{out}$; re-arrangement; evaluation; correct answer = 1.8 (kA) e.g. input power = output power $V_{in}I_{in} = V_{out}I_{out}$ $28 \times 21 = 330 \times I_{out}$ $I_{out} = (28 \times 21) \div 330$ I_{out} =1.7818...	-1 POT error	3

Total for Question 6: 7 marks

Question number	Answer	Notes	Marks
7 (a)	correct substitution KE = ½ (mass) × (speed)^2; re-arrangement to give v; evaluation to show 5.8(4…) (m/s); e.g. KE = ½ m v^2 0.29 = 0.5 × 0.017 × v^2 v^2 = 0.29 ÷ (0.5 × 0.017) = 34.1176471.. v = √34.1176471 = 5.8(4…) (m/s)	allow use of standard symbols e.g. KE = ½ m v^2 allow mass = 17 at this point	3
(b)	idea of conservation of momentum; idea that momentum before release was zero; evidence of re-arrangement; evaluation of large block speed giving 1.3 m/s; e.g. momentum of small block = 17 × 6 = 102 g m/s therefore momentum of large block = 102 g m/s momentum = mass × velocity = 75 v so v = 102/75 = 1.36 m/s	however expressed allow idea that momenta of two blocks is equal in magnitude allow 1.4 if v_{small} = 6 m/s ignore mass unit provided both masses consistent v=1.31 if v_{small} = 5.8 m/s v=1.32 if v_{small} = 5.84 m/s	4
(c)	substitution into given equation; idea of initial momentum = 0; evaluation; correct answer = 0.93 (N) e.g. force = change in momentum ÷ time taken force = ((0.017 × 6) – 0) ÷ 0.11 force = 0.102 ÷ 0.11 force = 0.9272… (N)	 allow use of init velocity = 0	3
(d)	substitution and re-arrangement of given equation; conversion of 17.6 cm to 0.176 m; evaluation; correct answer = 0.18(41…) (s) e.g. orbital speed=(2π × orbital radius)÷time period 6 = (2π × 0.176)÷T T = (2π × 0.176) ÷ 6 T = 0.1843… (s)	 accept 0.2 (s) accept use of v=5.84…(m/s) -1 POT error 0.092.. (s) for using 17.6 cm as a diameter scores 2 marks	3

Total for Question 7: 13 marks