

Physics 2 Summer 2015
Higher Tier

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
	1	(a)	(i)	2	Uranium [nucleus] / it absorbs neutron[s] (1) splits into <u>2</u> [smaller] nuclei <u>and</u> neutrons [are released] (1)	Atoms Neutron capture Named elements		Force of impact shatters nucleus. Don't accept collides.
			(ii)	2	Slows down the neutrons (1) so they can be absorbed / captured <u>by uranium</u> [nuclei] (1) The 2nd mark can only be awarded if it is linked to the 1st mark.	For 2 nd mark: Split <u>uranium</u> nuclei or they cause fission of <u>uranium</u> or the reaction of uranium		
			(iii)	2	Fewer or no neutrons absorbed (1) so increase [in rate of] fission [of uranium nuclei] (1) The 2nd mark can only be awarded if it is linked to the 1st mark.	For 1 st mark: So more neutrons available for fission		Taken out / removed / more energy released
		(b)	(i)	3	Ticks in the 2 nd , 3 rd and 4 th boxes A nucleus of U-230 least number of neutrons (1) <input checked="" type="checkbox"/> A nucleus of U-235 contains 143 neutrons (1) <input checked="" type="checkbox"/> A nucleus of U-234 contains 92 protons (1) <input checked="" type="checkbox"/>			Extra tick attracts -1
			(ii)	2	234 (1) ${}_{92}^{234}\text{U}$ (1) as shown here			
Total Mark				11				

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
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	2	(a)	(i)		2	<p>No credit is given for just naming the radioisotope Astatine Alpha particles highly ionising or easily absorbed [by cancer cells] or would not penetrate beyond the tumour [to affect healthy cells] (1) It decays [to a safe level] quickly or equivalent (1) Alternative solution: Tellurium Beta penetrates all of the tumour (1) It decays [to a safe level] quickly or equivalent (1)</p>	Alpha is not able to spread far [The source] won't last long in the body		<p>Answers for any other radioisotope Attacks / kills the cancer cells the best. It is highly ionising. Any statement implying that it leaves the body quickly / the half-life is short.</p>
			(ii)		2	<p>Cobalt / Caesium Beta / gamma will penetrate the <u>packaging/box</u> or kills bacteria (1) It won't need replacing for a long time / it lasts a long time (1)</p>			It has a long half-life
		(b)	(i)		1	5			
			(ii)		2	<p>288 – 144 – 72 – 36 – 18 - 9 Process of halving from 288 (1) 5 times to arrive at 9 (1) ecf</p>	Answer only of 9 gets 2 marks		An incorrect answer with no workings shown <u>e.g. 18</u> except for 4 half-lives in (b)(i) which gets 2 marks
Total Mark					7				

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	3			6	<p>Indicative content: If the vehicle is travelling faster then the thinking distance is increased and the braking distance is also increased. This means that the overall stopping distance is greater (or the converse for a vehicle travelling more slowly). If the brakes are worn (or poor road surface conditions) the thinking distance is unaffected but the braking distance is increased. This again leads to an increased stopping distance (or the converse for new brakes). If the driver has drunk alcohol or is tired the reaction time is bigger and so the thinking distance is greater. Although the braking distance is unaffected the overall stopping distance is greater.</p> <p>5-6 marks The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</p> <p>3-4 marks The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</p> <p>1-2 marks The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</p> <p>0 marks The candidate does not make any attempt or give a relevant answer worthy of credit.</p>			
Total Mark				6				

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
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	4		(i)	2	Repeat <u>the</u> experiment / gather more data (1) and if the current values or results are <u>close to the first set</u> of readings [the results are repeatable] (1) The 2nd mark can only be awarded if it is linked to the 1st mark.	Or opposite comment		
			(ii)	3	As the length doubles the current is halved (1) V is constant (1) so the resistance doubles (1) Alternative solution: For a length of e.g. 10 cm, $R = 2 \Omega$ and for a length of e.g. 30 cm, $R = 6 \Omega$ (2) therefore tripling l , triples R (1) For 2 marks, the first and third statements need to be linked	When the length doubles the current is halved (1) since resistance is inversely proportional to current this agrees with the statement (1)		As length increases, current decreases so resistance increases
			(iii)	3	Points plotted within $\pm \frac{1}{2}$ small square division (2) (-1 mark for each incorrect plot to a maximum of 2 marks) Curved line of best fit \pm one small square division of each point within the range 20 - 75 cm (1)			Line joined dot to dot, wispy lines, double lines
			(iv)	2	Award 2 marks for <u>inversely</u> proportional Award 1 mark for as the length increases current decreases	If length doubles, current is halved gets 2 marks Decreases at a decreasing rate gets 1 mark		Directly proportional. In a non-linear way for the 2 nd mark

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		(v)	4	<p>0.2 A identified from the graph (1) will be dependent on their graph line</p> $R = \frac{V}{I} = \frac{1.8}{0.2} = 9 \text{ } [\Omega] \text{ (1) ecf on 0.2 A}$ <p>So $\frac{9}{45} = 0.2 \text{ } \Omega/\text{cm}$ (1) ecf on 9 [Ω]</p> <p>Yes or No must be consistent with their answer (1)</p> <p>Alternative solution:</p> $V = 0.2 \text{ (1)} \times 0.2 = 0.04 \text{ V cm}^{-1} \text{ (1)}$ $0.04 \times 45 \text{ cm} = 1.8 \text{ V (1)}$ <p>So correct V (1)</p> <p>Alternative solution:</p> $R = 0.2 \text{ (1)} \times 45 = 9 \text{ } \Omega \text{ (1)}$ $I = \frac{V}{R} = \frac{1.8}{9} = 0.2 \text{ A (1)}$ <p>So correct value for I (1)</p>	<p>0.2 A identified from the graph (1) will be dependent on their graph line</p> <p>Resistance = $0.2 \times 45 = 9 \text{ } \Omega$ (1)</p> $V = IR = 0.2 \times 9 = 1.8 \text{ V (1)}$ <p>Yes because that was the voltage used (1)</p>		$V = IR = 0.2 \times 45 = 9 \text{ } \Omega$
Total Mark			14				

Question Number								
FT	HT	Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
	5	(a)	(i)	2	$P = VI = 120 \times 5 (1) = 600 [W] (1)$			
			(ii)	1	9 000 [J]	9 if k placed before J		9 kJ if given J not crossed out
			(iii)	2	$GPE = mgh = 50 \times 10 \times 14 (1) = 7\,000 [J] (1)$			
			(iv)	1	Lost as heat / due to friction / energy to lift blocks and hook			Lost to atmosphere / energy wasted / energy lost / air resistance
		(b)	(i)	2	50 (1) $\times 10 = 500 [N] (1)$	$F = \frac{W}{d}$ $= \frac{7\,000(1)}{14}$ $= 500 [N] (1)$		$\frac{9\,000}{14}$ Substitution of 50 into the PE equation
			(ii)	2	Resultant / unbalanced force (1) so velocity increases / object accelerates (1) The 2nd mark can only be awarded if it is linked to the 1st mark.			Statements of Newton's laws Reference to air resistance
			(iii)	3	Change in GPE = gain in KE (1) $KE = \frac{1}{2}mv^2 \Rightarrow v^2 = \frac{2KE}{m}$ (1 rearranged) ecf from (a)(iii) $\frac{2 \times 7\,000}{50} = 280 [m^2/s^2] \Rightarrow v = 16.7 [m/s] (1)$	Answer of 17 [m/s]		7 000 substituted into any equation other than an energy one
		Total Mark		13				

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
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	6	(a)		3	Area: $(\frac{1}{2} \times (60 \times 30)) + (60 \times 35) + (\frac{1}{2} \times (60 \times 15))$ So: $(900 + 450)$ (1) - triangles $+ 2\ 100$ (1) - rectangle $= 3\ 450$ [m] (1) Alternative solution: Area of a trapezium = $\frac{1}{2} \times (80 + 35)$ (1) $\times 60$ (1) $= 3\ 450$ [m] (1)			
		(b)		6	Indicative content: In the first 30 s there is a resultant force acting in the forward direction which makes the passenger accelerate. Calculations to show the acceleration is 2 m/s^2 and the force is 140 N. Between 30 and 65 s the speed is constant so the resultant force is zero. For the last 15 s there is a resultant force opposite/backward causing the passenger to decelerate to zero. Calculations to show the deceleration is 4 m/s^2 so the force is 280 N. 5-6 marks The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. 3-4 marks The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. 1-2 marks The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. 0 marks The candidate does not make any attempt or give a relevant answer worthy of credit.			
		Total Mark		9				