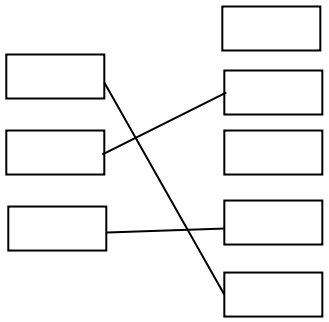
GCSE Science - Physics 2 Mark Scheme

January 2013

FOUNDATION TIER

Question			Answer / Explanatory Notes	Marks Available
1.	*(a)*		Correct lines 3 × (1) – (-1) for additional lines 	3
	(b)		Acceleration = $\frac{30}{6}$ (1 – substitution) = 5 [m/s^2] (1) For $\frac{30}{6}$ = 0.2 award 1 mark (the substitution mark)	2
	(c)		Slows down (accept falls slower) (1) ….because air resistance increases/becomes more than weight (1) Don't accept slow increase in air resistance. Forces mark (1) e.g. increased surface area against air [particles] Motion mark (1) e.g. air resistance increases (1) parachute goes up (0) – **N.B. independent marking points.**	2
			Question total	**[7]**
2.	*(a)*		Plots ± ½ square (2) [–1 per error] Joined point to point (1) **ecf** for incorrect plots If line is correct assume points are correct even if they can't be seen. Ignore thickness of line but do not accept disjointed / whispy / double / curves	3
	(b)	(i)	Use of 200 m from graph (1) Speed = $\frac{200}{40}$ (1 – subst) = 5 [m/s] (1) Correct working of gradient (matching points) = 3 marks e.g. $\frac{100}{20} = 5$	3
		(ii)	60 [s] **ecf** from graph	1
	(c)	(i)	Faster speed in the last 40 seconds **or** 5 m/s compared with 10 m/s	1
		(ii)	Steeper line / has a larger gradient / same time [interval] but travelled further **or** 5 m/s compared with 10 m/s	1
			Question total	**[9]**

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3.	*(a)*		Momentum = 800 × 12 (1 – subst) = 9 600 [kg m/s] (1)	2
	(b)	(i)	0 (ignore units)	1
		(ii)	9 600 **ecf** for subtract *(a)* – *(b)*(i)	1
		(iii)	$\frac{9600(1)(\text{ecf})\text{from (b)(ii)}}{3(1)}$ [=3 200 N]	2
	(c)		Any 1 from: • worse weather conditions or implied • worn tyres / incorrect tyre pressure • poor brakes • worse road conditions • high speed / momentum / mass bigger NOT drink driving / tiredness References to reaction time are neutral	1
			Question total	**[7]**

Question			Answer / Explanatory Notes	Marks Available
4.	*(a)*	(i)	graphite / moderator	1
		(ii)	to cause [fission / chain] reactions / if too quick, reaction won't work	1
	(b)	(i)	boron / control rods	1
		(ii)	to prevent an <u>uncontrolled</u> chain reaction / <u>control</u> the chain reaction / prevent overheating or meltdown / Don't accept "to stop fission" only must be qualified.	1
	(c)	(i)	235	1
		(ii)	36	1
		(iii)	[91 – 36] = 55 (No ecf for 91 – (ii))	1
	(d)		$^{136}_{56}$Ba circled	1
	(e)		37 (1) 0 (1)	2
			Question total	**[10]**
5.	*(a)*	(i)	2 [A]	1
		(ii)	$R = \frac{6}{2}$ (1 –substitution) = 3 [Ω] (1) **ecf** from (i) (If found for wire in (i) $R = 4.8\ \Omega$)	2
		(iii)	6 × 2 (1 – subst) = 12 [W] (1) **ecf** from (i) (If found for wire in (i) $P = 7.5$ W)	2
		(iv)	11 [V]	1
		(v)	3.25 [A]	1
	(b)	(i)	**<u>Lamp</u>** has bigger resistance or converse argument or values given W = 4.8 Ω and L = 5.2 Ω	1
		(ii)	Smaller current through it or converse argument **or** calculations shown (allow temperature increase)	1
			Question total	**[9]**

Question			Answer / Explanatory Notes	Marks Available
6.	*(a)*	(i)	Helium <u>nucleus/nuclei</u> / 2 protons and 2 neutrons (accept 2p and 2n)	1
		(ii)	Gamma more penetrating [than alpha] / so would not be blocked by smoke / wouldn't change the current / weakly ionising. **<u>Any 2 x (1) due to all points being interlinked.</u>**	2
			Or gamma is more weakly ionising (1) so doesn't cause an electric current (1) (Don't accept gamma is not ionising.)	
		(iii)	Distance between detector / ceiling and the human body (1) so / hence alpha is easily absorbed by the air / case (1) (Answer must be relevant to this context so **don't accept alpha will be blocked by skin** / **paper**.)	2
	(b)	(i)	<u>Longer ½-life</u> (1) (don't accept longer to decay) so detector stays active / works longer or doesn't need replacing [as often] (1)	2
		(ii)	I. becquerel [accept [Becquerel!] / Bq / bq	1
			II. 26 000 is half of 52 000 (1 – method) so time is one ½-life = <u>432</u> [years] (1) (Accept $\frac{52000}{2}$ as recognition of half-life – don't allow any other value divided by 2).	2
			III. $\frac{864}{432} = 2$ or 864 years is 2 ½-lives or implied (1) so ¼ of the mass remains = <u>0.1</u> [μg] (1)	2
			Question total	**[12]**

Question			Answer / Explanatory Notes	Marks Available
7.			**Indicative content**: The advantage is that the time taken for the given journey is reduced from 4 h to 3.5 h with the increase in speed. The disadvantage is that in the event of an emergency stop being necessary, the total stopping distance is increased from 96 m to 121.5 m, increasing risk of serious injury or death. Relevant factors clearly explained, e.g. tiredness, related to time or speed / separation from vehicle in front. Increased momentum at higher speed related to increased force on vehicle and occupants in the event of a collision. 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.	6
			Question total	**[6]**
			Total for foundation tier paper	**[60]**