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Mark Scheme (Results)

March 2013

GCSE Physics
5PH2H/01

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Question Number	Answer	Acceptable answers	Mark
1(a)(i)	C		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	B		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)	substitution (1) 3.7 x 13 evaluation (1) 48 (C)	 48.1 Correct answer with no calculation scores 2 marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)(i)	Correct responses can be seen in (i) or (ii) An explanation linking • <u>electrons</u> (1) and <u>one</u> of • removed by friction (1) • (transferred) <u>to</u> plastic (1)	 ["positive electrons/ protons moving", seen anywhere in part (i) or (ii) loses this mark] ignore reference to charge before rubbing transferred from cloth	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)(ii)	opposite to charge on plastic (1) <u>equal</u> to charge on the plastic (1)	charge on cloth is positive <u>same size</u> as charge on plastic electrons transferred from the cloth equal to electrons lost by cloth	**(2)**

Total question 1 = 8 marks

Question Number	Answer	Acceptable answers	Mark
2(a)	Description including 3 of the following: • (Gravitational) potential energy (transferred) to KE(1) • Idea of energy transfer to heat/sound whilst descending (1) • Chemical energy is transferred to heat energy in Andrew (1) • Idea of energy dissipated on stopping (1)	(G)PE (transferred) to KE Allow gravitational energy for GPE Energy transferred to heat because of air resistance/ friction The energy goes to heat as he stops. Energy is transferred to the surroundings	**(3)**

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	substitution (1) 67 × 31 evaluation (1) 2077 (kg m/s)	 2080, 2100 working backwards using 2000 (v=) 29.85, 30 (m=) 64.52, 65 67 X 31=2000 scores only one mark	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	substitution (1) 2000 ÷ 2.3 evaluation (1) 870 (N)	 answer to (b)(i)) ÷ 2.3 900, 869.6, 869.5 903	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)(iii)	an explanation linking two of the following • Force on Andrew is quite small (1) • Because impact time is long (1) • The acceleration/deceleration is quite small (1) • Because impact distance is far (1)	 force is reduced/ less /not as strong slows down/changes momentum gradually acceleration = 1.35 'g' or 13.5 m/s^2 slows down (rate of) change of momentum scores 2 marks	**(2)**

Total question 2 = 8 marks

Question Number	Answer	Acceptable answers	Mark
3(a)	D		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	12 (m/s) (1)	Range from 11(m/s) to 14 (m/s)	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	Substitution (1) $\frac{20-0}{5}$ evaluation (1) 4 (m/s^2)	$\frac{20}{5}$ Full marks for correct answer with no working Allow answers between 3.6 and 4.7 for 2 marks to reflect readings taken from the graph	**(2)**

Question Number	Answer	Acceptable answers	Mark
3b(iii)	• velocity/ speed (measured in) m/s (1) • <u>divided</u> by time in s (1)	velocity/ speed (measured in) ms^{-1} acceleration is rate of change of velocity m/s/s m per s per s [accept per for divide] do not accept m/s <u>times</u> time	**(2)**

Question Number	Answer	Acceptable answers	Mark
3b(iv)	at constant vel • distance = 60 (m) (1) slowing down • distance = ½×2×20 (1) • = 20 (m) (1)	correct answer scores 2 marks	**(3)**

Total for question 3=10 marks

Question Number	Answer	Acceptable answers	Mark
4(a)	A		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)	axes labelled correctly With label or unit (1) correct shaped smooth curve (1) line does not reach zero activity (1)	activity / Bq / count rate ignore radioactivity time/ seconds/ any time unit	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(c)(i)	Idea of 2 half-lives (1) 11 400 = 2 × 5700 Idea of halving activity twice (1) 0.55 × 2 × 2 Calculation (1) 2.2 (Bq)	11 400 / 5700 = 2 2.2 (Bq) for three marks	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(c)(ii)	Explanation linking two of: • Background radiation affects the measurement (1) • Needs to be subtracted from readings (1) • Background radiation is variable (1) • Background radiation needs to be averaged (1)	accept interfering / including varies with place/time/random nature repeating test improves reliability	**(2)** **t**

Question Number	Answer	Acceptable answers	Mark
4(c)(iii)	One relevant idea: (New method) more accurate (1) Hard to measure a small activity (1) Background radiation affects readings (1) Need to find difference of two small quantities (1) Can test smaller samples (1)	ignore better method/results / more reliable difficult to distinguish between the reading and background	**(1) grad**

Total for question 4=10 marks

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	11x 0.4 (substitution) (1) 4.4 (V) (1)	Full marks for correct answer with no calculation	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	0.6 - 0.4 (A) (1)	0.2 or 1/5 (A)	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(iii)	B		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)	An explanation linking: electrons (1) {colliding with / bumping into} ions in the lattice /atoms in the metal (1)	colliding with other electrons If no other marks scored, allow for 1 mark for "electrical energy {transferred/changed} into thermal/heat energy" <u>do not allow</u> energy being created or produced	**(2)**

Question Number		Indicative Content	Mark
QWC	***5(c)**	A explanation including some of the following points Light dependent resistors (LDR) • Resistance changes with light intensity • Bright light , low resistance • No light (dark), high resistance • Low resistance gives high current.(RA) Thermistor • Resistance changes with temperature • Negative temperature coefficient • High temperature, low resistance • Low temperature, high resistance • Low resistance gives high current (RA)	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation linking light affecting LDR AND heat affecting thermistor OR a correct relationship for one device, e.g. thermistors change resistance when the temperature changes and LDRs change resistance when it gets dark OR the {resistance decreases/ current increases} of a LDR when the light gets brighter • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation correctly linking the temperature and light with resistance or current for both devices OR a correct relationship for one device with a link to the way this affects the current and resistance. e.g. the resistance of a LDR increases when the light gets dimmer and when the temperature lowers the resistance of a thermistor increases OR the resistance of a LDR decreases when the light gets brighter and this increases the current • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation including the qualitative relationships for both devices and a link to the way resistance change affects the current in BOTH of them, e.g. the resistance of a LDR is less when the light gets brighter which increases the current. When the temperature lowers the resistance of a thermistor increases. This means that the current will decrease as the thermistor cools down. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for question 5 = 12 marks

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	Any **two** of: Gamma is a wave (1) Alpha is a helium nucleus (1) Alpha is charged (1) Alpha has a mass (1) Gamma penetrates further/ highly (1) Gamma weakly ionising (1) Gamma travels faster (1)	Reverse arguments em radiation Gamma has no charge Gamma has no mass examples of penetrating power alpha highly ionising ignore vague comments eg stronger Ignore uses and dangers	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)(i)	D		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)(ii)	B		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(c)	An explanation linking: electron(s) (1) is/are lost/gained (1)	 do not allow positive electron knocked off / removed/ released	**(2)**

Question Number		Indicative Content	Mark
QWC	***6(d)**	An explanation including some of the following points: <u>Radiation from the front of the lens</u> Alpha particles absorbed by glass Beta particles do not penetrate glass Gamma rays pass through glass Background radiation varies There is a large difference in size between front and back counts Radiation detected is gamma rays only <u>Radiation from side of the lens</u> Alpha particles cannot penetrate aluminium Beta particles are absorbed by aluminium Gamma rays pass through aluminium There is a small/no difference in size between front and side counts Perhaps a few gamma rays absorbed by aluminium Background radiation varies Likely to contain gamma rays only May be different from front count due to random nature of emissions <u>Radiation from the back of the lens</u> Alpha particles absorbed by coating and/or glass Beta particles are emitted the from rear surface Gamma rays emitted from radioactive glass There is a large difference in size between front and back counts Background radiation varies Radiation is both beta particles and gamma rays Difference between front and back counts due to beta particles	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation mentioning two unrelated points, but without linking them properly, e.g. beta particles are stopped by thick aluminium, there is most radiation behind the lens • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation mentioning some points with an appropriate linkage to **one** of the readings e.g. no beta particles escape forwards because the glass absorbs them OR only gamma rays escape to the side because the aluminium stops alpha and beta particles • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	

3	**5 - 6**	• a detailed explanation mentioning some of the points with appropriate linkage to a comparison of at least **two** of the readings e.g. no beta particles escape forwards because the glass absorbs them, but beta particles can escape backwards so that count is higher OR only gamma rays can get through the glass and the thick aluminium, so the front and side counts are about the same • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Total for question 6 = 12 marks

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