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Mark Scheme (Results)

Summer 2013

GCSE Physics (5PH2H)
Paper 01

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- For questions worth more than one mark, the answer column shows how partial credit can be allocated. This has been done by the inclusion of part marks eg (1).
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Quality of Written Communication

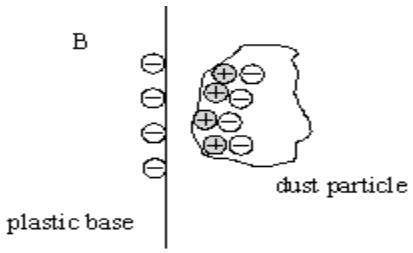
Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

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

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	An explanation linking (negative) electrons transfer (1) because of friction/from cloth (to base) (1)	 negative charge (reject protons and positive charge for this mp) moves cloth loses {electrons/negative charge} (to base) = 2	 **(2)**

Question Number	Answer	Acceptable answers	Mark
1(a)(iii)	A suggestion to include charge (any) could move through cup /metal (1) (cup is) earthed (1)	 cup/metal is a conductor ignore metal is not an insulator to {earth/ ground} / {to/ through} student's hand	 **(2)**

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

Question Number	Answer	Acceptable answers	Mark
1(b)	A description to include the situation which caused the charge separation (1) where the spark travelled {from or to}(1)	examples when refuelling, spark between end of {fuel/pipe} and vehicle =2 spark {between/from /to} person comb/clothes/metal handle and, when combing hair/removing clothing/opening door = 2 lightning flash, between cloud and cloud/plane/ground, =2 ignore between plug and socket/jump leads	 **(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)	**C** when the bungee cord is stretched the most		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)	**A** 600 kg m/s		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	Substitution: (1) 60 x 10 x 50 or 600 x 50 Evaluation: (1) 30 000 Unit: (1) J / Nm	 give two marks for correct answer no working j / joule 30 kJ for full marks	**(3)**

Question Number	Answer	Acceptable answers	Mark
2(c)(ii)	After falling 50 m / when the cord becomes straight/when cord starts to stretch	tension starting to increase at terminal velocity ignore maximum velocity/speed	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(iii)	An explanation linking any two of not all GPE is transferred to KE (1) some {of the GPE transfers to thermal energy /work is done} (1) due to drag (1)	 not all GPE goes to KE maximum energy is same (value) as GPE before falling /speed does not reach the speed at which he should fall some lost as heat/sound (of rope or movement through air) (air) resistance / friction ignore wind	**(2)**

Question Number	Answer	Acceptable answers	Mark
3 (a) (i)	Correctly plotted point (1)	+/- ½ a small square	**(1)**

Question Number	Answer	Acceptable answers	Mark
3 (a)(ii)	Smooth line through most (at least 5) crosses / points (1)	Do not accept clearly dot-to-dot or excessive tramlining Ignore any part of line after 45	**(1)**

Question Number	Answer	Acceptable answers	Mark
3 (a) (iii)	Substitution: (1) 12 = 0.047 x R Transposition: (1) R = 12/0.047 Evaluation: (1) R = 260	 transposition and substitution in either order substitution mark can be scored when incorrectly transposed word/symbol equation is given 255.3, 255 give full marks for correct answer no working power of 10 errors with no working score max 1 mark	 **(3)**

Question Number	Answer	Acceptable answers	Mark
3 (a) (iv)	An explanation linking • current increases with temperature (1) with • (so) resistance decreases(1) or • the voltage is constant (1) with • (so) resistance decreases (with temperature increase)(1)	 (for this first MP) ignore faster/slower (charge/current) ignore references to heat, current flows more can score both marks by quoting two suitable pairs of values from graph For full marks, there must be a reference to change of either I or R with temperature	 **(2)**

Question Number	Answer	Acceptable answers	Mark
3 (b)(i)	An explanation linking • {electrons / negative charges} (1) • collide with {ions/lattice/electrons} (1)	atoms / nuclei allow for 1 mark,electrical energy transferred to {thermal/heat} energy if no other scored	**(2)**

Question Number	Answer	Acceptable answers	Mark
3 (b) (ii)	A suggestion including energy transfer in {the thermistor/ any component part of the electrical circuit} causes a rise in temperature of thermistor (above surroundings)(1)	thermistor/resistor {gets hot/is heated}	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)	P and M OR M and P OR N and Q OR Q and N	one mark for a pair	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)	{atomic /proton} number drops by 2 **and** {mass/nucleon} number by 4 (1) (which is) alpha decay (1)	2 protons **and** 2 neutrons are lost 92 → 90 **and** 238 → 234 helium nucleus given off (which is) alpha particle	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)	same {mass/nucleon} number but {atomic/proton} number increases by 1 (1) (negative) beta decay (1)	a neutron changes to a proton ignore GAINS a proton beta particle /electron given off	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(d)(i)	alpha	Alpha ray, alpha particle, α Ignore capital letters	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(d)(ii)	A description including two of one increases as other increases (1) rate of increase is in the range from 1.17 to 1.33 (cm/MeV) (1) range gradually increases more with energy (1)	 the particles with higher energy travel further accept values quoted from graph not (quite) linear/not proportional /curves upwards accept values quoted from graph	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(e)	chain reaction needs a neutron from one fission to reach another uranium nucleus/atom (at the right speed) (1) (fission of 238) needs {fast/high(er) energy} neutrons (1)	idea of continuous nature of chain reaction the neutrons would be going too slowly /do not have enough energy / lose energy too fast	**(2)**

Question Number	Answer	Acceptable answers	Mark
5 (a) (i)	D the same size as the driving force		**(1)**

Question Number	Answer	Acceptable answers	Mark
5 (a) (ii)	transposition: (1) {change in) speed= accelerationxtime substitution: (1) speed = 12 x 4 evaluation: (1) 48 (m/s) (1)	transposition and substitution can be in either order substitution mark can be scored when incorrectly transposed word/symbol equation is given Give full marks for correct answer no working	**(3)**

Question Number	Answer	Acceptable answers	Mark
5 (b)	An explanation linking • {acceleration of sports is 2x / time to reach 30 m/s is ½} that of family car / RA (1) • mass of sports car LESS than ½ that of family car or RA (1) (so resultant force required is less)	Attempt to use f = m x a scores one mark e.g. 4200 <u>OR</u> 3600 scores 1 Correct numerical comparison scores both marks e.g. 4200:3600 numerically or in words scores 2 marks	**(2)**

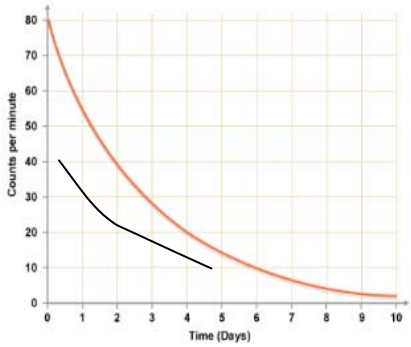
Question Number		Indicative Content	Mark
QWC	***5(c)**	An explanation including some of the following ideas • brakes apply a force to the car • this force from brakes makes the car decelerate/ lose velocity • a force also acts on the driver • driver decelerates at same rate as the car • does not move with respect to car/ stays in the driving seat • moves slightly because belt stretches • small/ no horizontal force acts on the shopping bag • shopping bag continues at similar/ same velocity • until shopping bag falls off seat / hits dashboard • ideas can be expressed in terms of energy, momentum and/or by reference to Newton's laws	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited explanation of the difference in decelerations of at least two of the objects Car **(C)**, Shopping **(S)** and Passenger **(P)** mainly describing the effects. E.g. (at start) **C** stops (very quickly) while {**P / S**} carries on moving (for a longer time) OR **S** {carries on at same speed / hits the dashboard} while **P** is {held back / slowed down} (by the seatbelt) • 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 of the difference in decelerations of at least **two** of the objects Car, Shopping and Passenger, including a reason for at least one of the decelerations. E.g.(at start) **C** stops (very quickly) **because of** friction at the brakes and at the road while {**P / S**} carries on moving (for a longer time) OR **S** {carries on moving (at same speed) / hits the dashboard} while **P** is {held back / slowed down} **because of** stretching force from the seatbelt) • 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 of the relative decelerations of **C**, **S and P** including mention of the physical principles involved in any two such as that named forces are needed to change given motions. E.g. (The force of) friction is large for **C** to {slow down / stop} quickly but is low for **P** and **S**. {**So / thus / therefore etc**} **P** or **S** carry on at the same speed (initially). **P** decelerates more slowly than **C** {**because / as a result etc**} of the stretching (force) of the seatbelt. OR *The idea of {*Newton's first law / inertia / need for a force to change motion} and the role of friction and {elastic / tension / stretching} force in producing the **three** named decelerations. OR Named force needed for a described change in {momentum/kinetic energy} to {stop / slow down} each of the **three** objects. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Question Number	Answer	Acceptable answers	Mark
6(a)	A description to include • name of detector / move detector over the ground (1) • where leak is, there will be an increased rate (1)	(move) until a {leak/high reading} is found	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)	D It is the time it takes for half the atoms to decay		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(c)i	1.9-2 (days)		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(c)ii	 plotting (0,40), (2,20) and (4,10) **OR ANY** line which passes through those coordinates (1) smooth curve through those points (1)	Ignore any part of line after 4 days	**(2)**

Question Number		Indicative Content	Mark
QWC	***6(d)**	An explanation including some of the following ideas **Need for measurement (N)** Background radiation • is {always present/all around us} • has (natural) source(s) exemplified by space, living things, rocks, food, nuclear/medical sources etc. • would give false reading in experiment **How and why to measure(H)** Background radiation measurement • is taken at site of experiment **because** it is different in different places • is taken with all apparatus **except** source in place • is taken before and after **because** {it can change with time / they need an average} • {must be worked out for same time as (or longer than) experiment / rate found} **so** analysis is simpler • It is {taken several times/ averaged} **because** it is random **Analysis (A)** Background radiation measurement • must be subtracted from {measurements with source /main count rate}	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited explanation mentioning any **two** from N or **one** from H or A e.g. Background comes from space and rocks.(N) It is there all the time. (N) OR Readings for background must be repeated because they are random. (H) OR Background must be taken away from all other readings (A) • 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 ***linking*** aspects of two ideas i.e. **N** + **H** OR **N** + **A** OR **H** + **A** e.g Take readings without source (H) and subtract them from the main readings with source present.(A) OR It should be taken several times because it is random (H)so that the average can be subtracted from the main readings (A) • 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 ***linking*** **A** with EITHER N + an idea from **H** OR two or more ideas from **H** e.g.Background radiation is there all the time. (N) You need to take readings at the place where you will do the experiment and with all the apparatus set up except the source because BR changes from place to place.(H) Then you should subtract background readings from the main experimental readings.(A) OR Take several readings of count rate for averaging since the effect is random (H) and make sure that they are taken in the same place.(H) Then subtract from readings in main experiment.(A) • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

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