

# Mark Scheme (Results)

November 2012

GCSE Physics  
5PH2F/01

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Question Number	Answer	Acceptable answers	Mark
<b>1(a)(i)</b>	D 23 m		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>1(a)(ii)</b>	A the driver is tired		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>1(b)</b>	substitution (1) 800 x 3  evaluation (1) 2400 (kg m/s)	Give full marks for correct numerical answer, even if no working  bald $2.4 \times 10^n$ gains 1 mark (BOD for correct substitution) eg bald 240 = 1 mark  In all calculations if the candidate gives two different methods and writes the wrong answer in the answer space award no marks If the candidate writes correct answer they will gain full marks.	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>1(c)(i)</b>	substitution (1) 600 x 15  evaluation (1) 9000 (J)	bald $9.0 \times 10^n$ gains 1 mark eg bald 900 = 1 mark (BOD for correct substitution)  give full marks for correct numerical answer, 9000 (J) even if no working	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>1(c)(ii)</b>	A the energy transferred		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2 (a) (i)</b>	A alpha particles		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2 (a) (ii)</b>	A suggestion to include  Absorbs (ionising) radiation (from the sources)	Stops/reduces radiation/ radioactivity (reaching people); Stops/reduces (alpha) particles or any named ionising radiation (reaching people); Protects people/keeps it safe;  Ignore – “so the source cannot pass through”	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2 (a) (iii)</b>	One from Buildings/building materials, food, plants, water, outer space, rocks, air, Sun	Cosmic rays/waves; radon (gas); radioactive waste; nuclear accidents/Chernobyl/nuclear explosions; nuclear power stations;  do NOT accept everywhere  ignore alpha, beta, gamma, microwaves and X-rays, carbon dioxide, nitrogen, (mobile) phones	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
2 (a) (iv)	Any two relevant precautions	<p>Distance (between students and source); no touching; no eating; short exposure time; (use of) film badge/ detector ;</p> <p>Protective clothing;</p> <p>Use of <u>lead</u> (lined) box /keep box shut/ sources in box (when not in use);</p> <p>(stand behind/use of) a screen;</p> <p>Do not point (source) at students;</p> <p>Show video/dvd of demo;</p> <p>Ignore goggles, gloves, lab coats,;</p> <p>Answers referring to the safety of teacher can score a maximum of one of the 2 marks eg use of tongs</p>	(2)

Question Number	Answer	Acceptable answers	Mark
2 (b) (i)	<p>Calculation of number of half-lives</p> $8 \div 4 = 2 \text{ (half lives)}$ <p style="text-align: right;">(1)</p> <p>evaluation of mass</p> $6 \div 2 = 3 \div 2 = 1.5 \text{ (mg)}$ <p>(1)</p>	<p>Award 1 mark for clearly calculating mass halves after 4 days</p> <p>eg <math>6/2 = 3 \text{ (mg)}</math></p> <p><math>6/4 = 1.5</math> scores 2 marks</p> <p>Allow rounded 2 mg if clear they calculated 1.5 mg</p> <p>give full marks for correct numerical answer, 1.5 (mg) even if no working</p>	(2)

Question Number	Answer	Acceptable answers	Mark
<b>2 (b) (ii)</b>	<p>An explanation linking any two of the following points</p> <ul style="list-style-type: none"> <li>• people inhale radon (gas) (1)</li> <li>• radon is quite likely to/may decay in the lungs (before being exhaled) (1)</li> <li>• causes ionisation of cells (in lungs) (1)</li> <li>• increases risk of (lung) cancer (1)</li> </ul>	<p>Breathe in radon (gas)/ breathe it in/ radon (gas) gets into the body;</p> <p>Gives out radiation in the body / alpha (particles) very ionising;</p> <p>causes damage to (DNA of) cells (in lung)/cell mutations/kills cells;</p> <p>(Damages the body is insufficient)</p> <p>(causes lung) cancer</p>	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(a)(i)</b>	D decrease the resistance of the variable resistor		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(b)(i)</b>	<p>correct symbol for ammeter or voltmeter (seen anywhere) (1)</p> <p>one meter connected in parallel with lamp/variable resistor/supply and one meter in series with lamp(1)</p> <p>both meters correctly connected (ammeter in series and voltmeter in parallel with lamp) (1)</p>	<p>Ignore gaps, lines through symbols and wire connected to side of variable resistor</p> <p>Symbols do not have to be correct for this mark            voltmeter connected across both components is same as voltmeter connected across supply</p> <p>Symbols do not have to be correct for this mark</p> <p>any shape, labelled ammeter, in series with lamp AND any shape, labelled voltmeter, in parallel with lamp gains marking points 2 and 3</p>	<b>(3)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(b)(ii)</b>	<p>substitution (1)  <math>0.5 \times 8</math></p> <p>evaluation (1)  <math>4 \text{ (V)}</math></p>	<p>bold <math>4.0 \times 10^n</math> gains 1 mark            eg bold 40 or <math>0.4 = 1</math> mark (BOD for correct substitution)</p> <p>give full marks for correct numerical answer, 4 (V) even if no working</p>	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(c)</b>	<p>An explanation linking the following points</p> <p>Heat/thermal energy is produced (1)</p> <p>In the lamp/bulb / variable resistor / connecting wires (1)</p>	<p>Ignore sound (energy) and 'it is inefficient'</p> <p>Accept 'it' as meaning the lamp Eg 'it also produces heat' gains both marks</p> <p>Idea that (some) energy is wasted/lost in the lamp/variable resistor/wires gains maximum of 1 mark</p>	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(d)</b>	<p>substitution (1) 0.4 x 5</p> <p>evaluation (1) 2 (W)</p>	<p>bald <math>2.0 \times 10^n</math> gains 1 mark eg bald 20 or <math>0.2 = 1</math> mark (BOD for correct substitution)</p> <p>give full marks for correct numerical answer, 2 (W) no working</p>	<b>(2)</b>



Question Number	Answer	Acceptable answers	Mark
<b>4 (a) (i)</b>	16 (s) (1)	Sixteen/ sixteen seconds/ 16 s/ 16 seconds	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4 (a) (ii)</b>	Downward arrow starting at centre of the block (1)	Mark by eye ie ruler not required. Accept freehand lines and gaps between dot and line less than half the distance between dot and bottom of block by eye. Accept lines that are not quite vertical	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4 (a) (iii)</b>	D zero		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4 (a) (iv)</b>	Substitution 3 / 2  Evaluation 1.5  Unit m/s <sup>2</sup>  (1)  (1)  (1)	ms <sup>-2</sup> or m/s/s  bald 1.5 x 10 <sup>n</sup> m/s <sup>2</sup> gains 2 marks eg bald 150 = 1 mark (BOD for correct substitution) 150 m/s <sup>2</sup> gains 2 marks  give full marks for correct numerical answer, 1.5 <u>m/s<sup>2</sup></u> even if no working	<b>(3)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4 (a)</b> <b>(v)</b>	<p>An explanation to include two of the following points</p> <ul style="list-style-type: none"> <li>• (At first/in first 2 seconds Block is) accelerating (1)</li> <li>• Which requires a (resultant) force (1)</li> <li>• In addition to the force needed to balance the weight of the block (1)</li> <li>• (In next 4 seconds) forces are balanced (1)</li> <li>• (Because) velocity is constant (1)</li> </ul>	<p>(block is) speeding up/increasing velocity</p> <p>there is an unbalanced force/ forces are not balanced</p> <p>(Because) speed is steady</p>	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4 (b)</b>	<p>An explanation to include</p> <p>Information taken from the graph (1)</p> <p>A valid conclusion (1)</p>	<p>Ignore air resistance</p> <p>(Overall) time is less OR velocity/speed is greater OR acceleration is greater OR bigger/faster change in velocity/speed</p> <p>So (same amount of) work is done more quickly/energy is transferred faster</p>	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>5(a)(i)</b>	Neutron(s)	Accept phonetic spellings eg newtron(s) or neutron(s) Reject newtons	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>5(a)(ii)</b>	D 9 Be 4		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>5(a)(iii)</b>	A explanation linking the following points <ul style="list-style-type: none"> <li>• Charge/electron transfer (1)</li> <li>• Correct transfer detail (1)</li> </ul>	Gains/loses charge Gains an electron = 1mark  Loses (an) electron(s) gains both marks Award 1 mark for gaining a proton as idea of gains charge	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>5(b)</b>	A description including any two of the following points <ul style="list-style-type: none"> <li>• Two (light) / (small) <u>nuclei</u> (1)</li> <li>• Fuse together (1)</li> <li>• To produce a large(r)/heavier nucleus/atom /particle (1)</li> </ul>	Ignore references to releasing energy as this is in the Q.  two hydrogen (and or helium) <u>nuclei</u> / two protons  join /combine/merge/come / forced together  helium/lithium (nucleus/atom/particle)	<b>(2)</b>

Question Number	Indicative Content	Mark
<b>QWC</b>	<p><b>*5(c)</b></p> <p>A description including some of the following points</p> <ul style="list-style-type: none"> <li>• Nucleus absorbs a neutron</li> <li>• Nucleus becomes unstable</li> <li>• nucleus fissions/ splits</li> <li>• (2 or) more neutrons released</li> <li>• daughter products</li> <li>• chain reaction</li> <li>• use of moderator</li> <li>• to control kinetic energy of neutrons/slow down neutrons</li> <li>• increases chance of further/more (fission) reactions</li> <li>• use of control rods</li> <li>• control rods absorb neutrons</li> <li>• reducing number of neutrons available for fission/to control (fission) reaction</li> <li>• containment of radioactive materials</li> <li>• little/no radiation enters environment</li> </ul> <p>Ignore references to the release of energy as this is given in Q</p> <p>Marks can be scored by a suitably labelled diagram</p>	<b>(6)</b>
<b>Level 1</b>	0	No rewardable content
<b>1</b>	<b>1 - 2</b>	<ul style="list-style-type: none"> <li>• a limited description that contains one or two points and possibly has a number of inaccuracies e.g. Uranium atom splits .....control rods are used (to moderate the reaction)</li> <li>OR</li> <li>Uranium atom absorbs a neutron ....there is a chain reaction</li> <li>OR</li> <li>(In the nuclear reactor) .....chain reaction starts</li> <li>• the answer communicates ideas using simple language and uses limited scientific terminology</li> <li>• <u>spelling, punctuation and grammar are used with limited accuracy</u></li> </ul>
<b>2</b>	<b>3 - 4</b>	<ul style="list-style-type: none"> <li>• a simple description that links two points e.g. A uranium nucleus absorbs a neutron and splits.</li> <li>OR</li> <li>A uranium atom splits and releases more neutrons.</li> <li>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately</li> <li>• <u>spelling, punctuation and grammar are used with some accuracy</u></li> </ul>

<b>3</b>	<b>5 - 6</b>	<ul style="list-style-type: none"><li>• a detailed description that gives a linked statement about fission plus some detail about control or containment</li></ul> OR A detailed description that gives two pairs of linked statements about fission e.g Uranium nucleus absorbs a neutron and splits/fissions
		AND 2 or more neutrons are released and are slowed by a moderator/ produce a chain reaction.
		OR Control rods absorb (some) neutrons to control the reaction.
		<ul style="list-style-type: none"><li>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately</li><li>• spelling, punctuation and grammar are used with few errors</li></ul>

Question Number	Answer	Acceptable answers	Mark
<b>6 (a) (i)</b>	A gained electrons		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>6 (a) (ii)</b>	<p>An explanation linking any two of the following</p> <p>Friction (1)</p> <p>(Causes) hair to lose electrons(to the comb) (1)</p> <p>Hair has an (overall) positive charge (1)</p>	<p>Reject positive electrons and movement of positive charge</p> <p>Rubbing (hair with comb)</p> <p>Electrons transfer/move (Ignore atoms)</p> <p>Eg electrons transfer to hair as comb rubs hair gains 2 marks</p>	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>6 (a) (iii)</b>	An indication that negative charges have been repelled ( by the comb) (1)	<p>An arrow/label clearly indicating to the bottom of the foil</p> <p>Correct separation of positive and negative charges</p> <p>minus signs shown less than half-way up the foil</p>	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>6 (b)</b>	<p>An explanation linking the following points</p> <p>excess charge is removed /comb does not become charged /gain charge/static electricity (1)</p> <p>it/charge moves through the metal/comb(1)</p>	<p>No credit for both have the same charge so repel</p> <p>Accept electrons for charge</p> <p>Charge is earthed/flows (in)to ground/off comb/into Vicky</p> <p>Metal is a conductor</p> <p>credit they are both neutral/have no charge with 1 mark</p>	<b>(2)</b>

Question Number	Indicative Content	Mark
<b>QWC</b>	<p><b>*6(c)</b></p> <p>A description / comparison/ explanation / etc including some of the following points</p> <ul style="list-style-type: none"> <li>• paint particles have the same charge</li> <li>• like charges repel</li> <li>• Particles repel each other</li> <li>• So spread out (more)/form a (fine) mist</li> <li>• Even layers</li> <li>• Improved finish</li> <li>• Opposite charge(is induced) on object</li> <li>• Paint particles are attracted to metal object</li> <li>• To parts not in direct line of spray/back of object</li> <li>• Need not move the sprayer to reach back</li> <li>• Takes less time</li> <li>• Uses less paint/ less paint wasted.</li> <li>• Uncharged paint forms large droplets/runs (off object)</li> </ul> <p>Allow reverse arguments for uncharged paint Accept an explanation that includes the idea that there is attraction between charged and uncharged/neutral/earthed objects</p>	<b>(6)</b>
<b>Level</b>	<b>0</b>	No rewardable content
<b>1</b>	<b>1 - 2</b>	<ul style="list-style-type: none"> <li>• a limited description that contains one or two points and possibly has a number of inaccuracies e.g. even layer....paint is attracted to object</li> </ul> <p style="text-align: center;">OR uses less paint</p> <ul style="list-style-type: none"> <li>• the answer communicates ideas using simple language and uses limited scientific terminology</li> <li>• spelling, punctuation and grammar are used with limited accuracy</li> </ul>
<b>2</b>	<b>3 - 4</b>	<ul style="list-style-type: none"> <li>• a simple description that links two points</li> <li>• e.g. particles repel each other which makes them spread out</li> </ul> <p style="text-align: center;">OR They are attracted to the metal object because it has the opposite charge.</p> <ul style="list-style-type: none"> <li>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately</li> <li>• spelling, punctuation and grammar are used with some accuracy</li> </ul>

<b>3</b>	<b>5 - 6</b>	<ul style="list-style-type: none"><li>• a detailed description that links two points about repulsion and links two points about attraction of charges</li></ul> OR a statement that links two points about charged paint together with a comment about uncharged paint.  e.g. particles have the same charge and repel each other (which makes them spread out to form even layers) AND they are attracted to the metal object OR particles have the same charge and repel each other but uncharged paint would form big drops.  <ul style="list-style-type: none"><li>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately</li><li>• spelling, punctuation and grammar are used with few errors</li></ul>
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