

# Mark Scheme (Results)

## Summer 2010

GCSE

360Science

GCSE Additional Science  
Structured Paper P2 (5020H/1H)

GCSE Physics  
Structured Paper P2 (5048H/1H)

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## Using the Mark Scheme

1. This mark scheme gives you;
  - \* an idea of the type of response expected
  - \* how individual marks are to be awarded
  - \* the total mark for each question
  - \* examples of responses that should not receive credit.
2. ; separates points for the award of each mark.
3. / means that the responses are **alternatives** and either answer should receive full credit.
4. ( ) means that a phrase/word is not essential for the award of the mark but helps the examiner to get the sense of the expected answer.
5. Phrases/words in **bold** indicate that the meaning of the phrase/word is **essential** to the answer.
6. OWTTE (or words to that effect) and eq (equivalent) indicate that valid alternative answers (which have not been specified) are acceptable.
7. 'Ignore' means that this answer is not worth a mark but does not negate an additional correct response.
8. 'Reject' means that the answer is wrong and negates any additional correct response for that specific mark.
9. ORA (or reverse argument) indicates that the complete reverse is also valid for the award of marks.
10. ecf (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

## Marking

1. Suggestion/explanation questions should be marked correct even when the suggestion is contained within the explanation.
2. **Do not** award marks for repetition of the stem of the question.
3. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct scientific context.

## Amplification

1. In calculations, full credit must be given for a bold, correct answer. If a numerical answer is incorrect, look at the working and award marks according to the mark scheme.
2. Consequential marking should be used in calculations. This is where a candidate's working is correct but is based upon a previous error. When consequential marks have been awarded write "ecf" next to the ticks.
3. If candidates use the mole in calculations they must be awarded full marks for a correct answer even though the term may not be on the syllabus at their level.
4. If candidates use chemical formulae instead of chemical names, credit can only be given if the formulae are correct.

Question Number	Answer	Additional guidance	Mark			
<b>1(a)</b>	<table border="1"> <tr> <td>alpha charge + 2</td> <td>beta ionisation = <b>medium or medium/high or high</b>  range= accept a number which is <b>more than 10 cm but less than 3m</b> <b>accept a few m</b></td> <td>gamma charge <b>none/0/zero/neutral</b>  range = <b>more than answer given for beta range but not less than 3m</b>  <b>accept ∞</b></td> </tr> </table>	alpha charge + 2	beta ionisation = <b>medium or medium/high or high</b>  range= accept a number which is <b>more than 10 cm but less than 3m</b> <b>accept a few m</b>	gamma charge <b>none/0/zero/neutral</b>  range = <b>more than answer given for beta range but not less than 3m</b>  <b>accept ∞</b>	accept moderate for medium	
alpha charge + 2	beta ionisation = <b>medium or medium/high or high</b>  range= accept a number which is <b>more than 10 cm but less than 3m</b> <b>accept a few m</b>	gamma charge <b>none/0/zero/neutral</b>  range = <b>more than answer given for beta range but not less than 3m</b>  <b>accept ∞</b>				
	any <b>two</b> or <b>three</b> correct for 1 mark any <b>four</b> or <b>five</b> correct for 2 marks any <b>six</b> or <b>seven</b> for 3 marks		<b>(3)</b>			

Question Number	Answer	Mark
<b>1(b)</b>	<p>Any <b>two</b> from:</p> <ol style="list-style-type: none"> <li>1. A correct comment re range e.g. range correct for alpha/particles have only travelled a few cm/stopped by air/ORA</li> <li>2. A correct comment re 'clear' track/lots of condensation linked to ionisation e.g. solid track because alpha is highly ionising /ORA lots of condensation as alpha is (highly) ionising</li> <li>3. A correct comment re straight track linked to mass or (slower) speed e.g. tracks are straight corresponds to heavy particles/ORA</li> </ol> <p>any other sensible answer</p>	<b>(2)</b>

Question Number	Answer	Additional guidance	Mark
<b>2(a)</b>	substitution evaluation unit $F = 620 \times 8.4 ;$ $= 5208 ;$ N ;	accept 5200 accept recognisable alternatives	<b>(3)</b>

Question Number	Answer	Additional guidance	Mark
<b>2(b)</b>	any <b>one</b> from <ul style="list-style-type: none"> <li>• air resistance</li> <li>• drag</li> <li>• friction in the engine</li> </ul>	accept wind resistance	Ignore friction between tyre and road references to energy such as heat in motor/wires <b>(1)</b>

Question Number	Answer	Acceptable Answers	Mark
<b>2(c)</b>	NO MARK FOR substitution; transposition; evaluation;	EQN $8.4 = \frac{54-0}{t}$ $t = \frac{54}{8.4}$ $= 6.4(s)$	Mark the calc in the order that the candidate has attempted it bald correct ans gains 3 marks no mark for unit, but if seen it must be correct <b>(3)</b>

Question Number	Answer	Acceptable Answers	Mark
<b>2(d)(i)</b>	<p>WORKING MUST BE SEEN FOR FULL MARKS</p> <p><math>m = 2 \times 860\,000 / 54^2</math>  OR <math>860\,000 = \frac{1}{2} \times m \times 54^2</math> ;</p> <p>= 589.9 (kg);</p> <p>alternative method:  (KE)=<math>\frac{1}{2} \times 600 \times 54^2</math></p> <p><b>874 800</b> &gt; 860 000</p>	<p><math>m = \frac{2 \times KE}{v^2}</math></p> <p>evaluation</p> <p>correct sub of m=600 into eqn</p> <p>statement that 874 800 &gt; KE</p>	<p>accept 2916 for <math>54^2</math></p> <p>accept 590 for 1 mark  no mark for unit, but if seen it must be correct</p> <p><b>(2)</b></p>

Question Number	Answer	Acceptable Answers	Mark
<b>2(d)(ii)</b>	some fuel used / eq ;	Petrol/diesel	<b>(1)</b>

Question Number	Answer	Acceptable Answers	Ignore	Mark
<b>3(a)</b>	any sensible answer	allows student to do experiment that (s)he could not otherwise do, faster to do, safer to do, work at individual rate, can be repeated if you don't understand it, can save it/re-do it can work from home;	more accurate more valid more exact more detailed clearer	<b>(1)</b>

Question Number	Answer	Acceptable Answers	reject	Mark
<b>3(b)(i)</b>	<ul style="list-style-type: none"> <li><b>time</b> for half of the <b>atoms</b> to <b>decay</b></li> </ul> OR <ul style="list-style-type: none"> <li><b>time</b> for the activity/count rate to drop to half (of original value);</li> </ul>	allow for atoms: isotope / element / nuclei / (radioactive) substance / particles / (radioactive) material  <b>ignore “mass”</b> <b>accept “radiation”</b>  <b>MUST</b> have the time idea <b>MUST</b> be clear & correct as to what is halving  “time for ½ of it to decay” is not enough	<b>atom</b> <b>die</b> <b>be lost</b> <b>molecules</b>	<b>(1)</b>

Question Number	Answer	Acceptable Answers	Mark
<b>3(b)(ii)</b>	40 to 47 s inclusive		<b>(1)</b>

Question Number	Answer	Acceptable Answers	Mark
<b>4(a)(i)</b>	the mark is for the method 235 -92;	143 ;	<b>(1)</b>

Question Number	Answer	Acceptable Answers	Mark
<b>4(a)(ii)</b>	a correct <b>comparative</b> statement of the number nucleons before and after fission	Xe <sub>137</sub> x 2 > 235 eq in words e.g. two Xe 137s have more nucleons than one U235  ignore protons neutrons	<b>(1)</b>

Question Number	Answer Including impact n	Answer Excluding impact n	Acceptable Answers	Mark
<b>4(a)(iii)</b>	(137 +94 = 231)  236-231 = <b>5</b> ;	(137 +94 = 231)  235 -231 = <b>4</b> ;	bald 4 or 5  235 -231 or 236-231	<b>(1)</b>

Question Number	Answer	Mark
4(b)	<p>THIS IS AIMED AT HIGH LEVEL ACHIEVEMENT SO STATEMENTS NEED TO BE PRECISE/DETAILED</p> <p><b>discussion</b> to include <b>three</b> from:</p> <p><b>P1</b>  Harmful radiation is emitted—need for appropriate shielding or appropriate security  OR beta/alpha emission -----need for appropriate shielding</p> <p><b>MP2</b>  identify an isotope with a long half life and link this to a need for long term storage  OR identify an isotope with a short half life and link this to a need for short term storage</p> <p><b>MP3</b> an activity issue identified - high activity linked to short half life/ORa</p> <p><b>MP4</b> heat production - a lot of heat produced so needs cooling/eq</p> <p><b>MP5</b> recognition that fuel rods contain <u>U</u> (which has a very long 1/2 life) as well as other isotopes</p>	(3)
	<p>IGNORE vague comments such as harmful must be disposed of properly</p> <p>EXAMPLES</p> <ol style="list-style-type: none"> <li>1. Uranium235 long half life...therefore needs secure long term storage...vitrification ;MP2</li> <li>2. U235 long half life....therefore not v active...less of a problem ;MP3</li> <li>3. Xe decay produces caesium...quite active needs storage where heat is taken into account ;MP4</li> <li>4. Kr decays mainly v short ½ lives so problem at start but not thereafter ; MP2</li> </ol> <p>FURTHER GUIDANCE</p> <p>MP1 .....appropriate security can include ideas of (long term) storage or underground storage</p> <p>MP2.....if the time for <i>storage</i> is specified in years, greater than or equal to two half lives..... ‘easy to store’ can be interpreted as does not need to be stored for long and vice versa</p>	

Question Number	Answer	Acceptable Answers	Mark
<b>5(a)(i)</b>	arrow from B at tangent to circle ;	vertical downward arrow judgement by eye two arrows from B = no mark	<b>(1)</b>

Question Number	Answer	Acceptable Answers	Mark
<b>5(a)(ii)</b>	Arrow from C towards centre of Earth ;	judgement by eye two arrows from C = no mark	<b>(1)</b>

Question Number	Answer	Acceptable Answers	Ignore	Mark
<b>5(b)</b>	1. velocity is changing ; 2. (because) direction is changing ;	ORA	momentum	<b>(2)</b>

Question Number	Answer	Acceptable Answers	Ignore	Mark
<b>5(c)</b>	1. no work done/ no energy transferred ; 2. Explanation of why work done is zero no distance moved in direction of force or no resultant force in direction of travel;	Any one from satellite stays at same height above Earth it has the constant GPE constant KE there is no air resistance		<b>(2)</b>

**TOTAL MARKS 30**

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