



**General Certificate of Secondary Education  
June 2013**

**Additional Science**

**AS2FP**

**(Specification 4409)**

**Unit 6: Additional Science 2 (Foundation tier)**

**Final**

***Mark Scheme***

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Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

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## Quality of Written Communication and levels marking

In Question 11(c) candidates are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Candidates will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

### Level 1: basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use, demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

### Level 2: clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

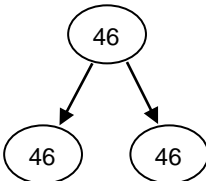
### Level 3: detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

### Question 1

question	answers	extra information	mark
<b>1(a)</b>	<b>B</b> has a head spine	for each additional tick deduct one mark	1
	<b>B</b> has fewer segments than <b>A</b>		1
<b>1(b)(i)</b>	none alive / all died out / none left	ignore dead unqualified	1
<b>1(b)(ii)</b>	(from) fossils	accept description, eg imprint in rocks	1
<b>1(b)(iii)</b>	A sudden massive change to the environment	additional tick disqualifies	1
<b>Total</b>			<b>5</b>

**Question 2**

question	answers	extra information	mark
2(a)(i)	two		1
2(a)(ii)	mitosis		1
2(b)(i)			1
2(b)(ii)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• growth (of body)</li> <li>• replacement (of cells / tissue)</li> <li>• repair (of tissues / damage)</li> </ul>	ignore growth of cells allow development  ignore repair of cells  allow examples of when repair or replacement are required eg cuts  ignore gametes	2
2(c)(i)	stem cells		1
2(c)(ii)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• cure / help conditions such as paralysis</li> <li>• to grow new organs</li> </ul>	allow any appropriate medical condition  allow cells that are developed/ grown into the type needed  eg grow new nerve cells  ignore growth of new limbs	1

**Question 2 continues on the next page**

**Question 2 continued**

question	answers	extra information	mark
<b>2(d)(i)</b>	any <b>two</b> from: <ul style="list-style-type: none"> <li>• fertilisation / fusion / joining / combination</li> <li>• (fusion of) gametes / sex cells <b>or</b> egg <b>and</b> sperm</li> <li>• (reproduction that) creates variation</li> <li>• involves mixing of genetic material</li> </ul>	ignore meeting  if no other mark awarded allow 'involves two individuals or male <u>and</u> female' for 1 mark  ignore meiosis	2
<b>2(d)(ii)</b>	have DNA the same as each other		1
<b>Total</b>			<b>10</b>

**Question 3**

question	answers	extra information	mark
<p><b>3(a)</b></p>	<p>any <b>three</b> from:</p> <ul style="list-style-type: none"> <li>• short distance athletes have high percentage / amount of fast twitch fibres</li> <li>• long distance athletes have low percentage / amount of fast twitch fibres</li> <li>• training for short distance races increases percentage / amount of fast twitch fibres</li> <li>• training for long distance races decreases percentage / amount of fast twitch fibres</li> </ul>	<p>award <b>2</b> marks for comparative answer eg short distance athletes have more fast twitch fibres</p> <p>for short distance allow 100 / 400 m allow correct data quotes</p> <p>for long distance allow 5000 /10000 m allow correct data quotes</p>	<p>3</p>
<p><b>3(b)</b></p>	<p>400(m)</p> <p>percentage / amount of muscle fibres in legs closest to 400m runners or 52% (before training)</p>	<p>ignore short distance</p> <p>allow 400m in the reason if not given on first line</p>	<p>1</p> <p>1</p>
<p><b>Total</b></p>			<p><b>5</b></p>

**Question 4**

question	answers	extra information	mark
4(a)(i)	hydrogen ion (H <sup>+</sup> )		1
4(a)(ii)	11		1
4(a)(iii)	neutralisation		1
4(b)	chlorine / gas is poisonous or (sulfuric) acid / sodium hypochlorite is corrosive	allow the chemicals are harmful / irritant / corrosive  allow to protect them from (the) chemicals  ignore radioactive	1
4(c)	Chlorine		1
	Sodium hydroxide		1
<b>Total</b>			<b>6</b>



**Question 5**

question	answers	extra information	mark
5(a)	exothermic		1
5(b)(i)	<p><b>(advantages of reusable)</b></p> <p>any <b>two</b> from:</p> <ul style="list-style-type: none"> <li>• cheaper(to buy)</li> <li>• reaches a higher temperature</li> <li>• it can be used many times</li> </ul> <p><b>(disadvantages of reusable)</b></p> <p>any <b>two</b> from:</p> <ul style="list-style-type: none"> <li>• doesn't give 'heat' out for as long</li> <li>• has to be put into boiling water to reuse</li> <li>• cost / energy needed to reverse reaction (and reuse)</li> </ul>	<p>ignore figures from the table unless qualified</p> <p>allow is hotter</p> <p>allow doesn't have to be thrown away or ref to non-renewable resources</p> <p>accept less 'heat' given out</p> <p>ignore takes longer to reach highest temperature</p>	<p>2</p> <p>2</p>
5(b)(ii)	stays warm for 10 hours	<p>allow stays warm for a long time</p> <p>ignore takes a long time to reach highest temperature</p> <p>ignore reaches low(er) temperature</p>	1
<b>Total</b>			<b>6</b>

### Question 6

question	answers	extra information	mark
6(a)(i)	precipitation		1
6(a)(ii)	filtration		1
6(b)	silver nitrate	allow in either order allow AgNO <sub>3</sub>	1
	sodium bromide	allow NaBr	1
<b>Total</b>			<b>4</b>

### Question 7

question	answers	extra information	mark
7(a)	sodium ions are positive(ly charged) or opposite (charges) attract	do not allow are positive electrodes do not allow positive electrons	1
7(b)(i)	sodium chloride		1
7(b)(ii)	NaCl(l)		1
7(c)	electricity / technology not available or first battery not made until 1800	ignore sodium not discovered in 1800  allow didn't have a battery	1
<b>Total</b>			<b>4</b>

### Question 8

question	answers	extra information	Mark
<b>8(a)</b>	Most of the atom is empty space.	for each additional tick deduct one mark	1
	There is a nucleus made up of only protons and neutrons.		1
	There are electrons orbiting the nucleus.		1
<b>8(b)(i)</b>	6 / six		1
<b>8(b)(ii)</b>	6		1
<b>Total</b>			<b>5</b>

### Question 9

question	answers	extra information	Mark
9(a)	gravity / gravitational		1
9(b)	fusion		1
9(c)(i)	W - protostar X – (red) giant Y - supernova Z – (black) dwarf	all 4 correct = <b>3</b> marks 2 or 3 correct = <b>2</b> marks 1 correct = <b>1</b> mark	3
9(c)(ii)	size balanced		1 1
<b>Total</b>			<b>7</b>

**Question 10**

question	answers	extra information	Mark
10(a)	gamma (rays / radiation)	allow symbol for gamma $\gamma$ / $\Upsilon$ or beta $\beta$ accept beta (particles) ignore incorrect reference to particles or rays ignore reference to x-rays do <b>not</b> accept alpha / $\alpha$	1
10(b)(i)	1000		1
	decreases		1
10(b)(ii)	6	<b>1</b> mark for evidence of 8 and 2 in working or on graph  ignore incorrect readings from the graph	2
10(c)(i)	(increase chance of / causes) (named) cancer	allow (cell) mutation / cell damage / radiation sickness  allow infertility  ignore death / other symptoms of radiation sickness / poisonous	1
10(c)(ii)	any <b>one</b> from:  <ul style="list-style-type: none"> <li>• reduce radiation (emitted from syringe)</li> <li>• absorb radiation</li> <li>• protect the nurse</li> </ul>	allow references to particular type of radiation  allow radiation cannot pass through  ignore answer in terms of patient	1
10(c)(iii)	(nurse) deals with radiation more / every day	ignore closer to radiation	1
	(so) has greater exposure		1
<b>Total</b>			<b>9</b>

**Question 11**

question	answers	extra information	mark
11(a)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• same amount / size (pieces) of egg (white)</li> <li>• same temperature</li> <li>• same concentration of enzyme</li> <li>• repeat (the whole investigation)</li> <li>• greater range of pH / more pH values</li> <li>• smaller intervals between pH values</li> </ul>	do <b>not</b> accept pH ignore factors already identified in method eg volume of solution / enzyme / acid / number of cubes accept eg put (all) in a water bath do <b>not</b> accept suggestions that introduce a new independent variable (eg do at more temperatures)	1
11(b)(i)	Enzyme A – stomach Enzyme B – small intestine / pancreas	do <b>not</b> accept large intestine allow ileum ignore intestine unqualified	1 1
11(b)(ii)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• enzyme (A) works best in acidic conditions</li> <li>• stomach contains / makes (hydrochloric) acid</li> </ul>	accept low pH or pH below 7 for acid allow stomach is acid	1

**Question 11 continues on the next page**

**Question 11 continued**

question				mark
11(c)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 3.			6
<b>0 marks</b>	<b>Level 1 (1-2 marks)</b>	<b>Level 2 (3-4 marks)</b>	<b>Level 3 (5-6 marks)</b>	
No relevant content.	At least one enzyme is named <b>or</b> the reaction an enzyme is involved in <b>or</b> the use of the products.	At least one enzyme is named <b>and</b> the reaction the enzyme is involved in <b>or</b> at least one enzyme is named <b>and</b> the use of its product <b>or</b> at least one reaction is described <b>and</b> the use of the product.	At least one enzyme is named <b>and</b> the reaction the enzyme is involved in <b>and</b> the use of its products <b>and</b> further information provided as described in Level 2 for a further enzyme, reaction, use.	
<b>Examples of biology points made in the response:</b> <ul style="list-style-type: none"> <li>• (E) protease</li> <li>• (R) (protease) digests protein</li> <li>• (R)(protein) to amino acids</li> <li>• (U) (protease) in (biological) detergents / washing powder / removes stains in clothes</li> <li>• (U) (protease) (pre-digest protein) in baby food</li>   <li>• (E) lipase</li> <li>• (R) (lipase) digests fat / lipid / oil</li> <li>• (R) (lipid / fat / oil)to fatty acids and glycerol</li> <li>• (U) (lipase) in (biological) detergents / washing powder / removes stains in clothes</li>   <li>• (E) carbohydrase / amylase</li> <li>• (R) (carbohydrase/ amylase) digests / converts starch</li> <li>• (R) (starch) to sugar (syrup)</li> </ul> then <ul style="list-style-type: none"> <li>• (E) isomerase</li> <li>• (R) (isomerase)converts glucose / sugar (syrup)</li> <li>• (R) (glucose / sugar (syrup)) to fructose (syrup)</li> <li>• (U) (fructose) in slimming foods</li> </ul> NB credit should be awarded for other specific examples of enzymes and their uses.				
<b>Total</b>				<b>10</b>



**Question 12**

question	answers	extra information	mark
12(a)(i)	calcium chloride (solution)	do <b>not</b> allow calcium chlorine ignore formulae ignore water	1
12(a)(ii)	carbon dioxide	do <b>not</b> allow carbon oxide ignore formulae	1
12(b)	(initial rate is) high the rate decreases the rate becomes zero or the reaction stops	ignore figures unless calculated as a rate accept fast(er) / rapid (at start) accept slows down allow max <b>2</b> marks for description of graph in terms of volume of gas produced	1 1 1
12(c)(i)	line from origin to left of original line until end levels out at 80cm <sup>3</sup>	tolerance + / - one small square	1 1
12(c)(ii)	particles have more energy (so particles) move faster (so there are) more frequent / energetic collisions	allow harder collisions allow more chance of collisions ignore faster collisions accept more particles have the activation energy needed	1 1 1
<b>Total</b>			<b>10</b>

**Question 13**

question	answers	extra information	Mark
13(a)(i)	insulator	accept not a conductor(of electricity) accept so you do not get electrocuted ignore references to 'heat' conduction ignore cost and other properties of plastic	1
13(a)(ii)	live	in either order	1
	neutral		1
13(b)(i)	students can choose any cable, but in order to gain marks the physics must be correct for that cable.  (cable 3 because)  (two-core) – does not need / have an earth wire <b>or</b> is double insulated  (3000W as) max power of the lawnmower / it needs 2760(W)  (flexible plastic) mower must be able to move easily	allow converse answers	
			1
		<b>allow</b> 1 mark for 230 x 12 with incorrect or no answer	2
			1
13(b)(ii)	(RCCB detects a) difference in the (current in the) live and neutral		1
	cuts off the live/circuit		1
<b>Total</b>			<b>9</b>

**UMS Conversion Calculator:** [www.aqa.org.uk/umsconversion](http://www.aqa.org.uk/umsconversion)