Version 1.0

General Certificate of Secondary Education
January 2013

Additional Science AS1HP

(Specification 4409)

Unit 5:Additional Science 1

Final

Mark Scheme

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.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available from: aqa.org.uk

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Quality of Written Communication and levels marking

In Question 2(a) 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.

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Question 1

question	answers	extra information	mark
1(a)	Cell part: mitochondria	allow mitochondrion	1
	Explanation:		
	release energy **or** reference to respiration for movement of cilia	ignore produce / make energy	1 1
1(b)	Cell part: ribosome(s)		1
	Explanation:		
	reference to synthesis of protein		1
	for production of mucus / sticky (substance)	reference to 'production of sticky protein' gains **2** marks allow for **3** marks cell part mitochondria , explanation: to release energy for production of protein	1
Total			**6**

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Question 2

<table>
<tr><th>question</th><th colspan="3"></th><th>mark</th></tr>
<tr><td>2(a)</td><td colspan="3">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 2 and apply a ‘best-fit’ approach to the marking.</td><td>6</td></tr>
<tr><td>0 marks</td><td>Level 1 (1-2 marks)</td><td>Level 2 (3-4 marks)</td><td>Level 3 (5-6 marks)</td></tr>
<tr><td>No relevant content.</td><td>There is a basic statement of how the plan is invalid
and / or
how the plan might be improved.</td><td>There are clear statements of how the plan is invalid
and / or
how the plan might be improved.</td><td>There are detailed statements of how the plan is invalid
and
how the plan might be improved.</td></tr>
<tr><td colspan="3">examples of biology points made in the response:
invalidity issues:
• insufficient data eg quadrat only used once
• does not consider change between crop and hedge
• not considered different species eg only counted (total number of) plants
• has not considered how to deal with plants overlapping edge of quadrat
• quadrat too small
improvements:
• use of transect (eg tape measure/string)
• positioning of transect (from crop to hedge)
• regular placement of quadrat (eg 1 metre apart)
• identification of species (eg text book or key)
• method of data collection (eg count each species / % cover / abundance scale)
• repeat at different points
• use a larger quadrat
• method of dealing with plants overlapping edge (eg count only if >½)</td><td colspan="2">extra information:
allow random use of quadrats
allow method of achieving randomness
allow record position of quadrats</td></tr>
</table>

Question 2 continues on the next page . . .

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Question 2 continued . . .

2(b)	any **2** from: • more mice closer to crop • closer to crop more (wild plant) seeds eaten • (so) fewer seeds grow / germinate	accept reference to competition between wild plants and wheat (1) so fewer wild plants grow (1) **or** use of (selective) weed killers on crop (1) so wild plants killed closer to crop (1) **or** (named) condition closer to hedge (1) so more suitable for wild plants (1)	2
Total			**8**

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Question 3

question	answers	extra information	mark
3	any **3** from: • atoms of the same element • with the same atomic number/ same number of protons • different mass number / different number of neutrons • with the same number of electrons	 accept both have 6 protons accept C-12 has 6 neutrons **and** C-14 has 8 neutrons accept C-12 has 2 fewer neutrons accept C-12 has a mass number of 12 **and** C-14 has a mass number of 14 accept both have 6 electrons allow correct reference to numbers of protons / neutrons / electrons in isotopes of other named elements	3
Total			**3**

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Question 4

question	answers	extra information	mark
4(a)	any **four** from: • made from carbon • giant structure **or** macromolecular • strong bonds • covalent (bonds) • each carbon / atom forms 4 bonds **or** each (carbon) atom bonded / joined to four other (carbon) atoms	maximum of **3** marks if refer to ionic bonding **and / or** having delocalised electrons ignore crystal allow giant molecule allow giant lattice allow correct description of bond formed by sharing of electrons	4
4(b)	are hard(er) (than other substances) (so) don't wear away (quickly) / need replacing	ignore reference to price or cost allow high melting point ignore strong (so) lasts for a long time	1 1
Total			**6**

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Question 5

question	answers	extra information	mark
5(a)(i)	11.75	accept 11.8 or 12 1 mark for 470/40 (provided no subsequent working)	2
	m/s^2	ms^{-2} or m/s/s	1
5(a)(ii)	any **three** from:	allow any sensible description of points	3
	• length of road	eg a distance greater than 10km allow the idea of road for acceleration / deceleration	
	• straightness of road		
	• smooth / flat (surface)	allow the 'surface' if no other marks are given for surface factors	
	• level / horizontal (surface)		
	• type of surface		
	• appropriate weather conditions	allow climate	
	• nearby obstructions		
		allow altitude	
5(b)		allow (air) resistance / friction as an alternative to drag	
	as the car goes faster / accelerates the drag (force) increases		1
	(until) drag force is the same as the maximum forward force	accept drag force = maximum thrust	1
	(therefore) no resultant force / no further acceleration (and therefore terminal velocity)	ignore balances out ignore forces balanced ignore cannot go any faster	1

Question 5 continues on the next page . . .

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Question 5 continued . . .

5(c)	any **one** from: **yes answers** • the total emissions produced are small (compared with family cars / other sources) • other technologies will be developed (outweighing the negatives) **no answers** • (more) air pollution **or** (more) pollution just for the sake of the record	no mark for yes or no allow the description of the consequences of air pollution eg global warming	1

Total			**10**

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Question 6

question	answers	extra information	mark
6(a)(i)	A = epidermis	allow epidermal ignore upper	1
	B = mesophyll	allow palisade **and** spongy mesophyll	1
6(a)(ii)	xylem	either order	1
	phloem	accept phonetic spellings	1
6(b)	**either**		1
	oxygen produced faster **or** carbon dioxide used faster	allow more oxygen produced/released allow more carbon dioxide used/taken in/needed	
	increases diffusion gradient	allow increases difference in concentration (between inside and outside) allow more oxygen in the leaf compared to outside or less carbon dioxide in leaf compared to outside the leaf	1
Total			**6**

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Question 7

question	answers	extra information	mark
7(a)		must be in this order	
	water	allow H_2O	1
	glucose / sugar	allow carbohydrate / $C_6H_{12}O_6$	1
		ignore starch	
7(b)(i)	(making / strengthening) cell walls	allow strengthening the cell	1
7(b)(ii)	nitrate (ions)	allow nitrogen / sulfur / sulfate	1
7(c)	increasing	ignore answers in terms of increasing light intensity	1
	idea of 10x CO_2 linked to doubling photosynthesis	accept specific values eg **two** of 0.04(%CO_2) rate 4 (au) / 0.4 (%CO_2) rate 8 (au) / 4(%CO_2) rate 16(au)	1

Question 7 continues on the next page. . .

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Question 7 continued . . .

7(d)	max **2** from: Advantages • increasing light will increase photosynthesis • increasing CO_2 will increase photosynthesis • more glucose / sugar / carbohydrate made • more growth / crop / tomatoes to sell max **2** from: Disadvantages • costs for light (running costs or installation) • costs for CO_2 (running costs or installation) • light greater than 50 000 lux has no added effect on photosynthesis (at 4% CO_2) Justified conclusion: a clear statement as to whether the gardener should or should not increase light / CO_2 along with explanation of reasons for or against	if neither light nor CO_2 mentioned, increased photosynthesis gains **1** mark if neither light nor CO_2 mentioned, increase cost gains **1** mark eg should do because advantage(s) xxx outweigh(s) disadvantage(s) yyy or vice versa	3 1
Total			**10**

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Question 8

question	answers	extra information	mark
8		a statement about hardness or strength is required for all **5** marks	
	(bronze is) hard(er)	accept corrosion resistance ignore reference to rust allow strong(er)	1
	(copper)		
	(the atoms are arranged) in layers (therefore) the layers / atoms can slide over each other (making it softer)	accept a correct diagram with annotation / labels	1 1
	(bronze)		
	the <u>tin</u> atoms distort the layers / structure **or** different sized atoms distort the layers / structure	accept a correct diagram with annotation / labels	1
	(so) the atoms / (distorted) layers cannot slide over each other (making it harder)	do **not** allow stronger bonds	1
Total			**5**

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Question 9

question	answers	extra information	mark
9 (a)(i)	32.5	allow 32.4 correct answer with or without working gains **3** marks if answer is incorrect then look for evidence of correct working **moles route** (moles of zinc oxide) = $\frac{40.5}{81}$ **or** = 0.5 (1) (mass of zinc) = 0.5 x 65 (1) **Or** **reacting masses route** (ZnO =) 162 and (Zn =) 130 (1) $\frac{40.5}{162}$ or 0.25 or ¼ (1) **or** $\frac{162}{40.5}$ or 4 (1) **note** $\frac{130}{162}$ x 40.5 gains (2) **Or** $\frac{130}{4}$ gains (2) (allow ecf from previous stage)	3

Question 9 continues on the next page. . .

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Question 9 continued . . .

question	answers	extra information	mark
9 (a)(ii)	not all the zinc reacts	accept reaction may not go to completion allow reaction (may be) reversible allow idea of loss during experimental process allow insufficient oxygen allow impurities in the zinc	1
9 (b)(i)	particles of 1-100nm in size	accept any value within this range in nm accept (in the order of) a few hundred atoms/molecules	1
9 (b)(ii)	(much) smaller than normal sized particles	allow high surface area: volume ratio	1
	(so) can cover larger area **or** need less sun cream **or** need less zinc oxide in sun cream	allow (so) transparent when applied ignore absorbed into skin	1
Total			**7**

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Question 10

question	answers	extra information	mark
10(a)	electronic structure of 2,8	accept electrons as dots, crosses or e	1
	negative charge shown as $[\ ]^-$	allow F^-	1
10(b)	giant (ionic) lattice / structure		1
	strong bonds **or** strong electrostatic forces **or** strong (forces of) attraction	do **not** accept covalent or intermolecular	1
	(so) a large number of bonds must be broken **or** lots of energy required to break (strong) bonds	accept overcome forces of attraction for breaking bonds	1
Total			**5**

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Question 11

question	answers	extra information	mark
11(a)	any **two** from: • fast • accurate • sensitive • use a small amount (of sample)	ignore cost, reliability, precision allow converse if answer clearly indicates reference to chemical tests	2
11(b)	different substances have different retention times **or** different substances travel at different speeds (through the column) (so) leave the column at different times	accept different substances have different attractions to material in column	1 1
Total			**4**

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Question 12

question	answers	extra information	Mark
12(a)(i)	80 000	correct answer with or without working gains **2** marks allow **1** mark for 0.5 x 1600 x 10^2 (providing no subsequent working)	2
	J	accept joule / Joule accept kJ if answer is 80 do **not** accept j	1
12(a)(ii)	mean velocity is used	accept velocity / speed varies allow average for mean	1
12(b)	456	correct answer with or without working gains **2** marks allow **1** mark for (0.5 x 20 x 12) +(25 x 12) + (0.5 x 6 x12) **or** equivalent or **1** mark for recognition that area under the line is the total distance travelled	2
Total			**6**

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Question 13

question	answers	extra information	Mark
13(a)(i)	a flow of charge	accept flow of electrons	1
13(a)(ii)	15 C	correct answer with or without working gains **2** marks allow **1** mark for eg 30 000 x 0.0005 or equivalent (provided no subsequent working) accept coulomb / Coulomb do **not** accept ºC do **not** accept lower case c	2 1
Total			**4**

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Question 14

question	Answers	extra information	Mark
14(a)	3 correct LED symbols in correct direction	max 2 if clear gap / break in circuit	1
	parallel circuit with 3 branches	do not award this mark if there is a short circuit	1
	switch that can turn all components on / off		1
14(b)(i)	any **three** from: • the current can flow both ways through a bulb and only 1 way in an LED • current changes with (all) p.d. for the bulb but current changes for only some p.d. for LED • current changes at varying rate for bulb current changes at constant rate for LED • the diode has a very high resistance in one direction and the resistance in the bulb varies with current (in both directions) • the resistance of a bulb increases with current/p.d. but the LED resistance decreases after a certain pd. • the bulb obeys Ohms' law for a small range of p.d. the LED does not	allow voltage for p.d. throughout for each mark a difference should include a reference to both LED and bulb	3

Question 14 continues on the next page. . .

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Question 14 continued . . .

question	answers	extra information	Mark
14(b)(ii)	any **four** from: **advantages** • lasts longer • lower power consumption • same power / light output • less heat transfer to surroundings • less waste (from broken bulbs) • less cost per hour **disadvantages** • higher (initial) cost • lower sales / profit from replacement bulbs • no increase in power / light output	max 3 for advantages allow lower current if no reference to power consumption / output allow 1 mark for more energy efficient allow less energy is wasted allow don't get as hot	4
Total			**10**

UMS Conversion Calculator – http://web.aqa.org.uk/UMS/index.php