



**General Certificate of Secondary Education
June 2013**

Additional Applied Science

AAS1HP

(Specification 4505)

Unit 1: Science at Work

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.

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MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

- 2.1** In a list of acceptable answers where more than one mark is available ‘any **two** from’ is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.
- 2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.
- 2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; e.g. allow smooth / free movement.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that ‘right + wrong = wrong’.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Ignore / Insufficient / Do not allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

Quality of Written Communication and levels marking

In Question 5(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.

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Question 1

question	answers	extra information	mark
1(a)	inside of curved material labelled C		1
1(b)	add weights. <u>measure</u> deflection (with ruler)	accept <u>measure</u> amount of bending	1 1
1(c)(i)	at least 4 points plotted correctly (± half a small square) best fit straight line (must extend to axis)		1 1
1(c)(ii)	K (no mark) (for the same force) K bends less (than J) line for K is less steep (than that for J)	accept converse accept converse allow ecf from their graph	1
Total			6

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Question 2

Question	Answers	Extra information	Mark
2(a)(i)	X		1
2a)(ii)	same / similar concentration(of ions in the drink)	same / similar amount / number (of ions)	1
	as in the blood	accept substances / electrolytes / salts / sugars(glucose) for ions	1
2(a)(iii)	to replace the ions lost (in sweat)	accept substances / electrolytes / salts for ions NOT sugars (glucose) / nutrients	1
2(b)(i)	28.91	allow 28.9 or 29	1
		correct answer with or without working gains 2 marks if answer incorrect, allow $74 \div (1.6 \times 1.6)$ or $74 \div 1.6^2$ for 1 mark.	1
2(b)(ii)	any two from : lose weight / over weight exercise more reduce intake of carbohydrates / fats / energy / calories	ignore healthy diet allow correct advice given for ecf from calculation	2
Total			8

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Question 3

Question	Answers	Extra information		Mark
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 5, and apply a 'best-fit' approach to the marking.			6
0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)	
No relevant content	Brief description of change in materials. No comparison of the changes have been made.	A clear description of changes in materials. An attempt at comparing the changes has been made with at least one linked to an advantage.	A detailed description of changes in materials, with clear comparisons made and linked to advantages.	
examples of the points made in the response: <ul style="list-style-type: none"> • head size increases • so it is easier to hit the ball • aluminium racquets lightest • so less effort needed • wood not strong enough for bigger heads • composite stronger than wood or aluminium • so won't break 			extra information	
Total				6

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Question 4

Question	Answers	Extra information	Mark
4(a)	place glass in oil		1
	heat oil		1
	take temperature of oil when glass disappears / at a certain temperature the glass will disappear		1
	read refractive index off chart / use computer		1
4(b)	because refractive index of the oil is equal to that of glass		1
			1
Total			6

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Question 5

Question	Answers	Extra information	Mark
5(a)	so it can be absorbed(by the roots)		1
5(b)(i)	$2\text{NH}_3 + \text{H}_2\text{SO}_4 \rightarrow (\text{NH}_4)_2\text{SO}_4$	allow multiples	1
5(b)(ii)	87.5 (%)	correct answer with or without working gains 2 marks if answer incorrect allow 1 compensation mark for correct substitution ($7 \div 8$)	2
5(b)(iii)	any two from: <ul style="list-style-type: none"> • the reaction had not gone to completion • some got spilt • losses in transfer between containers • formation of other products 		2
5(c)(i)	nitrates because when nitrates are added the growth increases more than when the other two nutrients are added (must be a comparison with the other nutrients for the mark)	accept nitrogen as an alternative to nitrates	1 1
5(c)(ii)	by the use of natural fertilisers;	e.g. manure / seaweed / compost allow crop rotation or growing nitrogen fixing plants previously	1

Question 5 continues on the next page...

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Question 5 continued

Question	Answers	Extra information	Mark
5(c)(iii)	nitrates: leaves		1
	phosphates: roots		1
	potassium: fruit		1
Total			12

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Question 6

Question	Answers	Extra information	Mark
6(a)	reaction is reversible or reaction can go both ways or products can change back to reactants		1
6(b)	it is recycled / reused / goes round again / goes back (to the start)		1
6(c)	increases rate or speed (of reaction)	allow reduces activation energy ignore lower production costs	1
6(d)(i)	350 ^o C and 40-50 atmospheres or 400 ^o C and 80-90 atmospheres or 450 ^o C and 130-140 atmospheres	correct values and units must both be present	1
6(d)(ii)	lower temperatures give higher yields	accept converse	1
	higher pressures give higher yields	accept converse	1
Total			6

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Question 7

Question	Answers	Extra information	Mark
7	<p>pros:</p> <ul style="list-style-type: none"> • new varieties can be designed to match changing needs due to climate change, new insects etc. • idea of climate change – might need new varieties • increase yield – growing population – will need more food to feed people • increase yield as they are resistant to attack by insects • less use of insecticides / pesticides • less likely to cause unwanted damage <p>cons:</p> <ul style="list-style-type: none"> • possibility of side-effects / allergies if eaten • concerns about cross-contamination of other plants • concerns about the effect on the environment / food chains • changes in environment may mean variety does not grow as well 	<p>Answers should include a mixture of pros and cons e.g. 3+2</p> <p>A mark may be awarded for an opinion / conclusion based on the points made above</p>	5
Total			5

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Question 8

Question	Answers	Extra information	Mark
8(a)	less dense / lighter		1
8(b)	mass = density \times volume $= 2.7 \times 500 = 1350$ $= 1.35(\text{kg})$	correct answer with or without working gains 3 marks if answer incorrect allow: 1 mark for correct rearrangement and 1 mark for correct substitution or 1350	3
8(c)	54 (Nm)	correct answer with or without working gains 2 marks if answer incorrect allow: 300×0.18 for 1 mark	2
Total			6

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Question 9

Question	Answers	Extra information	Mark
9(a)	covalent (bonding)	do not accept covalent	1
9(b)	add (dilute) sulphuric acid		1
	add potassium dichromate		1
	turns from orange		1
	to green		1
Total			5

UMS conversion calculator www.aqa.org.uk/umsconversion