

**GCSE**  
**ADDITIONAL APPLIED SCIENCE**  
**AAS1FP**

Science at Work  
Mark scheme

---

4505  
June 2014

---

Version: 1.0. Final

---

---

Mark schemes are prepared by the Lead Assessment Writer 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 associates 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 associate understands and applies it in the same correct way. As preparation for standardisation each associate 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, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

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](http://aqa.org.uk)

## 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 / ; eg 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 students 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)

Student	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)

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

### 3.2 Use of chemical symbols / formulae

If a student 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.

#### 4. Quality of Written Communication and levels marking

In Question 7 students 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.

Students 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.

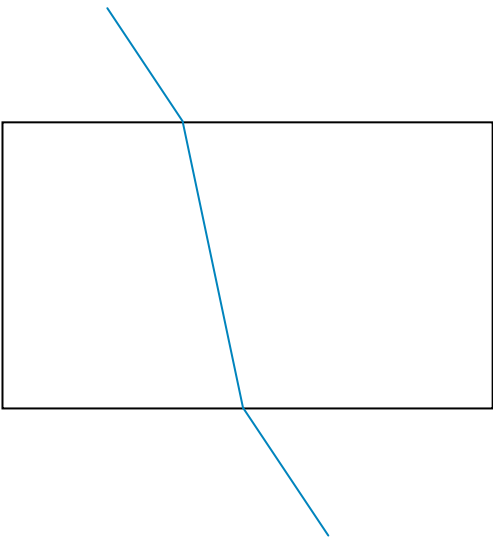
##### **Level 2: clear**

- 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	Answers	Extra information	Mark	AO/Specref																		
1(a)	a piece of universal indicator paper		1	<b>AO1</b> 3.3.6.2 (11)																		
1(b)	<table border="1" data-bbox="277 629 695 1039"> <tbody> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td>1 or 2</td></tr> <tr><td></td><td>neutral</td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td>8 or 9</td></tr> </tbody> </table>									1 or 2		neutral							8 or 9		3	<b>AO1</b> 3.3.6.2 (11)
		1 or 2																				
	neutral																					
		8 or 9																				
<b>Total</b>			<b>4</b>																			

Question	Answers	Extra information	Mark	AO/Spec ref
2(a)	refraction		1	<b>AO1</b> 3.3.6.7 (2)
2(b)	<p>ray into glass refracting towards normal</p> <p>ray leaving block refracting away from normal</p> 	<p><u>independent points</u></p> <p>ignore arrows</p> <p>not along normal</p> <p>ray need not reach far edge of block</p> <p>approximately parallel with incident ray</p>	<p>1</p> <p>1</p>	<b>AO1</b> 3.3.6.7 (2)
<b>Total</b>			<b>3</b>	

Question	Answers	Extra information	Mark	AO/Spec ref
<b>3(a)</b>	any <b>three</b> from: <ul style="list-style-type: none"> <li>• using detergents to wash up</li> <li>• wash hands / food</li> <li>• wearing protective clothing / apron</li> <li>• tie hair back / hat</li> <li>• use of a chopping board</li> </ul>	ignore references to cleaning work surfaces and equipment / cross-contamination  allow washing up / cleaning plates  allow 'uniform'	3	<b>AO3</b>  3.3.5.2 (5)
<b>3(b)(i)</b>	drying / evaporation		1	<b>AO1</b>  3.3.5.2 (6e)
<b>3(b)(ii)</b>	132 °C 1 minute rapidly		1 1 1	<b>AO1</b>  3.3.5.2 (6c)
<b>3(c)(i)</b>	any <b>four</b> from: <ul style="list-style-type: none"> <li>• use the syringe / glass rod to take a (measured) sample of milk</li> <li>• (use glass rod to) spread milk across agar in petri dish</li> <li>• repeat with other sample with the <u>same amount of</u> milk</li> <li>• leave (both) to <u>incubate</u> or leave for at least 24 hours (warm place) but max 5 days</li> <li>• count the bacteria</li> </ul>	max <b>3</b> marks if same amount of milk is not clearly indicated  accept container ignore stirring  allow this mark only if some procedure already given allow repeat with sample Q only if a measured amount of milk is given at the beginning  allow leave <u>to grow</u>  allow examine / compare plates	4	<b>AO2</b>  3.3.5.2 (7)

Question 3 continues on the next page ...



## Question 3 continued ...

<b>3(c)(ii)</b>	result 3 bacteria multiply faster in warm conditions	do not allow hot / heat  accept grow faster / more bacteria <u>in warm conditions</u>  accept converse argument	1 1	<b>AO3</b>  3.3.5.2. (6a)
<b>3(d)</b>	yoghurt/cheese		1	<b>AO1</b>  3.3.5.3 (1)
<b>Total</b>			<b>14</b>	

Question	Answers	Extra information	Mark	AO/Spec ref
<b>4(a)</b>	0.58 (g/cm <sup>3</sup> )	accept 0.6  1 compensation mark for 4200 ÷ 7200	2	<b>AO2</b> 3.3.4.2 (5a)
<b>4(b)</b>	in any order:  has the <u>lowest(er)</u> density / it is <u>lightest(er)</u>  has the <u>highest(er)</u> breaking stress / <u>largest(er)</u> force to break	must be a comparison  ignore cost  accept strongest(er)	1  1	<b>AO3</b> 3.3.4.2 (1a, 1e)
<b>4(c)</b>	600 (N/cm <sup>2</sup> )	1 compensation mark for 720 ÷ 1.2	2	<b>AO2</b> 3.3.4.2 (5b)
<b>Total</b>			<b>6</b>	

Question	Answers	Extra information	Mark	AO/Spec ref
<b>5(a)</b>	heat the acid use a higher concentration of acid		1 1	<b>AO1</b> 3.3.5.4 (9)
<b>5(b)(i)</b>	copper → copper + carbon carbonate oxide dioxide $\text{CuCO}_3 \rightarrow \text{CuO} + \text{CO}_2$	allow = instead of arrow  allow correctly balanced equation using formulae or mixture of correct formulae and words  products can be in any order	1	<b>AO3</b> 3.3.6.2
<b>5(b)(ii)</b>	limewater turns white		1	<b>AO1</b> 3.3.6.2 (14)
<b>5(c)</b>	physical		1	<b>AO1</b> 3.3.6.2
<b>5(d)</b>	in this order: $\text{CO}_2$ covalent		1 1	<b>AO1</b> 3.3.6.2 (4)
<b>5(e)(i)</b>	3		1	<b>AO2</b> 3.3.6.2
<b>5(e)(ii)</b>	5		1	<b>AO2</b> 3.3.6.2
<b>Total</b>			<b>9</b>	

Question	Answers	Extra information	Mark	AO/Spec ref
<b>6(a)</b>	physiotherapist		1	<b>AO1</b> 3.3.3.3 (1)
<b>6(b)</b>	muscles ligaments tendons	in this order	1 1 1	<b>AO1</b> 3.3.3.3
<b>6(c)(i)</b>	points plotted correctly ( $\pm$ half a small square)  straight line of best fit through origin	4 or 5 points correct for <b>2</b> marks 2 or 3 points correct for <b>1</b> mark	Max. 2  1	<b>AO2</b>  3.3.4.2
<b>6(c)(ii)</b>	if graph is plotted correctly the answer is 45 (N)	accept 44 – 46 even if no line drawn  <b>or</b> value from student's graph if plotted incorrectly +/- 1	1	<b>AO2</b>  3.3.4.2
<b>6(c)(iii)</b>	straight line graph / as force doubles so does extension etc.  so force is <u>proportional</u> to extension	ignore yes or no  accept proportional symbol ( $\propto$ )	1  1	<b>AO3</b>  3.3.4.2 (5c)
<b>Total</b>			<b>10</b>	

Question	Answers	Extra information	Mark	AO/Spec ref
7	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.		6	AO1, AO2 & AO3 3.3.4.2 (3)

0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant content.	<p>The answer may omit several relevant points.</p> <p>The answer may possibly only deal with one sample of salty water and may be simplistic.</p> <p>Basic experiment described eg add salt to water and add nail.</p> <p>Distinguish between 1 and 2 through candidate's use of English and scientific language.</p>	<p>The answer includes some relevant points.</p> <p>For the most part the information is presented in a structured and coherent format.</p> <p>Candidates need to include <b>qualified</b> amounts of water and salt.</p> <p>They must include an amount of iron</p> <p>Distinguish between 3 and 4 through candidate's use of English and scientific language.</p>	<p>The answer includes some relevant points.</p> <p>The information is relevant, clear, organised and presented in a structured and coherent format.</p> <p>Candidates need to include <b>quantified</b> amounts of water and salt.</p> <p>They must include a specified amount of iron (same size/ mass of nail) and/or suitable timescale.</p> <p>Distinguish between 5 and 6 through candidate's use of English and scientific language.</p>
<p><b>Examples of the points made in the response:</b></p> <ul style="list-style-type: none"> <li>in a test tube / boiling tube / beaker / flask</li> <li>add x cm<sup>3</sup> of water</li> <li>add one measure of salt / specified mass of salt and stir to dissolve</li> <li>add a specified number of same size nails</li> <li>set up two further containers, one containing two measures of salt, the other containing three measures</li> <li>both with same volume of water and same number of same sized nails as the first container</li> <li>check daily and compare results.</li> </ul>			<p><b>Extra information</b></p> <p>the candidate should mention different concentrations of salt solution to reach the higher levels</p> <p>at level 2 and 3 expect to see some mention of variables including suitable time, mass and volume</p>

<b>Total</b>			<b>6</b>
--------------	--	--	----------

Question	Answers	Extra information	Mark	AO/Spec ref
<b>8(a)(i)</b>	B has larger tomatoes B / C has more tomatoes per plant C has resistance to disease		1 1 1	<b>AO3</b> 3.3.5.5(1a)
<b>8(a)(ii)</b>	<u>cross</u> B and C  select from the offspring plants (with the best characteristics)  repeat the process	not 'breed' do not allow cloning / genetic modification  do not allow this mark if 'cloning' described accept cross the selected offspring	1  1  1	<b>AO1</b> 3.3.5.5(2)
<b>8(b)</b>	<ul style="list-style-type: none"> <li>kills weeds</li> </ul> any <b>one</b> from: <ul style="list-style-type: none"> <li>which compete with plants</li> <li>allows plants more nutrients / water / light / space / room</li> </ul>	accept get rid of accept unwanted plants <b>not</b> herbs / fungi  if fertiliser is implied no mark ignore 'food'	1  1	<b>AO1</b> 3.3.5.4(6)
<b>Total</b>			<b>8</b>	