



GCSE

Additional Science (Route 2)

AS1FP

Mark scheme

4409

June 2015

Version/Stage: 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

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 Assessment Objectives and specification content that each question is intended to cover.

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.
- 2.4** Any wording that is underlined is essential for the marking point to be awarded.

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 errors / 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	Neptune, Mars, Moon	1
2	Neptune, 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 is 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 Accept / allow

Accept is used to indicate an equivalent answer to that given on the left-hand side of the mark scheme. Allow is used to denote lower-level responses that just gain credit.

3.9 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 Communication and levels marking

In Question **10(b)** students are required to produce extended written material in English, and will be assessed on the quality of their 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 1

Question	Answers	Extra information	Mark	AO / Spec ref																
1(a)	<p>The diagram shows four organelles on the left: Cell wall, Chloroplast, and Nucleus. On the right are four functions: 'controls the activities...', 'absorbs ...', 'controls the movement...', and 'strengthens the cell'. Lines connect Cell wall to 'strengthens the cell' and 'controls the movement...'. Chloroplast connects to 'absorbs ...' and 'controls the movement...'. Nucleus connects to 'controls the activities...'.</p>	<p>award 1 mark for each correct line</p> <p>if more than one line from a part of the cell do not award a mark for that part</p>	3	AO1 B2.1.1 a/b																
1(b)	<table border="1" data-bbox="323 1111 770 1480"> <tbody> <tr> <td><i>Plant cell</i></td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td><i>Animal cell</i></td> <td>x</td> <td>x</td> <td>✓</td> </tr> <tr> <td><i>Bacterial cell</i></td> <td>✓</td> <td>x</td> <td>x</td> </tr> <tr> <td><i>Yeast cell</i></td> <td>✓</td> <td>x</td> <td>✓</td> </tr> </tbody> </table>	<i>Plant cell</i>	✓	✓	✓	<i>Animal cell</i>	x	x	✓	<i>Bacterial cell</i>	✓	x	x	<i>Yeast cell</i>	✓	x	✓	<p>award 1 mark for each correct row or award 1 mark for each correct column whichever is the higher total mark</p> <p>if only ticks are shown assume blank boxes represent crosses</p> <p>ignore unclear hybrid symbols</p>	3	AO1/ AO2 B2.1.1 a/c/d
<i>Plant cell</i>	✓	✓	✓																	
<i>Animal cell</i>	x	x	✓																	
<i>Bacterial cell</i>	✓	x	x																	
<i>Yeast cell</i>	✓	x	✓																	
Total		6																		

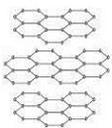
Question 2

Question	Answers	Extra information	Mark	AO / Spec ref
2(a)	quadrat		1	AO1 B2.4.1 b
2(b)(i) Mark with (b)(ii) and (b)(iii)	14 or 15	allow in range 14 to 15	1	AO2 B2.4.1 b
2(b)(ii) Mark with (b)(i) and (b)(iii)	14/25 or 15/25 or equivalent fraction	allow in range 14/25 to 15/25 must be consistent with (b)(i) if answered allow ecf from (b)(i) , ie value given in (b)(i)/25	1	AO2 B2.4.1 b
2(b)(iii) Mark with (b)(i) and (b)(ii)	56 or 60	allow in range 56 to 60 allow ecf from (b)(ii) , ie (b)(ii) expressed as a percentage	1	AO2 B2.4.1 b
2(c)(i) Mark with (c)(ii)	any one from: <ul style="list-style-type: none"> • temperature • light (intensity) • (direction of) rain • wind (speed / direction) 	ignore biological factors allow 'heat' allow (atmospheric) moisture allow nutrients / minerals / ions allow pH	1	AO2 B2.4.1 a
2(c)(ii) Mark with (c)(i)	correct instrument to measure factor named in (c)(i)	eg thermometer / temperature sensor / light meter / moisture meter / rain gauge / wind meter ignore suggestions that do not name an instrument (eg temperature measurer)	1	AO1 B2.4.1 a
Total			6	

Question 3

Question	Answers	Extra information	Mark	AO / Spec ref
3(a)(i)	1 st space water 2 nd space glucose	ignore anything written above or below the arrow ignore chemical symbols	1 1	AO1 B2.3.1 a/b
3(a)(ii)	(the) Sun	allow light or other sources of light eg lamp / (light) bulb ignore chlorophyll	1	AO1 B2.3.1 a/b
3(b)	temperature (of water)	allow 'heat'	1	AO2 B2.3.1 c
3(c)(i)	incorrect / lost count or incorrect temp / light / CO ₂ / mass of sodium hydrogen carbonate / time	allow answers re variation in pondweed, eg age / length / leaf number / smaller bubbles	1	AO3 B2.3.1
3(c)(ii) View with Figure 6	reasonable line of best fit across whole range of points	must show both parts of the relationship	1	AO3 B2.3.1
3(c)(iii) View with (c)(ii) and Figure 6	34	allow any value in range 33 – 35 allow answer matching line of best fit in (c)(ii) $\pm \frac{1}{2}$ square	1	AO2 B2.3.1
3(c)(iv)	any one from: <ul style="list-style-type: none"> • (dissolved in the) pond water • from respiration 	allow from the air or burning fossil fuels allow breathed out or from animals or decomposition	1	AO3 B2.3.1 b/d
Total			8	

Question 4

Question	Answers	Extra information	Mark	AO / Spec ref
4(a)(i)	(carbon fibre)	allow converse if clearly referring to aluminium		AO3 C2.2
	less dense stronger	ignore lighter	1 1	
4(a)(ii)	cost		1	AO3 C2.2
4(b)(i)			1	AO1 C2.2.3a/c
4(b)(ii)	diamond		1	AO1 C2.2.3a/c
4(b)(iii)	A carbon fibre is thicker than a nanoparticle		1	AO2 C2.2.6a
4(c)(i)	88 (%)	allow for 1 mark evidence of 100 – (6+3+2+1) allow for 1 mark correct calculation of percentage from incorrect addition of other metals	2	AO2 C2.2.4c
4(c)(ii)	any one from: <ul style="list-style-type: none"> • chromium • copper • magnesium • zinc 	ignore chemical symbols	1	AO2 C2.2.4c
4(d)(i)	Tangled polymer chains		1	AO1 C2.2.5b
4(d)(ii)	melt		1	AO1 C2.2.5b
Total			11	

Question 5

Question	Answers	Extra information	Mark	AO / Spec ref
5(a)	Accurate		1	AO1 C2.3.2a/c
	Detects small quantities		1	
5(b)(i)	C		1	AO3 C2.3.2c
5(b)(ii)	A		1	AO3 C2.3.2c
5(c)(i)	CO ₂	allow O ₂ C	1	AO2 C2.1.1a/g
5(c)(ii)	Do not conduct electricity		1	AO1 C2.2.1a/c
Total			6	

Question 6

Question	Answers	Extra information	Mark	AO / Spec ref
6(a)	layers (of atoms) (layers / atoms) slide over each other	allow rows	1 1	AO2 C2.1.1h C2.2.4b
6(b)	tin atoms distort the layers (of copper atoms) (so) the atoms / layers cannot slide (over each other)	allow rows for layers allow particles for atoms allow different sizes of atoms	1 1	AO1 C2.2.4b/c
Total			4	

Question 7

Question	Answers	Extra information	Mark	AO / Spec ref
7(a)(i)	equal to		1	AO1 P 2.3.2 k
7(a)(ii)	40(Ω)		1	AO2 P 2.3.2 k
7(b)(i) View with Figure 14	in parallel with R_2 	allow in parallel with R_1 or in parallel with the battery	1 1	AO1 P 2.3.2 c
7(b)(ii)	3 V		1	AO1 P 2.3.2 l
7(b)(iii)	0.3 + 0.1 = 0.4 A		1	AO1 P 2.3.2 l
Total			6	

Question 8

Question	Answers	Extra information	Mark	AO / Spec ref
8(a)(i)	opposite		1	AO1 P2.1.1 a
8(a)(ii)	470 newtons	allow 1 mark for correct substitution i.e. $5(.0) \times 94$ provided no subsequent step	2 1	2AO2 1AO1 P2.1.2 a
8(a)(iii)	increases		1	AO1 P 2.1.1 e
8(a)(iv)	0.5 seconds		1	AO1 P2.1
8(a)(v)	speed		1	AO1 P2.1.2 b
8(b)(i)	decreases	allow (time) gets quicker	1	AO3 P2.1
8(b)(ii)	any two from: <ul style="list-style-type: none"> • timings not accurate • other factor involved • not enough data • fatigue effects • possible injuries • wind / rain effects • surface effects • different reaction time (of sprinter) • limit to how fast he can run 	allow error in timing or different stopwatch used allow weather effects	2	AO3 P2.1
Total			10	

Question 9

Question	Answers	Extra information	Mark	AO / Spec ref
9(a)	192 (N)	allow 1 mark for correct substitution i.e. 1.6×120 provided no subsequent step	2	AO2 P2.1.4 d
9(b)(i)	electron		1	AO1 P2.3.1 a
9(b)(ii)	opposite charges attract	allow opposites attract allow the boots are negative(ly charged)	1	AO1 P2.3.2 b
Total			4	

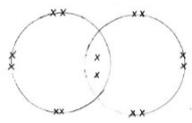
Question 10

Question	Answers	Extra information	Mark	AO / Spec ref
10(a)(i)	diffusion / diffusing	allow active transport ignore absorption	1	AO1 B2.2.1 a
10(a)(ii) Mark with (a)(iii)	(Cell) A		1	AO3 B2.2.1 b
10(a)(iii) Mark with (a)(ii)	concentration (of oxygen molecules) outside cell higher (than inside cell)	allow (oxygen) moves from a high concentration to a low concentration or moves down a concentration gradient ignore reference to more, rather than concentration	1	AO3 B2.2.1 b
10(a)(iv)	for respiration	allow aerobic respiration allow to 'release' energy do not allow anaerobic respiration	1	AO1 B2.1.2 c

QWC Mark Scheme

question	Answers	extra information	mark	AO / Spec ref
10(b)	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 B2.2.1 a/b/c/d B2.2.2 a/b
0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)	
No relevant content.	A description of a level of organisation or an example of a level.	A description of a level of organisation and an example of a level or a description of levels of organisation or examples of levels.	A description of levels of organisation with some linked examples.	
examples of biology points made in the response:		extra information		
<ul style="list-style-type: none"> • (D) tissues made of groups of (similar) cells (working together) • (E) muscle / epithelium / glandular (in animals) or epidermis / mesophyll / xylem / phloem (in plants) • (D) organ made of groups of (different) tissues (working together) • (E) stomach (in animals) or stem / root / leaf (in plants) • (D) system made of groups of (different) organs (that perform a function) • (E) digestive system (in animals) or flower (in plants) • (D) organism made of groups of organ systems (working together) • (E) animal or human or plant or named example 		accept any named examples of each level in plants or animals		
Total			10	

Question 11

Question	Answers	Extra information	Mark	AO / Spec ref
11(a)(i) View with Table 6	(proton) 1 (electron) very small	ignore positive charge allow $\frac{1}{2000}$ or $\frac{1}{1840}$ or 0.0005 allow negligible do not allow 0 / zero ignore negative charge	1 1	AO1 C2.3.1b
11(a)(ii)	isotopes		1	AO1 C2.3.1d
11(a)(iii)	18		1	AO2 C2.3.1a/c/ d
11(b)(i)	covalent		1	AO1 C2.1.1b/g
11(b)(ii) View with Figure 20	shared pair of electrons complete electronic structure	 allow dots or crosses or e ⁻ for electrons	1 1	AO1, AO2 C2.1.1.b/g
11(c)(i)	sodium + chlorine → sodium chloride	the reactants may be in either order allow Na for sodium allow Cl ₂ for chlorine allow NaCl for sodium chloride	1	AO2 C2.1.1d
11(c)(ii)	2 (or more) elements (chemically) combined	allow fixed ratio of atoms	1	AO2 C2.1.1a/d
Total			9	

Question 12

Question	Answers	Extra information	Mark	AO / Spec ref
12(a)(i)	15 510 000 (J) or 15 510 (kJ) J or kJ	award 1 mark for correct substitution i.e. $141\ 000 \times 110$ or 141×110 provided no subsequent step unit must be consistent with answer allow joule(s) or kilojoule(s) do not allow j or KJ	2 1	2AO2 1AO1 P2.2.1 b
12(a)(ii)	kinetic		1	AO1 P2.2.1 c
12(b)(i) Mark with 12bii	11 655 000 (J)	award 1 mark for correct substitution i.e. $8325 \times 10 \times 140$ provided no subsequent step	2	AO2 P2.2.1 f
12(b)(ii) Mark with 12bi	11 655 000	allow their answer to (b)(i)	1	AO1 P2.2
12(b)(iii)	any one from: <ul style="list-style-type: none"> • energy transferred to other forms (due to friction) • (due to) air resistance / friction 	allow sound / thermal energy 'lost' allow 'heat' / energy 'lost' / wasted	1	AO1 P2.2.1 d

12(c)	increases	allow faster / quicker	1	AO2 P2.2, 2.2.1 f
12(d)	<p>any one from:</p> <p>yes answers</p> <ul style="list-style-type: none"> to protect passengers from harm / danger <p>no answers</p> <ul style="list-style-type: none"> passengers can choose to go on the ride or not 	allow it would spoil the fun	1	AO3 P2.1
Total			10	