GCSE

Additional Science (Route 2)

AS1FP

Mark scheme

4409

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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 <u>not</u> 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 **13(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.

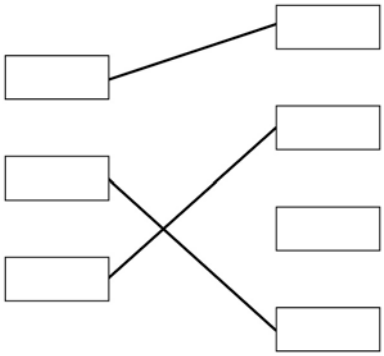
The following general criteria should be used to assign marks to a level:

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)		**1** mark for each correct link no mark for organ if more than one line from the organ	3	AO1 B2.2.1a/d
1(b)(i)	muscle		1	AO2 B2.2.1b
1(b)(ii)	move / churn food	allow mix food (with juices) ignore break down (food) ignore contracts	1	AO1 B2.2.1c
1(b)(iii)	any **one** from: • enzymes • hormones • (hydrochloric) acid	allow pepsin / protease allow digestive juices allow mucus	1	AO1 B2.2.1b/c
Total			**6**	

Question 2

Question	Answers	Extra information	Mark	AO / Spec. ref.
2(a)	any **one** from: • throw (over shoulder or with eyes closed) • use random numbers		1	AO2 B2.4.1b
2(b)(i)	1,1,4,3,1,0,1 (total) 15	in this sequence only accept ecf from table	1 1	AO2 B2.4.1b
2(b)(ii)	1.5	accept ecf from part **(b)(i)**, ie total in part **(b)(i)** ÷ 10	1	AO2 B2.4.1b
2(b)(iii)	300	allow answer to **(b)(ii)** × 200	1	AO2 B2.4.1b
2(b)(iv)	1	allow ecf from Table 1	1	AO2 B2.4.1b
2(c)(i)	more quadrats	allow repeat allow use a larger quadrat	1	AO3 B2.4.1b
2(c)(ii)	idea of taking less time	allow less effort	1	AO3 B2.4.1b

Question 2 continues on the next page

Question 2 continued

Question	Answers	Extra information	Mark	AO / Spec. ref.
2(d)	any **one** from: • temperature • nutrients / minerals • light • water	allow where seeds land allow idea of grazing / trampling allow direction of wind (from existing thistles / plants) allow presence of other plants	1	AO1 B2.4.1a
Total			**9**	

Question 3

Question	Answers	Extra information	Mark	AO / Spec. ref.
3(a)	cell wall		1	AO1 B2.1.1b
3(b)(i)	B = nucleus C = (cell) membrane		1 1	AO1 B2.1.1a
3(b)(ii)	any **two** from: • respiration • release energy • for movement / 'heat'	 ignore make / produce energy allow for active transport	2	AO1 B2.1.1a
3(b)(iii)	the magnification of the microscope was not great enough		1	AO3 B2.1
Total			**6**	

Question 4

Question	Answers	Extra information	Mark	AO / Spec. ref.
4(a)	the solvent in the beaker was above the start line the start line was drawn in ink		1 1	AO3 C2.3.2b
4(b)(i)	2 / two		1	AO2 C2.3.2b
4(b)(ii)	blue		1	AO3 C2.3.2b
Total			**4**	

Question 5

Question	Answers	Extra information	Mark	AO / Spec. ref.
5(a)	carbon		1	AO1 C2.2.3a/b
5(b)(i)	covalent		1	AO1 C2.2.3a/b
5(b)(ii)	strong		1	AO1 C2.2.3a
5(c)(i)	mixture of metals	allow a mixture of metal and (other) elements allow a mixture of metal and carbon	1	AO1 C2.2.4c
5(c)(ii)	75% gold 15% silver 10% copper	allow **1** mark for: 1 or 2 percentage + element correct **or** all elements correct **or** all percentages correct	2	AO2 C2.2.4c
5(c)(iii)	the alloy of gold is hard(er) **or** pure gold is (too) soft	allow answers relating to cost or rarity of gold	1	AO3 C2.2.4c
5(d)(i)	100		1	AO1 C2.2.6a
5(d)(ii)	because nanoparticles have a higher surface area to volume ratio because using nanoparticles requires less gold to be used		1 1	AO1 AO3 C2.2.6a
Total			**10**	

Question 6

Question	Answers	Extra information	Mark	AO / Spec. ref.
6(a)(i)	11 / eleven		1	AO1 C2.3.1a
6(a)(ii)	neutron(s)		1	AO1 C2.3.1c
6(b)(i)	sodium (atom) loses (an electron) chlorine (atom) gains (an electron) one electron transferred reference to ionic bonding **or** reference to charges on ions	max **3** if reference to incorrect bonding or particle do **not** allow reference to sharing electrons allow reference to full outer shells **or** allow reference to noble gas structure	1 1 1 1	AO1 AO2 C2.1.1b/c/d/e
6(b)(ii)	argon		1	AO2 C2.1.1b
Total			**7**	

Question 7

Question	Answers	Extra information	Mark	AO / Spec. ref.
7(a)(i)	the rod gains electrons from the cloth		1	AO1 P2.3.1a
7(a)(ii)	the same as		1	AO1 P2.3.1b
7(b)(i)	the first rod will be repelled (from the second rod)	allow it will be repelled allow the first rod will move away (from the second rod) ignore it will move	1	AO1 P2.3.1c
7(b)(ii)	like charges repel	allow they both have negative charge **or** they both have the same charge ignore they are the same	1	AO1 P2.3.1d
Total			**4**	

Question 8

Question	Answers	Extra information	Mark	AO / Spec. ref.
8(a)	A thermistor		1	AO1 P2.3.2c
8(b)(i)	L		1	AO1 P2.3.2f
8(b)(ii)	M		1	AO1 P2.3.2f
8(c)(i)	ohms		1	AO1 P2.3.2h
8(c)(ii)	6000 **idea of** the temperature is the same as at 1 pm	allow the temperature is 24 (^{o}C)	1 1	AO1 AO3 P2.3.2q
Total			**6**	

Question 9

Question	Answers	Extra information	Mark	AO / Spec. ref.
9(a)(i)	15(.0)		1	AO2 P2.1.5e
9(a)(ii)	(as force increases) extension increases (extends) 5 cm for every 1 N	allow positive correlation allow linear **or** at a constant rate award **2** marks for extension is directly proportional to force	1 1	AO2 P2.1.5e
9(a)(iii)	the extension went back to 0 cm		1	AO3 P2.1.5e
9(a)(iv)	reproducible		1	AO1 P2.1.5e
9(b)	elastic potential energy		1	AO1 P2.1.5b
Total			**6**	

Question 10

Question	Answers	Extra information	Mark	AO / Spec. ref.
10(a)	a force (is causing) movement	allow transfer of energy allow (resulting in) transfer of energy allow for **2** marks work = force × distance	1 1	AO1 P2.2.1a
10(b)	more work done (in the same time)	allow less work (in the same time) if there is a clear reference to set 1 allow jumps higher **or** more jumps per minute	1	AO2 P2.2.1e
10(c)	identifies 30 (W) as an anomalous result add other results and divide by 4	allow idea that 30 (W) **or** the anomaly should be left out of the mean calculation award **2** marks for a calculation of 100 (W) award **1** mark for an answer of 100 (W) without working if no other mark awarded allow **1** mark for a calculation of 86 (W) **or** correct description of calculating a mean value from all five results	1 1	AO3 P2.2.1e
Total			**5**	

Question 11

Question	Answers	Extra information	Mark	AO / Spec. ref.
11(a)(i)	to let light in / through (to the plant) for photosynthesis	ignore ref to seeing the plant allow absorb by chlorophyll **or** to produce glucose / starch / sugar / carbohydrates / biomass	1 1	AO1 AO2 B2.3.1a/b/c/d
11(a)(ii)	protein		1	AO1 B2.3.1g
11(b)(i)	any **one** from: • temperature • light (intensity / wavelength) • mineral ion (type / concentration) • volume / amount of water	accept named, eg nitrate (amount / concentration) do **not** allow carbon dioxide / pressure	1	AO3 B2.3.1a/c/d
11(b)(ii)	greater (mass) by factor of 2	allow bigger / faster growth allow 180 (g) rather than 90 (g) allow a difference of 90 (g) award **2** marks for 'twice as heavy / big'	1 1	AO2 / AO3 B2.3
11(b)(iii)	increase oxygen / O_2 **or** decrease carbon dioxide / CO_2	ignore references to changing water (vapour) content allow plant gives out oxygen allow plant takes in carbon dioxide	1	AO1 B2.3.1a/b
11(c)(i)	mass / growth does not increase (with greater carbon dioxide concentration)	allow mass levels off allow graph / line levels off	1	AO3 B2.3.1c/d

Question 11 continues on the next page

Question 11 continued

Question	Answers	Extra information	Mark	AO / Spec. ref.
11(c)(ii)	any **one** from: • temperature • light (intensity) • mineral ions	ignore water allow named ions eg nitrate allow (air) pressure	1	AO1 B2.3.1c/d
Total			**9**	

Question 12

Question	Answers	Extra information	Mark	AO / Spec. ref.
12(a)	(magnesium oxide) No Yes (silicon dioxide) giant covalent (sulfur trioxide) No No	in this order only allow macromolecular ignore lattice	1 1 1	AO1 C2.2.1c C2.2.2b C2.2.3a
12(b)	(very) high melting point	allow will not melt in the furnace ignore references to boiling point	1	AO3 C2.2.2a C2.3.3a
12(c)(i)	80	allow **1** mark for evidence of $32 + (16 \times 3)$ provided no subsequent working	2	AO2 C2.3.1f
12(c)(ii)	53.3 (%)	allow 53.33 (%) or 53 (%) allow **1** mark for evidence of: $\frac{32}{60} \times 100$ **or** 0.533	2	AO2 C2.3.3a
12(c)(iii)	40 g / grams	must have correct unit	1	AO1 C2.3.1g
Total			**9**	

Question 13

Question	Answers	Extra information	Mark	AO / Spec. ref.
13(a)(i)	3500		1	AO2 P2.1.1c
13(a)(ii)	accelerating in the direction of the resultant force	allow speed is increasing accept forwards	1 1	AO2 P2.1.1e

Question 13 continued

Question	Answers	Extra information	Mark	AO / Spec. ref.
13(b)			6	AO1 AO2 AO3 P2.1.3a P2.1.4a/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 5 and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content.	At least one statement is made about the force or motion of the car or van.	At least one similarity or one difference is given between the motion of the car and the van, with a simple link to horizontal forces **or** at least one similarity **and** one difference is given between the car and the van.`	At least one similarity **and** at least one difference is given between the motion of the car and the van **and** there is at least one explained link with horizontal forces.

Question 13 continues on the next page

Question 13 continued

Question	Answers	Extra information	Mark	AO / Spec. ref.
	examples of physics points made in the response: **similarities** both car and van increase in velocity both the car and the van reach constant / terminal velocity **differences** car has a higher velocity (than van) car reaches higher max velocity (than van) car accelerates more quickly (than the van) van reaches maximum velocity before the car **forces** a simple link could be that the van is less streamlined explained links could be: • both car and van have greater forward / driving force than backward / resistant force • resistance force increases as speed / velocity increases • eventually driving force balances resistance force	**extra information** allow speed for velocity throughout		
Total			**9**	