GCSE

Science B

SCB3HP

Mark scheme

4500

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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

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 and underlining

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 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	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 calculation s

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 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient are 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 2(b) 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	Spec ref and AO
1(a)(i)	can heal itself	accept description, e.g. scratches repair themselves	1	3.5.2.2.1a AO2
1(a)(ii)	resistance becomes (almost) zero at low temperatures (therefore) reduces energy loss / less heating (of the wires) / more efficient (energy transfer)	accept low / lower / no resistance if no other mark given allow correctly named example of a superconductor, i.e. Maglev (train)	1 1	3.5.2.2.1b AO1
1(b)(i)	photochromic		1	3.5.2.2.1d AO2
1(b)(ii)	monitor exposure to sunlight **or** high light intensity	ignore references to heat ignore reference to time in sunlight accept easy to see the colour change accept correct description of monitoring, e.g. parents can see when their children need to come indoors / apply a higher SPF suncream	1	3.5.2.2.1c AO3
Total			**5**	

Question	Answers	Extra information	Mark	Spec ref and AO
2(a)(i)	measles		1	3.5.1.2.1 AO1
2(a)(ii)	any **one** from: • reproduce rapidly (in the cells) • cause cell damage		1	3.5.1.2.3 AO1

Question 2 continues on the next page …

Question	Answers	Spec Ref and AO	Mark
2(b)		3.5.1.2.2/4/5/6 AO1	6

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** way the body prevents disease developing is identified. **or** at least **one** way the body prevents pathogens entering the body is identified	There is an attempt at a description of a way in which the body prevents disease developing **or** the way in which the body prevents pathogens from entering. A good level 2 answer will include preventing disease developing and preventing entry of pathogens.	There a description of a way in which the body prevents disease developing **and** the way in which the body prevents pathogens from entering.

examples of the points made in the response

Protection

- skin forms a barrier
  - to microorganisms
- blood clots (form a barrier)
  - seal a wound / cut
  - (caused by) platelets

Immune response

- white blood cells / phagocytes
  - engulf pathogens
  - (and) digest them
- white blood cells / lymphocytes
  - produce antibodies
  - to destroy pathogens
- white blood cells / lymphocytes
  - produce antibodies
  - (to) provide immunity (in the longer term)

Ideas beyond the spec but credit worthy

- antiseptic chemicals
  - released in the mouth and vagina
  - to kill pathogens
- strong acid
  - in the stomach
  - which kills pathogens
- cilia
  - in the windpipe
  - trap dust containing pathogens

extra information

Total			**8**

Question	Answers	Extra information	Mark	Spec ref and AO
3(a)(i)	changes chemical processes in the body **or** leads to addiction / dependency	harms body is insufficient allow long term use leads to circulatory damage	1	3.5.1.1.8/ 9 AO1
3(a)(ii)	reduces oxygen carrying capacity (of blood)	allow reduces oxygen (in the blood)	1	3.5.1.1.1 1 AO1
3(b)(i)	points correctly plotted line of best fit	allow ±0.5 square tolerance 3 or 4 correctly plotted for 2 marks 2 correctly plotted for 1 mark	2 1	3.5.1.1 AO2
3(b)(ii)	2450 – 2500	allow any number in range	1	3.5.1.1 AO3
3(b)(iii)	any **one** from: • change in drug taking habits • more contaminants/ impurities in drugs • new (designer) drugs (become available)	allow improvements in treatment (of overdosing) allow change in drug classification	1	3.5.1.1 AO3
Total			**7**	

Question	Answers	Extra information	Mark	Spec ref and AO
4(a)(i)	(water taps) to prevent corrosion (cupboard door handles) for decoration (nickel necklace) prevent allergies	accept 'for decoration' once only	1 1 1	3.5.2.1.1/ 2/9 AO1 AO2
4(a)(ii)	A cathode B anode C electrolyte	allow 1 mark if 'electrode' used and no marks other than 'electrolyte' awarded	1 1 1	3.5.2.1.5/ 6 AO1
4(a)(iii)	(ion) is charged (because it is) an atom that has gained / lost electron(s) **OR** (atom) is not charged / neutral (1) (because it has not) lost / gained electron(s) (1)	accept: (because) it has an equal number of electrons and protons	1 1	3.5.2.1.7 AO1
4(a)(iv)	ne^- M	additional numbers negates mark, e.g. $2e^-$	1 1	3.5.2.1.8 AO1
Total			**10**	

Question	Answers	Extra information	Mark	Spec ref and AO
5(a)(i)	any **two** from: • only works on 4% of patients / those with the mutation • would waste the drug (because it won't work on all CF patients) • inefficient use of (NHS) money • may give patients false hope	ignore side effects unqualified allow "**very** expensive"	2	3.5.1.1 AO3
5(a)(ii)	any **one** from: • (because) it is worth a lot of money • could be collected fraudulently • has a black market value • drug could be harmful to those who do not need it		1	3.5.1.1 AO3
5(a)(iii)	any **one** from: • cells • tissues	accept computer simulations	1	3.5.1.1.1 AO1
5(b)	any **two** from: • safety (of the drug over the medium and long term) • effectiveness of drug • unexpected side effects		2	3.5.1.1.1 AO2
Total			**6**	

Question	Answers	Extra information	Mark	Spec ref and AO
6(a)(i)	PVOH / EVOH	accept PVA accept polyvinyl alcohol and ethylene vinyl alcohol	1	3.5.3.1.8 AO2
6(a)(ii)	biodegradable		1	3.5.3.1.8 AO1
6(b)	any **six** from: • (fertiliser) leaches into the lake • algae / plants to grow (rapidly) • on the surface • prevents sunlight reaching the plants (underneath) • the plants die • bacteria break down the plants • (bacteria) uses up the oxygen (in the pond causing death)		6	3.5.3.1.4/5 AO1 AO3
Total			**8**	

Question	Answers	Extra information	Mark	Spec ref and AO
7(a)(i)	thatched roof (it has the) lowest U-value	 accept saves the most money (per year)	1 1	3.5.3.2.3/5 AO2 AO3
7(a)(ii)	3.90 / 3.9	correct answer with or without workings gains **2** marks evidence of use of 780 and 200 gains **1** mark	2	3.5.3.2.4 AO2
7(a)(iii)	any **one** from: • saves the most money each year / approx. £6 each year • will save the most money over time / £25 more		1	3.5.3.2.3/4/5 AO2
7(a)(iv)	0.16 - 0.17 (because) energy saving is between recycled newspaper and sheep's wool so U-value should be higher than 0.15 and lower than 0.18		1 1	3.5.3.2.3/4/5 AO3
7(b)	(fire) needs a good air supply (to ensure) complete combustion lack of oxygen leads to incomplete combustion / carbon monoxide / CO which is poisonous	 allow not all heat energy is transferred	1 1 1 1	3.5.3.3.5/6 AO1 AO2 AO3
Total			**11**	

Question 8

Question	Answers	Extra information	Mark	Spec ref and AO	ID
8	(mouse) gene is removed from mouse cell using a (restriction) enzyme	max 4 if enzymes not referred to correctly at least once	1	3.5.2.3.3 AO1 AO2	E
	plasmid removed from bacterium	accept ring / circle of DNA / genes as synonym of plasmid	1		
	plasmid (from bacterium) is cut open using a (restriction) enzyme		1		
	(and)mouse gene inserted into plasmid	allow mouse gene and plasmid are joined	1		
	plasmid put into bacterium		1		
Total			**5**		