GCSE

Science B

SCB2HP

Mark scheme

4500
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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 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 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 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 3 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

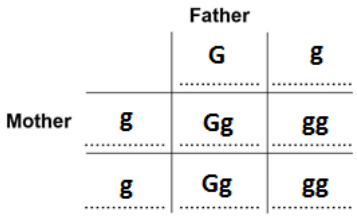
- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

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 / Spec. Ref.
1(a)(i)	in the nucleus	if more than one answer is circled award no marks	1	AO1 3.4.1.3.2b
1(a)(ii)		1 mark for the alleles of the mother (g and g) in column 1 1 mark for the correct derivation of offspring in column 2 1 mark for the correct derivation of offspring in column 3 allow 2 ecf marks for the correct derivation of offspring from incorrect alleles of parents max. 1 mark for the correct derivation of **all** offspring if other symbol given without a key	3	AO2 3.4.1.3.5
1(a)(iii)	50%		1	AO3 3.4.1.3
1(b)	any **one** from: • better medical care • better drugs • more information given to patients to control the symptoms • gene therapy	eg more physiotherapy	1	AO3 3.4.1.3

Question 1 continues on the next page

Question	Answers	Extra Information	Mark	AO / Spec. Ref.
1(c)(i)	(the number of people diagnosed with) type 2 diabetes is increasing more / at a much faster rate compared with those diagnosed with type 1 diabetes		1	AO3 3.4.1.1.10
1(c)(ii)	type 2 diabetes is due to more people being overweight / obese **or** eat poor diets / eat too much sugar **or** are exercising less (as) type 1 diabetes is caused by genetic (inherited) factors / is not affected by lifestyle choices		1 1	AO3 3.4.1.1.10
Total			**9**	

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)	thermoregulatory (centre)		1	3.4.1.1.11 AO1
2(b)	blood vessels to the skin constrict	accept arteries / arterioles for blood vessels do not allow capillaries / veins accept narrow for constrict do not allow blood vessels move through skin	1	3.4.1.1.11 a/c AO1
	reducing blood flow / heat loss from blood	accept vasoconstriction vessels to or in the skin for 2 marks	1	
	and			
	sweating is reduced (so less heat is lost to the surroundings)		1	
	by evaporation	ignore shivering / goose bumps accept: hair stands on end 1 mark to increase insulation / trap a layer of air / heat 1 mark	1	
Total			**5**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3			6	AO1 3.4.3.2.6a-e, 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 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 electromagnetic wave is identified **or** an appropriate use **or** hazard	At least two electromagnetic waves are identified **and** one is linked to a use **or** a hazard	At least two electromagnetic waves are identified **and** at least **one** is correctly linked to its use **and** a hazard **and** a further attempt to link another electromagnetic wave to its use **or** hazard

examples of the points made in the response	extra Information
gamma o radiotherapy, irradiating fruit, sterilising (surgical equipment), gamma camera for detecting tracers ▪ cancer, cell damage, cell mutations X-ray o imaging, radiotherapy, detecting guns / bombs in airports ▪ cancer, cell damage, cell mutations ultraviolet o sunbeds, detecting forged notes ▪ skin cancer infrared o thermal imaging, remote controls, fibre optics ▪ burns visible light o illumination, light bulbs ▪ damage to eye / retina microwaves o mobile phones, microwave ovens, cooking food, satellite communication ▪ burns	accept suggestions of causing cancer

Total			6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)(i)	stimuli/stimulus		1	3.4.1.1.1 AO1
4(a)(ii)	longitudinal wave		1	3.4.1.1.5 AO1
4(a)(iii)	20 – 20 000Hz / hertz		1	3.4.1.1.6 AO1
4(a)(iv)	rapid and automatic	accept fast or quick doesn't need thinking about	1	3.4.1.1.3 AO1
4(b)(i)	3120 waves per second	accept: number of waves per second	1	3.4.3.2.2 AO1
4(b)(ii)	0.1 m / metres	accept evidence of rearrangement ie wavelength = velocity / frequency for 1 mark accept evidence of 315/3120 for **1** mark	2 1	3.4.3.2.5 AO2 AO1
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	any **two** from: • higher tensile strength / stronger than aluminium and wood • density is lower than aluminium and steel • easiest to maintain	must be comparative accept valid reference to the sailing boat being light weight	2	3.4.2.1.12 AO3
5(b)	composite (material)		1	3.4.2.1.12 AO1
5(c)	any **two** from: • less landfill • less resources / raw materials used • less energy / electricity used to heat furnace		2	3.4.2.1.12 AO3
Total			**5**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6 (a)(i)	poor conductor of heat electrical insulator	accept to prevent burns accept to prevent electric shocks / does not conduct electricity	1 1	3.4.2.1.10 AO2
6 (a)(ii)	high melting point (to allow plates to get hot enough)	allow **electrical** insulator	1	3.4.2.1.11 AO2
6 (b)(i)	1 joule of energy is transferred per second	accept 1 J/s	1	3.4.3.1.1 AO1
6 (b)(ii)	21	correct answer gains 3 marks **max. 2 marks using:** • accept evidence of 10 x 60 = 600 for **1** mark • accept evidence of conversion of W to kW for **1** mark • accept evidence of 600 x 0.035 (35W) for **1** mark	3	3.4.3.1.3 AO2
6 (c)	0.75p	accept £0.0075 (0.06-0.01) x 15 for 1 mark	2	3.4.3.1.4/5 AO2
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7 (a)	hormone(s)		1	3.4.1.1.9 AO1
7 (b)	pancreas releases glucagon	do **not** accept glucagon made / produced by the liver	1	3.4.1.1.10 AO1
	(causing) liver to convert		1	
	glycogen to glucose		1	
	(causing) glucose to be released into the blood (blood sugar level returns to normal)	allow the liver maintains the correct / constant level of glucose in the blood if biological terms are incorrectly spelt accept phonetically correct terms. Beware confusion between glucagon and glycogen	1	
7 (c)(i)	acid	accept H^+ / hydrogen ions accept pepsin, (gastric) protease / (gastric) proteinase	1	3.4.1.2.6 AO1
7 (c)(ii)	$H^+ + OH^-$ $\rightarrow H_2O$ $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$	correct input (either order) correct output correct state symbols	1 1 1	3.4.1.2.5 AO1
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
8(a)	$C_3H_8 + O_2 \rightarrow$ $CO_2 + H_2O$ $C_3H_8 + \mathbf{5}O_2 \rightarrow \mathbf{3}CO_2 + \mathbf{4}H_2O$	correct reactants either order correct products either order correct balancing accept correct scaled answer in either order	1 1 1	3.4.2.2.5 AO2
8(b)	any **five** from: **<u>arguments for nuclear</u>** • good availability • saving fossil fuels • low running costs • reliable • more energy / kg • less fuel needed • no greenhouse gases emitted • no SO_2 causing acid rain • cleaner • jobs to area **<u>arguments against nuclear</u>** ▪ (potential) radioactive emissions ▪ (potential) danger to health of local community ▪ non-renewable ▪ high cost of decommissioning ▪ long half-life of waste materials ▪ need for safe storage of waste ▪ high cost of commissioning ▪ danger involved in transporting fuel / waste a sensible reasoned and linked conclusion	max. **4** marks for one-sided answer this mark requires an opinion supported by at least 1 for and 1 against statement in the answer	5 1	3.4.2.3.5 AO2 AO3
Total			**9**	