
GCSE

Science B

SCB2FP
Mark scheme

4500
June 2016

Version 1.0: Final Mark Scheme

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 not 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 8(c) 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)	A cell membrane	answers must be in the correct order	1	AO1 3.4.1.3.1
	B nucleus		1	
	C cytoplasm		1	
1(a)(ii)	B	do not allow if more than one circled	1	AO1 3.4.1.3.2
Total			4	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)	variation	do not allow if more than one circled	1	AO1 3.4.1.3.3
2(b)	<div> <div>Cause</div> <div> <div>The environment only</div> <div>Genetics only</div> <div>Genetics and the environment</div> </div> <div>Difference</div> <div> <div>Age</div> <div>Eye colour</div> <div>Scars</div> <div>Weight</div> </div> </div>	one mark for each correct cause and difference do not allow if more than one line leaves the cause box	3	AO2 3.4.1.3.3
Total			4	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)(i)	184	ignore any units given here	1	AO2 3.4.3.1.2
3(a)(ii)	W	do not allow if more than one answer is ticked	1	AO1 3.4.3.1.2
3(b)(i)	13	do not allow if more than one answer is circled	1	AO2 3.4.3.1.4
3(b)(ii)	182 (p)	accept £1.82 allow ecf from 3(b)(i)	1	AO2 3.4.3.1.5
3(b)(iii)	kilowatt-hours	do not allow if more than one answer is circled	1	AO1 3.4.3.1.4
3(c)	advantage any one from: <ul style="list-style-type: none"> renewable no carbon dioxide released disadvantage any one from: <ul style="list-style-type: none"> does not work at night/ when it is cloudy solar cell has to be facing the Sun 	1 mark for an advantage and 1 mark for the disadvantage ignore environmentally friendly ignore reference to cost	1	AO3 3.4.2.3.5
		ignore reference to cost	1	
Total			7	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	<p>Material</p> <p>Glass</p> <p>Plastic</p> <p>Reinforced concrete</p> <p>Use of material</p> <p>Drain pipe</p> <p>Lintel</p> <p>Roof</p> <p>Window</p>	<p>1 mark for each correct answer</p> <p>do not award mark if more than one line comes out of the material</p>	3	<p>AO1</p> <p>3.4.2.1.2, 10, 11</p>
4(b)(i)	quarrying	accept mining	1	<p>AO1</p> <p>3.4.2.1.1</p>
4(b)(ii)	heated (with) (powdered) clay	ignore water	1 1	<p>AO1</p> <p>3.4.2.1.4</p>
4(b)(iii)	sand	allow specific types of sand e.g. builder's sand	1	<p>AO1</p> <p>3.4.2.1.5</p>
	aggregate	allow (small) stones / gravel	1	
4(c)(i)	<p>use:</p> <p>water pipes</p> <p>property:</p> <p>any one from:</p> <ul style="list-style-type: none"> • does not react with water • malleable / easily bent (into shape) 	<p>do not allow if more than one answer is circled</p> <p>accept reasonable alternatives</p>	1 1	<p>AO1</p> <p>3.4.2.1.7</p>
4(c)(ii)	steel will rust / corrode		1	<p>AO3</p> <p>3.4.2.1.7</p>
Total			11	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	distance travelled increases (with increasing speed to start with)	accept a correct value for speed when the range starts to decrease	1	AO3 3.4.2.2
	up to 16 – 20 mph	allow 410 miles providing speed is referred to somewhere in the answer	1	
	then the distance travelled decreases (with increasing speed)	credit correct statements about battery life if no other mark awarded award allow 1 mark for the faster the car travels the less miles the car travels	1	
5(b)(i)	oxygen	left hand side	1	AO1 3.4.2.2.3
	carbon dioxide	allow O ₂ right hand side allow CO ₂	1	
5(b)(ii)	Carbon and hydrogen only	do not allow if more than one answer is ticked	1	AO1 3.4.2.2.2
Total			6	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)	any two from: <ul style="list-style-type: none"> • (increased) sweating • increased blood flow near the surface of the skin • vasodilation 	if no other mark given allow 1 mark for behavioural change ignore hair references	2	AO1 3.4.1.1.11
6(b)	any two from: <ul style="list-style-type: none"> • changing their diet • doing more exercise • lose weight 	allow eating less sugar	2	AO1 3.4.1.1.10
6(c)(i)	correct plotting of points	correct plotting of two or three points for 1 mark	2	AO2 3.4.1.1
	line of best fit drawn correctly		1	
6(c)(ii)	12 hours	allow the correct time from a line of best fit drawn on the graph	1	AO3 3.4.1.1
Total			8	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)	speed in a vacuum	do not allow if more than one answer is circled	1	AO1 3.4.3.2.4
7(b)(i)	Ultraviolet waves sterilising / sunbeds / detecting forged bank notes / security X-Rays to see (broken) bones / airport security Microwaves - (Mobile phones) Infrared - (Remote controls)	in this order allow tanning (beds) allow for therapy / diagnosis ignore X-ray machines unqualified allow IR	 1 1 1 1	AO1 3.4.3.2.6 3.4.3.2.7
7(b)(ii)	the higher the energy carried the shorter the wavelength	accept the inverse of this ignore reference to speed	1	AO1 3.4.3.2.4
7(c)(i)	2	do not allow if more than one answer is circled	1	AO2 3.4.3.2
7(c)(ii)	62.5	allow evidence of 12.5 (cm) for 1 mark allow 125 for 1 mark allow ecf from 7ci for 2 marks if 7ci = 5 answer 25 for 2 marks if 7ci = 4 answer 31.25 for 2 marks	2	AO2 3.4.3.2.5
Total			9	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
8(a)(i)	measuring cylinder	accept burette / pipette / syringe do not allow beaker / jug	1	AO2 3.4.1.2.4
8(a)(ii)	mass of metal carbonate		1	AO2 3.4.1.2.4
8(b)(i)	Neutralisation		1	AO2 3.4.1.2.3
8(b)(ii)	carbon dioxide / gas is given off		1	AO3 3.4.1.2.3
8(b)(iii)	mass of the reaction mixture before <u>and</u> after the reaction		1	AO3 3.4.1.2.3

Question 8 continues on the next page

8(c)		AO2 AO3 3.4.1.2.2	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 comment	Identify a risk or identify a hazard or a control measure	Identify a hazard / risk, and a control measure and at least two must be linked	Identify hazards, risks, and control measures and at least one risk and control measure is correctly linked to the hazard
examples of the points made in the response <ul style="list-style-type: none"> • glass (boiling/test) tube <ul style="list-style-type: none"> = could break/smash ○ cause a cut ▪ handle glass with care • bunsen burner <ul style="list-style-type: none"> = get too hot ○ burn/scald ▪ do not touch when hot ▪ leave to cool before moving • (hydrochloric) acid <ul style="list-style-type: none"> = corrosive ○ burn/irritate ▪ wear safety glasses/gloves/clothing ▪ wash off immediately • (metal) carbonate <ul style="list-style-type: none"> = irritant ○ irritate skin ▪ wear safety glasses/gloves/clothing • tripod/gauze <ul style="list-style-type: none"> = get too hot ○ burn/scald ▪ do not touch when hot ▪ leave to cool before moving 		extra information answers must refer to the use of apparatus	
Total			11