



GCSE COMBINED SCIENCE: SYNERGY 8465/2F

Foundation Tier Paper 2 Life and Environmental Sciences

Mark scheme

June 2025

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 Examiner.

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.

No student should be disadvantaged on the basis of their gender identity and/or how they refer to the gender identity of others in their exam responses.

A consistent use of 'they/them' as a singular and pronouns beyond 'she/her' or 'he/him' will be credited in exam responses in line with existing mark scheme criteria.

Further copies of this mark scheme are available from aqa.org.uk

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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 their judgement
- 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 (for example, a scientifically correct answer that could not reasonably be expected from a student's knowledge of the specification).

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**.
Alternative words in the mark scheme are shown by a solidus 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** magnetic materials.

[2 marks]

Student	Response	Marks awarded
1	iron, steel, tin	1
2	cobalt, nickel, nail*	2

3.2 Use of symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, or uses symbols to denote quantities in a physics equation, 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

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. At any point in a calculation students may omit steps from their working. If a subsequent step is given correctly, the relevant marks may be awarded.

Full marks should be awarded for a correct numerical answer, without any working shown. Full marks are **not** awarded for a correct final answer from incorrect working.

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

An error can be carried forward from one question part to the next and is shown by the abbreviation 'ecf'.

Within an individual question part, an incorrect value in one step of a calculation does not prevent all of the subsequent marks being awarded.

3.6 Phonetic spelling

Marks should be awarded if spelling is not correct but the intention is clear, **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 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

3.9 Ignore

Ignore 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.

3.10 Do not accept

Do **not** accept means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

3.11 Numbered answer lines

Numbered lines on the question paper are intended to support the student to give the correct number of responses. The answer should still be marked as a whole.

4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and, if necessary, annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1: Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level.

The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

Step 2: Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	(at 15 °C) liquid		1	AO3 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	(at 70 °C) gas		1	AO3 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	(A) combustion		1	AO2 4.4.1.6 4.4.1.7 4.4.1.8 RPA11
	(B) boiling		1	
	(C) condensing		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	any one from: - cool the (delivery / test) tube - place the test tube in an ice bath - use a longer (delivery) tube - use a (Liebig) condenser	ignore seal the test tube	1	AO3 4.4.1.8 RPA11

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	pure water boils at exactly 100 °C		1	AO2 4.1.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	carbon dioxide oxygen		1 1	AO2 4.1.1.5
Total Question 1			9	

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	methane		1	AO1 4.4.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(number of times greater =) $\frac{420}{0.060}$ = 7000	allow $\frac{420}{0.06}$	1 1	AO2 4.4.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	400 (arbitrary units)		1	AO2 4.4.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	any one from: • combustion / burning • respiration • industrial use of limestone	allow decay allow making cement / concrete ignore deforestation	1	AO1 4.4.1.2 4.4.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	trees absorb carbon dioxide		1	AO2 4.2.2.5 4.4.1.2 4.4.1.5
	(because trees) photosynthesise		1	

Question	Answers	Mark	AO / Spec. Ref.		
02.6	4 rows correct scores 2 marks allow 1 mark for 3 correct rows		2	AO3 4.4.1.4 4.4.1.5	
	Statement	An advantage when predicting climate change			A disadvantage when predicting climate change
	Climate data from some parts of the world is incomplete				✓
	Computers can be used to model climate change	✓			
	Data about the atmosphere has been collected for many years	✓			
	Research using climate change data is peer reviewed	✓			
	do not accept more than one tick in each row				

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	rising sea-levels		1	AO1 4.4.1.5

Total Question 2	10
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Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	(P) compression		1	AO1 4.1.4.1
	(Q) wavelength		1	4.1.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	parallel to the direction of energy transfer		1	AO1 4.1.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	the speed of light is greater than the speed of sound	an answer in terms of time only is insufficient	1	AO3 4.1.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	to reduce the effect of random errors		1	AO3 4.1.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	frequency = $\frac{330}{0.12}$		1	AO2
	frequency = 2750		1	AO2
	hertz	allow Hertz allow Hz ignore hz	1	AO1
				4.1.4.2

Total Question 3	8
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Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	any two from: • wash hands • cover wounds • clean surfaces • sterilise (surgical) equipment • use antiseptic on wound	ignore wear mask / PPE allow use hand sanitiser allow avoid unnecessary surgery	2	AO2 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	$\frac{39}{1300} \times 100$ 3 (%)		1 1	AO2 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	HIV damages the immune system		1	AO2 4.3.3.2 4.3.3.10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	plasmids		1	AO1 4.1.3.2

Question	Answers	Mark	AO / Spec. Ref.
04.5	Part of drug trial Reason Animal testing Clinical trial Double-blind trial To avoid bias To check the drug is not toxic To find the optimum dose of the drug To see if the drug makes viruses multiply	1	AO3
		1	AO3
		1	AO1
	do not accept more than one line from a box on the left		4.3.3.7

Total Question 4	9
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Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	any one from: • cancer • diabetes • cystic fibrosis • liver disease (caused by the effect of alcohol) • lung disease (caused by the effect of smoking)	allow named non-communicable / deficiency disease allow brain damage caused by effect of alcohol allow COPD allow stroke	1	AO1 4.3.1.1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	eating large amounts of fatty food sitting down for long periods every day		1 1	AO2 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	a stent statins		1 1	AO1 4.3.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	differentiation		1	AO1 4.1.3.6 4.3.3.9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	immune system		1	AO2 4.3.3.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	(cells) travel (to another part of the body) in the blood	allow by invading neighbouring tissues	1	AO1 4.3.2.7 4.3.3.9
	(the cells) divide / grow uncontrollably		1	

Total Question 5	9
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Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	oxygen	allow O ₂	1	AO1 4.2.2.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	light intensity		1	AO1 4.2.2.6 RPA10

[illegible]

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	110	allow an answer in the range 109 to 111	1	AO2 4.2.2.6 RPA10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	54 (cm)	allow an answer in the range 53.5 cm to 54.5 cm	1	AO2 4.2.2.6 RPA10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	species A produced more bubbles than species B at 60 cm		1	AO3 4.2.2.6 RPA10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.7	carbon		1	AO1 4.4.1.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.8	decrease		1	AO2 4.2.2.6

Total Question 6	8
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Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	many generations of fruit flies can be produced in less time		1	AO3 4.4.4.3
	the environment that the fruit flies are in can be controlled		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	let the offspring (with longest wings) breed	allow let the ten fruit flies breed	1	AO2 4.4.4.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	any one from:		1	AO1 4.4.4.5
	• (all are) more likely to get the same diseases • inherited defects more likely to be seen	ignore inbreeding allow greater risk of abnormality / deformities		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	natural selection		1	AO2 4.4.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	spray crops with pesticide		1	AO2 4.4.4.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	less of the crop is damaged by fruit flies		1	AO3 4.4.4.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7	food chains and food webs will be disrupted		1	AO3 4.4.2.1 4.4.4.6
Total Question 7			8	

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	greater		1	AO2 4.1.3.3 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	diffusion		1	AO1 4.1.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	oxygen	allow O ₂	1	AO1 4.2.1.1 4.2.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	short distance (for diffusion)		1	AO2 4.2.1.2
	(so gas) diffusion / exchange is faster	alternative route short distance (for energy transfer) (1) (so) blood warms up faster (1)	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	small(er) / less / low(er)		1	AO2
	small(er) / less / low(er)		1	AO2
	large(r) / more / great(er) / big(ger)		1	AO3
				4.2.1.2

Question	Answers	Mark	AO / Spec. Ref.
08.6	Level 2: Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3–4	AO1 4.1.3.3 4.2.1.2 4.2.1.3
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–2	
	No relevant content	0	
	Indicative content - many alveoli - provide a large(r) surface area (:volume) - for oxygen (diffusion) - alveoli / capillary walls are thin or one cell thick - capillaries are close to the alveoli - which provides a short diffusion distance / path - lungs are ventilated or breathing (mechanism) moves air in and out - to bring in oxygen and to remove carbon dioxide - to maintain the concentration / diffusion gradient - large capillary network (around alveoli) or good blood supply - to move oxygen(ated blood) away quickly - to bring carbon dioxide to the lungs quickly - to maintain the concentration / diffusion gradient		

Total Question 8	12
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Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	<i>substitution</i> $400 = \frac{38}{\text{size of real object}}$	allow real diameter for size of real object	1	AO2 4.1.3.1
	<i>rearrangement</i> $\text{size of real object} = \frac{38}{400}$	allow substitution of incorrectly converted value	1	
	0.095 (mm)	allow answer of incorrectly converted value	1	
	<i>conversion</i> (0.095 × 1000 =) 95 (micrometres)	allow conversion to µm at any stage	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	shape similar to cell in Figure 1 and nucleus is present	ignore shading ignore drawing of zona pellucida	1	AO2
	any two features correctly labelled: • cell membrane • cytoplasm • nucleus	allow label line to zona pellucida do not accept cell wall do not accept other cellular structures drawn	1	AO1 4.1.3.1 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	any one from: • mitochondria • ribosome	ignore vacuole unqualified do not accept permanent vacuole	1	AO2 4.1.3.1 4.1.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	meiosis		1	AO1 4.1.3.5 4.4.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	23	do not accept 23 <u>pairs</u>	1	AO1 4.1.3.5 4.4.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.6	sperm contain either an X or a Y (chromosome)	do not accept a sperm contains X and Y chromosomes	1	AO1 4.4.3.2
	sperm with X (chromosome) result in female offspring or sperm with Y (chromosome) results in male offspring		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.7	LH		1	AO1 4.3.1.6

Question	Answers	Mark	AO / Spec. Ref.
09.8	Level 3: A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3 4.3.1.7
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content	0	
	Indicative content effectiveness in perfect use - pill and sterilisation expected to be equally effective - pill / sterilisation expected to be most effective - condom expected to be least effective - condom (approximately) 1% less effective than pill / sterilisation effectiveness with use in real life - condom is least effective in real life - sterilisation is most effective or more effective than the pill / condom - pill is more effective than the condom - condom shows 6% difference to the pill - condom shows 12% difference to the sterilisation - pill shows 6% difference to the sterilisation difference in effectiveness between perfect use and use in real life - condom less effective in real life than with perfect use - pill less effective in real life than with perfect use - male sterilisation no difference - condom shows greatest difference between perfect and real use - condom shows 11% difference between perfect and real use - pill shows 6% difference between perfect and real use reasons for differences and other considerations - condoms splitting - forgetting to take pill - food poisoning affecting effectiveness of pill - only condom protects against sexually transmitted diseases - surgical sterilisation is (generally) permanent For Level 3, answers must compare the effectiveness of all three methods and must include use of comparative data.		

Total Question 9	18
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Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	measuring cylinder	allow burette allow volumetric beaker / flask	1	AO3 4.1.4.3 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.2	thermometer A can measure smaller temperature changes	allow thermometer A has a better resolution allow thermometer A is more accurate	1	AO3 4.1.4.3 RPA6
	thermometer A is easier to read or no parallax error when taking readings using thermometer A	allow thermometer B is more difficult to take readings from ignore thermometer A is digital	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.3	cans had different start temperatures		1	AO3 4.1.4.3 RPA6
	(so) two variables were being changed or start temperature and colour of can was being changed or initial temperature should be a control variable or water temperature affects rate of infrared emission	ignore no repeat readings	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.4	the datalogger recorded readings more frequently than a student could		1	AO3 4.1.4.3 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.5	at the start of the investigation		1	AO3 4.1.4.3 RPA6
	temperature changes most quickly or gradient of line is greatest	MP2 dependent on MP1 allow temperature difference between can and surroundings is greatest allow temperature (of can) is greatest	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.6	line starting at 80 °C, above existing line and similar curved shape	ignore any part of line drawn beyond 5 minutes	1	AO3 4.1.4.3 RPA6

Total Question 10	9
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