



GCSE COMBINED SCIENCE: SYNERGY 8465/1F

Foundation Tier Paper 1 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	particles are arranged randomly		1	AO1 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	particles move randomly		1	AO1 4.1.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	force		1	AO1 4.1.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	temperature increase = $\frac{31\,500}{0.25 \times 4200}$		1	AO2 4.1.1.4
	temperature increase = 30 (°C)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	(mean speed of gas particles) increased		1	AO1 4.1.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	(mean kinetic energy of the gas particles) increased		1	AO1 4.1.1.3

Total Question 1	7
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Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	the inks were insoluble in water		1	AO3 4.2.2.4 RPA9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	any one from: • wear (safety) goggles • do not use near flames	allow wear safety glasses ignore wear glasses unqualified allow use a fume cupboard	1	AO1 4.2.2.4 RPA9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	a pencil line will not move up the paper		1	AO3 4.2.2.4 RPA9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	C		1	AO3 4.2.2.4 RPA9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	24 (mm)		1	AO2 4.2.2.4 RPA9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	$(R_f =) \frac{24}{80}$	ecf from question 02.5	1	AO2 4.2.2.4 RPA9
	= 0.3	if no other mark awarded, allow 1 mark for $\frac{2.4}{80} = 0.03$	1	

Total Question 2	7
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Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	the number of neutrons in an atom		1	AO1 4.1.2.4

Question	Answers	Mark	AO / Spec. Ref.
03.2	Type of radiation Beta Gamma Description A neutron An electron from the nucleus Electromagnetic radiation do not accept more than one line from a box on the left	1 1	AO1 4.3.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	gamma		1	AO1 4.3.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	alpha		1	AO1 4.3.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	concrete		1	AO1 4.3.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	$\text{Cs} \rightarrow \text{Ba} + \beta$		1	AO1 4.3.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	the half-life of xenon-133 is less than the half-life of iodine-131		1	AO3
	time for radiation emitted to reach half of initial value is less (for xenon)	MP2 dependent on MP1 allow time to fall from 200 000 to 100 000 is less (for xenon) allow half-life of xenon is 5 days and half-life of iodine is 8 days	1	AO2 4.3.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.8	less than one half-life has occurred since the accident		1	AO3 4.3.2.3

Total Question 3	10
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Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	photosynthesis		1	AO1 4.2.2.5 4.4.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	penguin		1	AO2 4.4.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	more penguins	allow penguin population will increase allow penguin population will not decrease (as much)	1	AO3
	(because) fewer penguins will be eaten	allow (because) fewer / no penguins will be eaten / hunted / predated	1	AO2
	(so) more krill will be eaten		1	AO2 4.4.2.1 4.4.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	a new pathogen		1	AO1 4.4.2.3
	lack of food		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	competition		1	AO2 4.4.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	1.8 (m ²)		1	AO2 4.4.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	$\frac{122\,400}{1.8}$	ecf from question 04.6	1	AO2 4.4.2.4
	68 000	if no other mark awarded, allow 1 mark for $\frac{122400}{18000} = 6.8$	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.8	a quadrat		1	AO1 4.4.2.4 RPA12

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.9	to investigate the distribution of a population		1	AO1 4.4.2.4 RPA12

Total Question 4	13
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Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	in the head		1	AO1 4.2.1.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	ovary		1	AO1 4.3.1.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	$\frac{4500}{250}$		1	AO2 4.3.1.6
	18	allow 1 mark for $\frac{4500}{265} = 16.98\dots$ or $\frac{4500}{265} = 17$	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	greater		1	AO2 4.3.1.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	chemical Y could contaminate drinking water		1	AO3 4.4.1.8 4.4.2.6
	chemical Y could get into food		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	not being able to recover from infections		1	AO2 4.3.3.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.7	phagocytosis		1	AO1 4.3.3.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.8	enzymes		1	AO1 4.3.3.4 4.2.1.5

Total Question 5	10
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Question 6

Question	Answers	Mark	AO / Spec. Ref.
06.1	Part of a plant Function Guard cell Meristem Root hair Changes shape to open stoma Grows new tissue Moves starch into the leaves Takes water into the plant do not accept more than one line from a box on the left	1 1 1	AO1 4.2.2.1 4.2.2.2 4.2.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	blocking phloem reduces the transport of substances in the tree		1	AO2 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	destroy infected orange trees immediately		1	AO2 4.2.2.8
	wash hands after touching infected orange trees		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	blue		1	AO1 4.2.1.5 RPA7
	red / orange	allow brown / yellow / green	1	

Question	Answers	Mark	AO / Spec. Ref.
06.5	Level 2: The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	3–4	AO1 4.2.1.5 RPA7
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content • place beaker of water on gauze • place Bunsen burner under gauze • boil water or heat to at least 60 °C • turn off Bunsen burner • mix drink with Benedict's solution (in test tube) • use approximately the same volumes of drink and Benedict's solution • place test tube in hot water • for 5 minutes (allow range 2 minutes to 10 minutes) • record the colour of the mixture (in the tube)		
Total Question 6		12	

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	fewer amino acids will break down to form urea		1	AO2 4.2.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	purple		1	AO1 4.2.1.5 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	(carbohydrate) greater (mass in wholemeal bread)	allow converse if clearly referring to low-protein bread ignore nutrients unqualified ignore numbers	1	AO2 4.2.1.5
	(lipids) less (mass in wholemeal bread)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	$\frac{30}{100} \times 40$	allow 0.3×40	1	AO2 4.2.1.5
	12 (g)	allow 1 mark for $\frac{41}{100} \times 40 = 16(.4)$ (g)	1	

Question	Answers	Mark	AO / Spec. Ref.
07.5	Level 2: Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6	AO1 4.2.1.5 4.2.1.1 4.1.3.3 4.3.1.5
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–3	
	No relevant content	0	
	Indicative content break down of carbohydrates • mixed with saliva and chewed • saliva contains carbohydrase / amylase • carbohydrase / amylase in small intestine • carbohydrase / amylase breaks down starch / carbohydrates • starch / carbohydrates broken down into glucose / sugar break down of lipids • lipase • break fats / oils / lipids into fatty acids • break fats / oils / lipids into glycerol absorption and transport • absorption through walls of gut • transport by blood uses • respiration • (which) releases energy • for building larger molecules • growth • movement • keeping warm • active transport • storage • as glycogen / lipids For Level 2, answers must describe the digestion and the use of carbohydrates / lipids.		
Total Question 7		12	

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	any one from: - temperature - water (content of the body / blood)	allow pH allow ions / salt allow carbon dioxide allow oxygen allow blood pressure	1	AO1 4.3.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	7.8 – 4.0		1	AO2 4.3.1.5
	3.8 (arbitrary units)	allow a correct calculation using an incorrect reading of the peak value	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	all points (from 70 minutes to 120 minutes) plotted correctly	allow a tolerance of $\pm \frac{1}{2}$ a small square allow 1 mark for 4 or 5 correct plots	2	AO2 4.3.1.5
	curved line of best fit drawn through points	ignore line extended beyond 120 minutes ignore line joined point to point with straight lines	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	(pancreas releases / produces) insulin	do not accept glucose is broken down to glycogen	1	AO1 4.3.1.5
	glucose moves from blood to muscle / liver / cells or glucose is converted to glycogen (in muscles / liver)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	glycogen		1	AO1 4.3.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.6	(more) exercise	allow example of (more) exercise	1	AO1 4.3.1.5
	eat less carbohydrate / sugar or eat a low carbohydrate diet	allow eat less fat allow eat a carbohydrate controlled diet allow correct drug treatment eg metformin ignore insulin (injection) ignore references to healthy / balanced diet or diet unqualified if no other marks awarded allow 1 mark for lose weight or maintain healthy weight or eat less or eat fewer calories	1	

Total Question 8	11
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Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	(number of electrons) 79		1	AO2 4.1.2.3 4.1.2.4
	(number of neutrons) 118		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	two neutrons and two protons	allow the nucleus of a helium atom ignore symbols representing an alpha particle	1	AO1 4.3.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	(total number of alpha particles = 132 000 + 40 500 + 196 =) 172 696		1	AO2 4.1.2.1
	(percentage =) $\frac{196}{172\,696} \times 100$	all subsequent marks may be awarded using an incorrectly determined total number of alpha particles	1	
	= 0.113 (%)	allow 0.11349... correctly rounded to 2 or more significant figures	1	

Question	Answers	Mark	AO / Spec. Ref.
09.4	Observation Most alpha particles passed straight through the gold foil Some alpha particles changed direction Conclusion Atoms have a charged nucleus Atoms are mostly empty space Atoms contain neutral sub-atomic particles The mass of electrons is less than the mass of atoms do not accept more than one line from a box on the left	1 1	AO1 4.1.2.1
Total Question 9		8	

Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	the mutation could stop cells producing a protein		1	AO2 4.4.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.2	(white lions are) less camouflaged	allow white colour may lead to rejection (by other lions) allow more likely to be seen by prey / predators	1	AO2 4.4.2.1 4.4.4.2
	(so) less likely to catch food	allow (so) more likely to be shot / hunted / captured / attacked / killed	1	
	(so) less likely to (survive and) breed / reproduce or (so) less likely to pass on allele for white fur	allow fewer white lions to breed / reproduce ignore (so) less likely to survive unqualified	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.3	(parents gamete genotypes shown)	if neither mark awarded allow 1 mark for parent gamete genotypes reversed	1	AO2
	(heterozygous male) B b			
	(homozygous recessive female) b b		1	AO2
	(possible offspring genotypes correctly derived) Bb Bb bb bb	allow correct derivation of offspring genotypes from incorrect gametes allow 3 correct offspring genotypes for 1 mark	2	AO2
	correct identification of: Bb as brown and bb as white	if derivation not correct and shows BB and Bb , both must be identified as brown	1	AO2
	probability must match derived offspring genotypes	allow correct probability from incorrectly derived offspring if no derivation shown allow 0.5 or 50% or 1 in 2 or 1:1 or ½ do not accept 1:2	1	AO3 4.4.3.3 4.4.3.4
Total Question 10			10	