GCSE
COMBINED SCIENCE: TRILOGY
8464/B/1H

Biology Paper 1H

Mark scheme

June 2025

Version: 1.0 Final

256G8464/B/1H/MS

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

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 <u>not</u> 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.

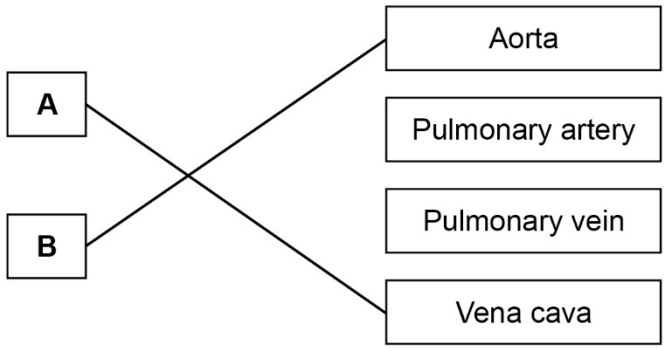
You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

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	Mark	AO / Spec. Ref.
01.1	**Blood vessel** **Name**  do **not** accept more than one line from a box on the left	1 1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	F		1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	(more) respiration (in mitochondria)	do **not** accept anaerobic respiration	1	AO2
	(which) releases more energy	allow (muscles) need more energy do **not** accept energy produced / made / created do **not** accept provides more energy for respiration	1	AO2
	(so the heart) muscle <u>contract</u>s		1	AO1 4.2.2.2 4.4.2.1 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	any **two** from: • fast / increased heart rate • fast / increased breathing (rate) • tiredness • pale skin • heart attack • difficulty exercising • difficulty gaining weight	 allow irregular heartbeat ignore shortness of breath allow fatigue allow blue skin (due to poor oxygenation) allow cold / cool skin (to the touch) allow cyanosis allow blood clots allow chest pain allow stroke allow increased sweating allow frequent chest infections allow swelling in legs / feet / abdomen	2	AO3 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	any **two** from: • heavy / internal bleeding • infection • damaging blood vessels • damaging the heart • risk from anaesthetic • risk of rejection (of the mesh / tube)	allow named infection e.g. MRSA ignore risk of disease allow blood clots allow stroke allow heart attack allow irregular heartbeat ignore damage unqualified	2	AO3 4.2.2.2

Total Question 1	**10**

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	touch / contact (with contaminated surfaces / skin / blisters)	allow through droplets / air / coughs / sneezes ignore sexual intercourse	1	AO2 4.3.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(chickenpox) is caused by a virus	allow antibiotics (only) treat bacterial infections allow chickenpox is not caused by bacteria ignore antibiotic resistance	1	AO2 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	inactive / dead / weakened (named) pathogen	allow inactive / dead / weakened virus / bacteria / fungi / microorganism allow proteins / antigens (from the pathogen) allow the mRNA (from the pathogen)	1	AO1 4.3.1.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	(for) toxicity **or** check not poisonous / harmful	allow check for side-effects allow to check it is safe ignore to check it is not dangerous	1	AO1 4.3.1.9
	(for) efficacy **or** to see if it works		1	
	(for) dose **or** how much is needed		1	
		allow interaction with other drugs allow to find out when a booster vaccination would be needed allow to find out how long it offers protection against the pathogen for		

Question	Answers	Mark	AO / Spec. Ref.
02.5	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1 4.2.2.3 4.3.1.6 4.3.1.7
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	
	Level 1: Points are identified, and stated simply but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	
	Indicative content **how a vaccine works (primary):** • white blood cells stimulated / respond • (by) producing antibodies • (antibodies) are specific to microorganism / microbe / virus / chickenpox • (antibodies) bind with antigens • reference to memory cells **when chickenpox virus enters the body (secondary):** o virus / pathogen is destroyed faster / quickly o (because) production of correct antibodies o (because) antibodies are produced sooner o (because) rate of antibody production is faster o (because) more antibodies produced It is acceptable for students to refer to virus / chickenpox / microorganism / microbe for pathogen throughout For **Level 3** primary and secondary responses must be considered		

Total Question 2	**12**

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	10 cm^3 measuring cylinder with intervals of 0.1 ± 0.01 cm^3		1	AO1 4.4.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	*evidence of squaring for **two** distances that double:* (10 cm and 20 cm) 100 **and** 400 **or** (20 cm and 40 cm) 400 **and** 1600 **or** (30 cm and 60 cm) 900 **and** 3600	allow other appropriate values throughout	1	AO2 4.4.1.2 RPA5
	*calculate $1/d^2$ for **two** distances that double:* (10 cm and 20 cm) 0.01 / $\frac{1}{100}$ **and** 0.0025 / $\frac{1}{400}$ **or** (20 cm and 40 cm) 0.0025 / $\frac{1}{400}$ **and** 0.000625 / $\frac{1}{1600}$ **or** (30 cm and 60 cm) 0.001(11…) / $\frac{1}{900}$ **and** 0.00027(77…) / $\frac{1}{3600}$	allow **2** marks for these values without working	1	
	(therefore as distance doubles) light intensity is quartered		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	the rate of oxygen production increases	allow rate of photosynthesis increases ignore the volume of oxygen production increases unqualified	1	AO3
	(because) reactants / particles / molecules / enzymes have greater (kinetic) energy	allow reactants / particles / molecules / enzymes move faster	1	AO2
	(so) collisions are more frequent	allow (so) more collisions in a given time allow (so) more <u>successful</u> collisions	1	AO2 4.2.2.1 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	no / less oxygen (is produced)	allow photosynthesis is stopped / reduced allow the rate of oxygen production is 0 (cm^3/hour)	1	AO3
	(because) enzymes are destroyed	allow the enzymes are denatured allow active site has changed shape do **not** accept the cells / plant / pondweed is denatured do **not** accept the enzymes are killed	1	AO2 4.2.2.1 4.4.1.2

Total Question 3	**9**

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	(takes account of) different starting masses	ignore were not all the same size do **not** accept as a control variable	1	AO2 4.1.3.2 RPA2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	as (total) surface area increases percentage increase in mass increases	allow as one increases, so does the other allow there is a positive correlation	1	AO2 4.1.3.2
	by a decreasing amount	allow description of decreasing amount of increase do **not** accept they are directly proportional	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	water moved in by osmosis	allow water moved in by diffusion do **not** accept (water moves) by active transport	1	AO1 4.1.3.2 RPA2
	(because water moves) from a dilute solution to a concentrated solution (inside the cell / potato)	allow (because water moves) from a high(er) concentration of water to a low(er) concentration of water (inside the cell / potato) allow (because water moves) from a high(er) water potential to a low(er) water potential (inside the cell / potato) allow (because water moves) from a lower concentration (of solute) to a higher concentration (of solute inside the cell / potato) allow (because water moves) down its concentration gradient do **not** accept water moves along / across a concentration gradient	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	all the (groups of) potato pieces had the same percentage change in mass		1	AO2
	(because the) cell walls are completely stretched	allow <u>cells</u> are turgid	1	AO3
	(so) the <u>cells</u> cannot absorb any more water		1	AO3
				4.1.3.2 RPA 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	(change the independent variable to) different concentrations of salt solution		1	AO3 4.1.3.2 RPA2
	do not cut the potato into pieces	allow control the surface area of the potato allow cut into the same number of pieces ignore use the same shape / size	1	

Total Question 4	**10**

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	carbon dioxide		1	AO1 4.4.2.1
	ethanol		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	palisade (mesophyll layer)	ignore reference to cells	1	AO1 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3		ignore name of tissue	1	AO1 4.2.3.1
	(cells / tissue) contain **many** chloroplasts	allow (cells) are closely packed together allow cells / tissue contain a lot of chlorophyll		
	(to) absorb more light for photosynthesis		1	
		allow for **2** marks (cells / tissue) contain **many** chloroplasts to absorb light for photosynthesis		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	(water absorbed from soil by osmosis / diffusion) into / through root hair (cells)		1	AO1
	(water) travels **up** through xylem (vessels) **or** (water) through xylem (vessels) to the leaf	do **not** accept water travels up through the phloem	1	AO1
	(water) moves into the spongy mesophyll / layer by diffusion / osmosis		1	AO2
	(water) lost through stomata		1	AO1
	(water) lost by evaporation / transpiration (to atmosphere)	do **not** accept translocation	1	AO1
		if no other mark awarded allow **1** mark for transpiration stream		4.2.3.2

Total Question 5	**10**

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	any **one** from: • high resolution • high magnification • 3D image • cilia can be seen in detail	 allow a high level of detail ignore subcellular structures can be seen	1	AO3 4.1.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	move / transport egg / embryo / ovum / mucus	ignore move / transport dust / bacteria / pathogens / sperm	1	AO2 4.1.1.3 4.3.1.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	*recall of equation* magnification = $\frac{\text{size of image}}{\text{size of real object}}$	ignore use of equation triangle	1	AO1
	rearrangement of equation size of real object = $\frac{\text{size of image}}{\text{magnification}}$		1	AO2
	substitution $\frac{6}{1.5 \times 10^3}$	allow $\frac{6}{1500}$ allow substitution of incorrectly converted value	1	AO2
	0.004 (mm)	allow answer using incorrectly converted value	1	AO2
	conversion 4 (µm)	allow conversion to µm at any stage	1	AO2 4.1.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	less oxygen (is transported) to cells / tissues / organs / muscles	allow less oxyhaemoglobin transported	1	AO2 4.2.2.3 4.4.2.1 4.4.2.2
	(so) anaerobic respiration produces lactic acid	ignore less aerobic respiration ignore reference to energy	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	*total amount of red blood cells* $(5 \times 10^5 \times 100\,000 =)$ $50\,000\,000\,000$	allow 5×10^{10}	1	AO2 4.2.2.3
	percentage calculation $\frac{50\,000\,000\,000}{100} \times 35$	allow $\frac{5 \times 10^{10}}{100} \times 35$ allow $5 \times 10^{10} \times 0.35$ allow a correctly calculated percentage calculation from an incorrectly calculated number of red blood cells	1	
	$17\,500\,000\,000$		1	
	standard form 1.75×10^{10}	allow correct standard form from an incorrectly calculated number of red blood cells	1	
		alternative route $\frac{35}{100} \times 100\,000 = 35\,000$ (1) $35\,000 \times 500\,000$ (1) $17\,500\,000\,000$ (1) 1.75×10^{10} (1)		

Question	Answers	Mark	AO / Spec. Ref.
06.6	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO2
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	AO3
	Level 1: Relevant points are made. They are not logically linked.	1–2	AO3
	No relevant content	0	4.1.2.3 4.2.2.3

Indicative content

Advantages of blood from stem cells:

- reduces the need for volunteer blood donors
- **only** a small sample of blood is required (to produce the necessary blood cells)
- can produce a large(r) quantity of red blood cells
- (blood cells are all new) so last longer in the patient
- no rejection **or** no need to tissue match
- no ethical objection to receiving blood (because it is from the patient)
- we can produce blood that is a rare / specific blood group / type
- less / no risk of infection (from contaminated blood)

- whole blood donation takes more time / processing to separate the blood into its parts

Disadvantages of blood from stem cells:

- a blood donation is still required
- not tried and tested **or** it is a (relatively) new technology
- white blood cells, plasma and platelets are not collected
- cannot use for other purposes as only red blood cells collected

Costs:

- red blood cells from donation are cheaper than blood from stem cells
- red blood cells from whole donation costs 61 / 62 pence per cm^3
  or
  red blood cells from whole donation costs £6.15 per 10 cm^3
- red blood cells from stem cells cost £1.50 per cm^3

- lab grown blood is 2 / 3 times more expensive than whole blood donation
- (470 cm^3 of red blood cells) from stem cells cost £705
- (211.5 cm^3 of red blood cells) from stem cells cost £317.25
- 211.5 cm^3 of red blood cells from whole donation costs £130

For **Level 3**, advantages and disadvantages for a treatment are needed **and** a reference to costs.
For **Level 2**, advantages / disadvantages for a treatment are needed **and** a reference to costs.
For **Level 1**, relevant points are made.

Total Question 6	**19**