GCSE
COMBINED SCIENCE: TRILOGY
8464/B/1H

Biology Paper 1H

Mark scheme

June 2021

Version: 1.0 Final Mark Scheme

2 1 6 G 8 4 6 4 B 1 H / M S

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.

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
- the Assessment Objectives, level of demand 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

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. Full marks can, however, be given for a correct numerical answer, without any working shown.

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 ecf 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 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.

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 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.

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	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	$6\,CO_2 + 6\,H_2O \rightarrow C_6H_{12}O_6 + 6\,O_2$		1	AO1 4.4.1.1
01.2	distance of the pondweed from the lamp		1	AO1 4.4.1.2 RPA5
01.3	bubbles (of gas) would be produced faster (because) enzymes work faster	allow more / bigger bubbles of gas would be produced (in a given time) allow (because) photosynthesis is controlled by enzymes allow (because) photosynthesis would be faster	1 1	AO3 4.4.1.2 RPA5 AO2 4.2.2.1 4.4.1.2
01.4	any **one** from: • use an LED (lamp) • place a tank / beaker of water between the lamp and tube / pondweed • put the tube in a beaker of water • put the tube in a (thermostatically controlled) water bath • place a piece of glass between the lamp and tube / pondweed	allow use a light that does not emit (a lot of) infrared / thermal radiation allow place a heat shield between the lamp and tube / pondweed	1	AO3 4.4.1.2 RPA5

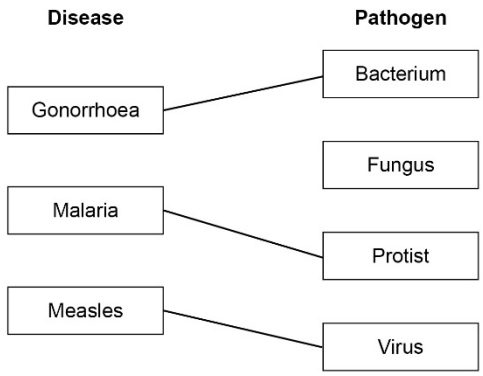
01.5	any **two** from: • measure the volume of gas produced • allow the pondweed time to equilibrate • repeat **and** calculate a mean **or** repeat **and** remove anomalies • control the concentration of carbon dioxide (in the water) • use the same bulb / lamp	 allow amount for volume allow use a cylinder / gas syringe to collect the gas allow a description of this ignore repeat unqualified allow put the pondweed in sodium hydrogen carbonate (solution) **or** sodium bicarbonate (solution) allow use the same type / size / age / piece of pondweed allow record the number of bubbles of gas produced in a longer period of time	2	AO3 4.4.1.2 RPA5
01.6	3 (bubbles of gas produced per minute)	allow 3.2 (bubbles of gas produced per minute) do **not** accept 3.0 (bubbles of gas produced per minute)	1	AO2 4.4.1.2 RPA5
01.7	as light intensity decreases the rate of photosynthesis decreases	allow as distance from lamp increases rate of photosynthesis decreases allow as distance from lamp increases number of bubbles produced decreases	1	AO3 4.4.1.2 RPA5

01.8	all points plotted correctly line of best fit through their points	allow tolerance of ± ½ a small square allow **1** mark for four points plotted correctly do **not** accept line extended to 0, 0 ignore extrapolations of line	2 1	AO2 4.4.1.2 RPA5
01.9	8	allow correct value from their line ± ½ a small square allow value in range 6 to 9 if a curved line of best fit is not drawn	1	AO3 4.4.1.2 RPA5
Total			**13**	

Question	Answers	Mark	AO / Spec. Ref.
02	**Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO1 4.2.2.1 RPA3
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3–4	
	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 **Protein** • grind up food • add Biuret (reagent / solution) **or** add copper sulfate (solution) **and** sodium hydroxide (solution) **or** add Biuret 1 and Biuret 2 • turns purple / lilac **Starch** • add iodine (solution) • turns black / blue-black / dark blue - ignore blue / purple **Sugar** • grind up food • mix with water • add Benedict's (reagent / solution) • heat mixture (≥ 65 °C) • in a water bath • turns (brick) red / orange / brown / green / yellow For Level 3 correct references to all three tests are needed.		
Total		**6**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	releases energy (to the surroundings)	allow transfers (thermal) energy to the surroundings ignore transfers energy unqualified	1	AO1 4.4.2.1
03.2	to keep oxygen out	allow to keep air out allow (because) fermentation is an anaerobic reaction allow to prevent aerobic respiration	1	AO3 4.4.2.1
03.3	to allow the mixture / yeast / cells to reach the temperature	allow to reach 2 °C allow so yeast can equilibrate allow idea that contraction of gas (on cooling) would hinder results collection	1	AO3 4.4.2.1
03.4	(2 °C is) too cold for enzymes / yeast to work (so) no carbon dioxide / gas produced **or** (so) fermentation did not occur **or** fermentation was very slow enzymes become active at 35 °C so carbon dioxide / gas was produced	allow (at 2 °C) few / no collisions (between sugar and enzymes) do **not** accept an incorrect gas allow at 35 °C the enzymes started to work so carbon dioxide / gas was produced	1 1 1	AO2 4.2.2.1 4.4.2.1

03.5	ideal / suitable temperature for enzymes / yeast to work		1	AO1
	(so) carbon dioxide / gas produced (rapidly)	do **not** accept an incorrect gas	1	AO2
	(after time / ≥ 15 minutes) rate / fermentation slowed	allow (after time / ≥ 15 minutes) less gas produced per minute	1	AO2
	(because) sugar / glucose / food began to run out **or** (because) increased concentration of ethanol / alcohol started to kill the cells		1	AO2 4.2.2.1 4.4.2.1
Total			**10**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	 do **not** accept more than one line from a box on the left		1 1 1	AO1 4.3.1.1 4.3.1.2 4.3.1.3 4.3.1.5
04.2	reduces breeding / reproduction (in mosquitos) (so) fewer mosquitos to bite people **or** (so) fewer mosquitos to pass on pathogen / protist	allow fewer (mosquito) eggs fertilised allow no offspring produced (by sterile mosquitos) allow (so) less likely to be bitten by mosquitos ignore fewer mosquitos to pass on malaria / disease	1 1	AO2 4.3.1.1 4.3.1.5
04.3	electron microscope	ignore microscope unqualified ignore scanning / transmission do **not** accept light microscope	1	AO2 4.1.1.5 4.3.1.2

04.4	(fungal spore) (16 μm =) 1.6×10^{-5} m **or** (virus) (2.5×10^{-7} m =) 0.25 μm $\frac{1.6 \times 10^{-5}}{2.5 \times 10^{-7}}$ **or** $\frac{16}{0.25}$ (=) 64	 allow $\frac{0.000\,016}{0.000\,000\,25}$ allow incorrect attempt at conversion or not converted value for length correctly substituted allow a correctly calculated value using an incorrectly or not converted value for length allow **1** mark **only** for $\frac{16}{2.5} = 6.4$	1 1 1	AO2 4.1.1.1 4.1.1.5 4.3.1.2 4.3.1.4

04.5		the idea of less is only needed once		
	discolouration in leaves **or** less chlorophyll in leaves	ignore mosaic pattern of leaves unqualified	1	AO1
	(so) reduced photosynthesis	allow less light absorbed	1	AO1
	(so) less glucose produced so less amino acids / proteins / cellulose made	allow (so) less glucose so less energy for synthesis of chemicals **or** allow (so) less glucose for respiration (so) less energy transferred for growth	1	AO2 4.3.1.2 4.4.1.1 4.4.1.2 4.4.1.3 4.4.2.1

Total			**12**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	D		1	AO2 4.2.2.2
05.2	C		1	AO3 4.2.2.2
05.3	right atrium → right ventricle → pulmonary artery		1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.		5–6	AO3
	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	AO1
	No relevant content		0	
	Indicative content Advantages of statins • easy to take **or** not invasive (procedure) • decrease blood cholesterol • slow down build-up of fatty materials in arteries • maintain blood flow to heart muscle cells • low cost (compared to stent operation) Disadvantages of statins • might be side effects of drug eg muscle pain • effects take time to happen • drug will need to be taken long term • might forget to take drug Advantages of stent • blocked artery is held open • blood flow to heart muscle cells is increased • stent will remain in place for a long time • effect of stent is immediate • rapid recovery from operation Disadvantages of stent • risk of infection from operation • risk of surgery eg heart attack **or** bleeding • risk of thrombosis **or** blood clot For Level 3, arguments for and against **both** treatments are needed.			4.2.2.4

05.5	heart (muscle) cannot contract / pump as effectively / powerfully (so) less blood pumped out of heart **or** to body (on each beat / contraction) (so) less oxygen (reaches cells / body) for (aerobic) respiration (so) breathing rate increases to supply more oxygen **or** (so) breathing rate increases to repay oxygen debt	allow heart (muscle) is not as strong ignore reference to rate of blood flow allow (so) more anaerobic respiration allow (so) breathing rate increases to break down lactic acid	1 1 1 1	AO2 4.2.2.2 4.2.2.4 4.4.2.1
05.6	stem cells are undifferentiated cells (therefore) can form heart (muscle) cells	allow stem cells can differentiate allow stem cells can develop into different types of cell ignore stem cells can become specialised ignore stem cells are not specialised allow (therefore) can form muscle cells	1 1	AO1 AO2 4.1.2.3 4.2.2.4
05.7	any **two** from: • cells will not be rejected • no risk of damage to embryo • adult can give consent	allow converse if clearly referring to embryonic stem cells allow no (potential) human life destroyed / damaged ignore unethical unqualified ignore religion unqualified	2	AO3 4.1.2.3
Total			**17**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	(absorbed from soil) by osmosis through root hair (cells)	allow (absorbed from soil) by diffusion through root hair (cells)	1	AO1 4.1.3.2 4.2.1 4.2.3.1 4.2.3.2
	travels through xylem (vessels) to the leaves	ignore travels upwards in the xylem unqualified	1	
	lost through <u>stomata</u> (to atmosphere)		1	
	idea of driven by evaporation / transpiration	ignore evaporation / transpiration unqualified	1	
06.2	translocation		1	AO1 4.2.3.2
06.3		allow sap for dissolved sugars		
	have pores in the end walls		1	AO1
	(so) dissolved sugars / food / contents can move from cell to cell		1	AO2
	or			4.1.1.3 4.2.1 4.2.3.1 4.2.3.2
	no nucleus **or** few / no sub-cellular structures (1)	allow few / no organelles ignore cells are empty		
	to maximise space for movement of dissolved sugars / food / contents (1)			
		allow thick / rigid cell wall (1) to withstand pressure inside cell (1)		

06.4	any **one** from: (the process): • requires energy • is an active process • uses active transport		1	AO3
	(reason) cells have many mitochondria		1	AO2
		allow flow of dissolved sugars / food in sieve tube cell is not impeded (1) (reason) companion cell is flattened (1)		4.1.1.2 4.1.1.3 4.1.3.3 4.2.3.1 4.2.3.2 4.4.2.1

06.5		allow glucose for sugar		
	sugars are made in the leaves by photosynthesis	allow sugars are not made in the root / meristems (by photosynthesis)	1	AO1
	<u>all</u> cells / tissues need sugar for respiration	allow <u>every</u> cell / tissue needs sugar for respiration allow whole plant needs sugar as an energy source	1	AO2
	(sugars) transported to meristems for growth / cell division / mitosis **or** (sugars) transported for storage as starch / fat / oil		1	AO2 4.2.1 4.2.3.1 4.2.3.2 4.4.1.3 4.4.2.3

Total			**12**