GCSE
COMBINED SCIENCE: TRILOGY
8464/B/1H

Biology Paper 1H

Mark scheme

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2 3 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 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 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	Extra information	Mark	AO / Spec. Ref.
01.1	cancer		1	AO1 4.2.2.7 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	any **one** from: • (coronary) heart disease / CHD / cardiovascular disease • diabetes	ignore cancer allow atherosclerosis ignore heart attack allow high blood pressure allow stroke / asthma / depression / gallstones / (osteo)arthritis allow sleep apnoea	1	AO1 4.2.2.4 4.2.2.5 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	any **one** from: • taxes on high energy / fat / sugar foods • education (about diet and health) • (government) advertising • restrict media advertising of high energy / fat / sugar foods • information on food labels • help / advice / groups for obese people via the NHS • calorie information on restaurant / takeaway menus • regulation of supermarket offers on high sugar / fat / energy foods • regulation of type of foods for sale near checkouts • exercise campaigns	allow increase the price on high energy / fat / sugar foods	1	AO3 4.2.2.5 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	BMI = $\frac{69}{1.64^2}$	allow BMI = $\frac{69}{1.64 \times 1.64}$ allow BMI = $\frac{69}{2.6896}$	1	AO2
	BMI = 25.6(5437….)	allow 26 or 25.7	1	AO2
	(the person's BMI category is:) overweight	must be consistent with their calculated BMI value	1	AO3 4.2.2.5 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	any **one** from: • women will gain mass / weight (during pregnancy) • (developing) baby will increase mass / weight of woman	allow BMI (of woman) will increase (during pregnancy)	1	AO3 4.2.2.5 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	any **two** from: • smokers had babies with lower birth mass • women / smokers / non-smokers with higher BMI had heavier babies • smoking had the greatest effect on birth mass in underweight women • smoking had the least effect on birth mass in overweight women • smoking had less effect on birth mass in overweight and obese women (than in underweight and healthy weight women)	statements must be comparative allow converse statements allow weight for mass allow obese women have the heaviest / heavier babies allow underweight women have the lightest / lighter babies allow there is only a 365 g difference between the smallest and largest babies	2	AO3 4.2.2.5 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7		assume 'it' refers to the virus		AO1 4.3.1.1 4.3.1.2
	coughs / sneezes (spread virus in droplets)	allow breathing out (spreads virus in droplets)	1	
	droplets / virus are inhaled	allow droplets / virus are breathed in ignore contact with infected person unqualified allow touch a contaminated surface **and** then touch your mouth / nose / eyes for **1** mark if no other marks awarded allow kissing for **1** mark only	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.8	$\frac{17}{100}$ × 67 961 900	allow 0.17 x 67 961 900	1	AO2 4.3.1.4
	= 11 553 523	allow 11 553 500	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.9	any **one** from: • dry feet thoroughly (after washing) • do not share socks / tights / shoes / towels • use a fungicide • do not walk around barefoot in public / contaminated areas	allow use foot powder ignore keep feet dry ignore wash feet regularly allow named fungicide allow wear silver(-impregnated) socks allow wear flip flops in public / contaminated areas ignore avoid moist conditions	1	AO2 4.3.1.1 4.3.1.4

Total Question 1	**14**

Question 2

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	AO2
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	AO1
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	AO1
	No relevant content	0	

	Indicative content Method 1 • place ruler on (microscope) stage • focus on (scale on) ruler • measure diameter / width of field of view • in millimetres • replace ruler with slide • focus on cells • use same magnification • estimate / count number of cells that fit (lengthwise) across field of view • (to calculate mean length of onion cells): divide diameter / width of field of view by (estimated) number of cells **or** divide diameter / width of field of view by 3 cells Method 2 • focus on cells • note magnification • take a photograph of the image • calculate a mean: o measure length of several cells (3 or more) cells on the photograph o add all image lengths together and divide total by number of cells (to calculate mean cell image length) OR o measure the length of one cell o calculate the real size o repeat for other cells (3 or more) o calculate the mean real size • (mean) size of real cell = (mean cell) image size / magnification General points • focus under low power first • using focusing knob • then focus at ×100 magnification • reference to how total magnification is calculated • equation: (mean) size of real cell = (mean cell) image size / magnification For **Level 2** attempt at a method to measure cells plus an indication of how to calculate mean length For **Level 3** suitable method and calculation of mean length		4.1.1.2 4.1.1.5 RPA1

Total Question 2	**6**

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	right ventricle pumps blood to the lungs left ventricle pumps blood around / to the body	allow right side of heart pumps blood to the lungs allow left side of heart pumps blood to the body if no other marks awarded allow **1** mark for: (two circuits / pumps) one from heart to lungs **and** one from heart to body **or** blood passes twice through heart on each circuit	1 1	AO1 4.2.1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	right atrium		1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	pulmonary artery		1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	valves prevent backflow of blood	allow valves prevent blood from flowing in the wrong direction	1	AO1
	(because) blood (in veins) is at lower pressure / force (than in arteries)	allow (because) blood travels more slowly (through veins than arteries) allow converse statements eg blood in arteries is at higher pressure (1) (so) do not need valves to prevent backflow (1)	1	AO3 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	any **two** from: • lumen in vein is wider (than in an artery) • (wall of vein) has a thinner layer of muscle (tissue) • (wall of vein) has a thinner layer of elastic tissue	answers must be comparative allow converse statements ignore reference to valves if neither mark awarded allow **1** mark for: veins have thinner walls (than arteries) do **not** accept reference to cell wall	2	AO1 4.2.2.2

Total Question 3	8

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	A		1	AO1 4.2.1 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	has (large) air spaces (between cells)	allow has (large) gaps (between cells)	1	AO1 4.2.1 4.2.3.1
	(so) gases can diffuse / move through the leaf	allow carbon dioxide **or** oxygen **or** water vapour for gases	1	
	to / from the photosynthetic / palisade / B layer	allow to / from the upper mesophyll if named gas given for mp 2 direction of movement must be correct if no other marks awarded allow **1** mark for cells have chloroplasts for photosynthesis	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3		reason must correctly match the structure		AO1 4.2.1
	composed of hollow tubes / cells	allow cells are empty allow no cytoplasm / nucleus / sub-cellular structures	1	4.2.3.1 4.2.3.2
	(so) no obstruction to water flow	allow (so) water flows easily if linked to hollow tubes allow to maintain the transpiration stream	1	
	OR			
	has lignin (1)	ignore has thick walls		
	(to) hold tubes open (1) **or** (to) strengthen the tubes	allow (to) keep water inside xylem allow (to) make tubes rigid		
	OR			
	no end walls (1)			
	(so) water flows easily (1) **or** (so) water flows continuously	must be linked to an adaptation allow (so) maintains a constant water flow allow to maintain the transpiration stream		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	water enters (guard) cells by osmosis	allow water enters (guard) cells because the concentration of water is higher outside the cell than inside the cell	1	AO2
	cells swell and curve (to open the stoma)	allow cells become turgid and curve (to open the stoma) allow inner wall of (guard) cell is thicker / stronger **or** less flexible than outer wall so cells curve (to open stoma)	1	AO3 4.1.1.2 4.1.1.3 4.1.3.2 4.2.3.1 4.2.3.2

Total Question 4	**8**

Question 5

Question	Answers	Mark	AO / Spec. Ref.
05	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO2
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO1
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO1
	No relevant content	0	

	Indicative content **Bright light:** • rate of photosynthesis is high due to high light intensity • (extra) carbon dioxide is absorbed from the air • (so) oxygen is released into the air • carbon dioxide produced in respiration is used for photosynthesis • (so) no carbon dioxide released from plant **or** into the air • sufficient oxygen for respiration is produced by photosynthesis • (so) no extra oxygen absorbed from the air • rate of photosynthesis is greater than rate of respiration **Dim light:** • no net / overall flow / exchange of carbon dioxide or oxygen with the air • (because) rate of respiration equals rate of photosynthesis • carbon dioxide produced in respiration is used for photosynthesis • no (extra) carbon dioxide is absorbed from the air • oxygen produced by photosynthesis is used in respiration • no (extra) oxygen is absorbed from the air **No light:** • no photosynthesis occurs as no light • (so) no carbon dioxide is absorbed and no oxygen released / produced • plant respires so takes in oxygen and releases carbon dioxide into the air **General points:** • plants photosynthesise when there is light using carbon dioxide and producing oxygen • rate of photosynthesis depends on light intensity • respiration occurs at all times of the day • respiration uses oxygen and produces carbon dioxide **Level 3** response must include explanation at all three light intensities, demonstrating a good understanding of both photosynthesis **and** respiration. For **Level 2** correct reference to **both** processes **and** to **both** gases		4.4.1.1 4.4.1.2 4.4.2.1

Total Question 5	**6**

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	starch (molecules) are large / insoluble (so) cannot be absorbed (into the blood)	 allow (so) cannot pass through the wall of the (small) intestine / gut allow (so) cannot diffuse into the blood allow sugar (molecules) are small / soluble (1) (so) can be absorbed into the blood **or** (so) can pass through the wall of the (small) intestine / gut (1)	1 1	AO1 4.2.2.1 4.4.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	(10 cm^3 dilute) iodine solution and (1 cm^3 of) water	allow (10 cm^3 dilute) iodine solution allow water ignore iodine unqualified	1	AO3 4.2.2.1 RPA3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	percentage of light passing through the liquid decreased with increasing starch concentration	allow the more concentrated the starch (suspension) the less light could pass through	1	AO2 4.2.2.1 RPA3
	(because iodine) solution was darker (in colour)	allow (iodine) solution was blacker allow the more (insoluble) starch the more cloudy the mixture	1	
	(so) absorbed more light	ignore less light passes through	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	any **one** from: • to allow them to reach 37 °C • so they would be at the optimum / same temperature	allow to allow them to reach body temperature allow to equilibrate	1	AO3 4.2.2.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	6.6 (g/dm^3)	allow answer in range 6.5 to 6.7 (g/dm^3)	1	AO2 4.2.2.1 RPA3
	6.6 – 0.3 **or** 6.3 (g/dm^3)	allow correctly calculated value consistent with range allowed in step 1	1	RPA4
	$\frac{6.3}{3}$	allow correct subtraction of answer to step 1 minus 0.3 for 6.3 in this equation	1	
	2.1 (g/dm^3 per minute)	allow correctly calculated rate using incorrectly calculated value for 6.3 if no other marks awarded allow **1** mark for the concentrations 1.8 **and** 0.8 (g/dm^3)	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	(at pH 1) shape of active site would be altered	allow (at pH 1) enzyme / amylase would be denatured	1	AO2
	(so) starch would not be digested	allow (so) enzyme / amylase would not work allow (so) no reaction would occur allow (so) reaction would be (a lot) slower	1	AO2
	(so) percentage of light passing through liquid would stay at 10	allow (so) percentage of light passing through liquid would not change / increase	1	AO3 4.2.2.1 RPA3 RPA4

Total Question 6	**14**

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	any **one** from: • plasmid • chromosome • DNA / genes	 do **not** accept nucleus allow alleles allow genetic material	1	AO2 4.1.1.1 4.1.2.1 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	 no clear area (around C and E) (so) no bacteria killed (by antibiotic)	if no letters are given assume they are referring to antibiotics C and E allow (so) antibiotic did not work	 1 1	AO2 AO3 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	increased the concentration of antibiotic clear area seen (around disc) **or** bacteria (around disc) killed	allow increased the dose of antibiotic ignore increased the volume of antibiotic ignore left it longer ignore used a different temperature ignore used a different sized disc mark dependent on describing a change to the method	1 1	AO3 AO2 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	the treatment injected around the implant		1	AO2 4.1.2.3 4.3.1.3 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	any **one** from: (stem cells from fat tissue) • easier to obtain • less invasive	ignore reference to cost allow quicker to obtain allow fewer side effects allow less painful ignore reference to rejection	1	AO3 4.1.2.3 4.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	by diffusion concentration of antibiotic lower inside cells than in solution **or** concentration of antibiotic higher in solution than inside cells	no marks if incorrect process selected allow 'it' for antibiotic allow correct reference to concentration gradient	1 1	AO2 4.1.1.2 4.1.2.3 4.1.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7	0.09 to 0.31	allow 0.31 to 0.09	1	AO2 4.1.2.3 4.3.1.1 4.3.1.3 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.8	any **two** from: **Pros:** stem cells containing antibiotic had: • smallest area of infection (**:** total tissue area) • small(est) range of results • no overlap with unreactive solution (suggesting significant effect)		2	AO3
	any **two** from: **Cons:** • only tested on 5 patients • some results for antibiotic treatment similar to stem cells containing antibiotic • some results for stem cell treatment similar to stem cells containing antibiotic • age / health of patients not controlled • only tested on one type of bacterium • only tested on one type of implant • only collected results after 7 days • may lead to antibiotic resistance (in *S. aureus* bacteria) • rejection of stem cells • need donors for stem cells • allergic reaction to antibiotic	allow small sample size ignore only tested on one infection ignore cost ignore religion ignore use of embryonic stem cells ignore references to viruses ignore side effects unqualified	2	AO3 AO2 4.1.2.3 4.3.1.1 4.3.1.3 4.3.1.8

Total Question 7	**14**