GCSE
COMBINED SCIENCE: TRILOGY
8464/B/1H

Biology Paper 1H

Mark scheme

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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.

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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 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	concentration of the sugar solution		1	AO1 4.1.3.2 RPA 2
01.2	gained <u>water</u> (water moves) by osmosis **or** (because) concentration of water outside the potato is greater than inside the cells / potato	 allow converse statements (because) concentration (of sugar solution) inside the potato is greater than outside the potato / cells	1 1	AO2 AO1 4.1.3.2 RPA 2
01.3	all points correctly plotted line of best fit drawn as a curve through all the points	allow ± ½ a square ignore extrapolation of curve	1 1	AO2 4.1.3.2 RPA 2
01.4	correct reading from their graph	allow ± ½ a square allow answer in range 0.23 to 0.24 (mol/dm^3) if no line drawn	1	AO3 4.1.3.2 RPA 2

01.5	$\frac{0.25 \times 100}{7.96}$ = 3.14(070352) 3.14 (%)	allow $\frac{(8.21-7.96) \times 100}{7.96}$ allow correct rounding to 3 sig figs of an incorrectly calculated percentage change	1 1 1	AO2 4.1.3.2 RPA 2
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	amylase	allow phonetic spelling allow carbohydrase do **not** accept amylose	1	AO1 4.2.2.1
02.2	small intestine		1	AO1 4.2.1 4.2.2.1
02.3	any **one** from: • greater magnification • higher resolving power	allow can see (smaller) sub-cellular structures / parts allow can see more detail (inside cells) allow reference to 3-D images	1	AO1 4.1.1.5
02.4	capillary		1	AO2 4.2.2.1 4.2.2.2
02.5	$20 = \frac{\text{image length}}{0.8}$ image length = 0.8 x 20 image length = 16 (mm)		1 1 1	AO2 4.1.1.5 RPA 1
02.6	diffusion		1	AO3 4.1.3.1
02.7	active transport	allow active uptake	1	AO3 4.1.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	any **one** from: • respiration • to form glycogen • to make amino acids / proteins	allow as an energy source do **not** accept to make / use / create / produce energy allow to make lipid / fat	1	AO1 4.4.2.1 4.4.2.3
02.9	**Level 2:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.		3–4	AO2 4.1.1.3 4.1.3.1 4.1.3.3 4.2.2.1
	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 • have (many) microvilli • (to) increase surface area • wall of villus only one cell thick **or** is thin • capillaries are close to surface • (so) short pathway • good blood supply • (to) transport food molecules away **or** to the body • (and) maintain a diffusion gradient • cells have many mitochondria • (where) respiration takes place • (where) energy is transferred • (as) active transport requires energy • energy is needed to absorb sugar / food / molecules For Level 2 must make links between structure and it's function			
Total			**14**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **one** from: • (Type 2) diabetes • (coronary / ischaemic) heart disease / CHD • high blood pressure • cancer • depression	ignore obesity do **not** accept Type 1 diabetes allow cardiovascular disease ignore heart attack / failure allow (osteo)arthritis	1	AO1 4.2.2.5 4.2.2.6
03.2	$27 = \frac{68.1}{\text{height}^2}$ $\text{height}^2 = 68.1 \div 27$ **or** $\text{height}^2 = 2.522(\text{r}) / 2.52 / 2.5$ height = 1.59 (m)	allow height = $\sqrt{\frac{68.1}{27}}$ **or** allow height = $\sqrt{2.522(\text{r})}$ allow a correctly rounded value if 2.5 is given in step 2 allow an answer of 1.58 (m)	1 1 1	AO2 4.2.2.5 4.2.2.6
03.3	overweight	answer must be consistent with height calculated in **03.2**	1	AO3 4.2.2.5 4.2.2.6

03.4		max **2** marks if refer to energy being made / used / produced / created allow reference to calories / joules for energy		AO2 4.2.2.5 4.2.2.6 4.4.2.2 4.4.2.3
	any **three** from:		3	
	• increased energy intake if more food eaten	allow increased energy intake if more fat / carbohydrate eaten allow converse allow energy taken in when you eat		
	• if exercise more, more energy is transferred / released	allow if exercise more, respiration / metabolism increases **or** is faster allow converse allow energy is transferred during exercise do **not** accept energy is burnt during exercise		
	• if more energy is taken in than is transferred body mass increases **or** if less energy is taken in than is transferred body mass decreases	allow if less energy is transferred than is taken in body mass increases **or** if more energy is transferred than is taken in body mass decreases		
	• if energy intake = energy transferred body mass stays the same			
		if no marks are awarded allow **1** mark for food eaten can increase body mass **and** exercise can decrease body mass **or** allow **1** mark for if a lot of food is eaten **and** little exercise is done body mass increases allow converse		

Question	Answers	Mark	AO / Spec. Ref.
03.5	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1 4.4.2.1 4.4.2.2
	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 **During exercise:** • increased breathing rate • increased breath volume • (to) take in more oxygen for (aerobic) respiration • (and) exhale more carbon dioxide • increased heart rate • (so) increased blood flow (to muscles) • (to) transport oxygen / glucose to respiring cells faster • (and) increase rate of carbon dioxide removal • glycogen converted to glucose • insufficient oxygen supplied (during prolonged vigorous exercise) • (so) lactic acid is formed (during anaerobic respiration) • (and) an oxygen debt is created • (lactic acid causes) muscles become fatigued / tired **or** (causes) muscles to stop contracting efficiently • allow reference to sweating **or** increased body temperature **or** vasodilation (during or after exercise) **After exercise:** • heart rate remains high **or** heart rate slowly decreases • continue to breathe rapidly **or** breathing rate slowly decreases • (to) pay back oxygen debt • oxygen debt is the amount of oxygen needed to break down lactic acid • (and to) provide more oxygen to react with the lactic acid and remove it from cells • (some) lactic acid transported to liver • (lactic acid) is converted back into glucose For Level 3 need reference to: • changes during **and** after exercise • lactic acid **and** its removal.		

Total			14

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	any **four** from: • bacterial cell is smaller (than a plant cell) • bacterial cell does **not** have chloroplasts (plant cell does) • bacterial cell does **not** have its DNA / genetic material inside a nucleus (plant cell does) • bacterial cell (may) have plasmids (plant cell does not) • bacterial cell does **not** have mitochondria (plant cell does) • cell wall in bacterial cells is **not** made of cellulose (cell wall in plant cells is) • bacterial cell does **not** have a large / permanent vacuole (plant cell does) • bacterial cell has smaller ribosomes (than plant cells)	allow converse statements 'it' refers to bacteria ignore chlorophyll allow bacterial cell does **not** have a nucleus (plant cell does) allow bacterial cell has DNA / genetic material in a ring / loop (plant cell does not) allow bacterial cell has DNA / genetic material free in cytoplasm do **not** accept idea that bacterial cells do not have ribosomes allow bacterial cell (may) have a flagellum (plant cells do not) allow bacterial cell (may) have a slime capsule (plant cell does not)	4	AO1 4.1.1.1 4.1.1.2

04.2	any **four** from: • dead / inactive / weakened form of pathogen / bacterium / microorganism is introduced / injected • white blood cells stimulated to produce antibodies • reference to memory cells made or remain • on re-exposure specific / correct antibodies are made (very) quickly • bacteria / pathogens / microorganisms killed and do not produce a large enough population to cause the disease	allow introduce / inject antigen(s) from the pathogen allow dead / inactive / weakened form of *Gonorrhoea* (bacteria) introduced / injected do **not** accept inject Gonorrhoea disease do **not** accept incorrect white blood cell, eg phagocyte allow on re-exposure specific / correct antibodies are produced in large quantities allow bacteria / pathogens / microorganisms killed and do not produce a large enough population to produce toxins	4	AO1 4.3.1.7 AO2 4.3.1.1

04.3	fewer bacteria / pathogens in chicken / eggs / food (so) fewer bacteria are ingested (by humans) **or** fewer bacteria / pathogens ingested (by humans) (1) (so) fewer toxins produced (1)	ignore references to immunity unqualified allow fewer chickens / eggs will carry the bacteria / pathogens ignore chickens do not get disease / infected allow idea of fewer bacteria being passed on to humans in food allow idea of fewer bacteria being passed on to humans in food (1)	1 1	AO2 4.3.1.3 4.3.1.1
04.4	wash hands before preparing food wash hands after using the toilet	ignore wash hands unqualified allow good food hygiene allow clean areas where a person has been ill allow do not shake hands (with someone who has food poisoning)	1	AO1 4.3.1.1 4.3.1.3
04.5	warmer weather so bacteria reproduce / increase faster	ignore bacteria are killed at low temperatures allow food not cooked properly on barbeques	1	AO3 4.3.1.1 4.3.1.3
Total			**12**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	measure the volume of oxygen produced in a given time **or** when more oxygen is produced in a given time the rate of photosynthesis is faster	a reference to rate is needed allow gas for oxygen allow when oxygen is produced faster the rate of photosynthesis is faster ignore the faster the rate of photosynthesis, the more oxygen is produced allow the slower the oxygen is produced the slower the rate of photosynthesis **or** less oxygen being produced in a given time, the slower the rate of photosynthesis	1	AO1 4.4.1.1 4.4.1.2 RPA 5
05.2	light (intensity)	ignore temperature	1	AO2 4.4.1.2
05.3	20 000 (lux)	allow answers in range 19 500 to 20 500 (lux)	1	AO3 4.4.1.2

05.4	there is a cost for heating the greenhouse		1	AO3 4.4.1.1 4.4.1.2
	there is a cost for increasing the carbon dioxide in the atmosphere (of the greenhouse)		1	
		allow there is a cost for lighting (in winter)		
	(therefore) the additional costs might exceed the (additional) sale price / profit **or** (additional) costs could not be recovered by increasing the sale price of the tomatoes	ignore these additional costs would reduce profits unqualified	1	

05.5	when there is no light there is no photosynthesis		1	AO1
	(so) no oxygen is produced		1	AO1
	(but) respiration happens (all the time) and oxygen is used		1	AO1
	(therefore) the net / overall oxygen production is negative / - 2 (arbitrary units)	do **not** accept an answer of -2 (arbitrary units) unqualified	1	AO2 4.4.1.1 4.4.1.2 4.4.2.1

Total			**10**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	3 years		1	AO2 4.3.1.9
06.2	any **one** from: • to reduce any risk	allow idea (if it is unsafe) less harm will be caused with a lower dose ignore that it may be unsafe / dangerous unqualified	1	AO1 4.3.1.9
	• to look for side effects	ignore unknown side effects unqualified		
06.3	too great a risk for ill person / patient	allow may make their condition worse allow less risk to healthy person ignore references to immune system	1	AO2 4.3.1.9
	patient might be taking another drug **or** side effects of drug are easier to identify	allow unhealthy person might be taking another drug ignore to see side effects unqualified	1	
06.4	any **one** from: • to prevent false claims • to make sure the results / conclusions are correct / valid • to avoid bias	ignore references to accuracy, reliability or precision	1	AO2 4.3.1.9

Question	Answers	Mark	AO / Spec.
06.5	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3 4.3.1.9
	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 **arguments for use:** • will save the NHS money • (approximately) 20 times as many people or 19 more people can be treated compared to Drug A • (approximately) 29 times as many people can be treated compared to Drug B (allow 28 times **or** 28 / 27 more people) • more people can be treated for the same cost • patients will be treated sooner • improves patient choice • used in other countries so likely to be effective • used in other countries so likely to be safe • likely to have been tested in other countries **arguments against use:** • injections of drug not tested (in UK) • cannot be sure it is as effective as Drug A / Drug B • cannot be sure if it is safe to use • may have unknown side effects • doctors cannot be confident in prescribing Drug C • goes against regulations / laws regulating drug development / use • might set a precedent for other drugs not to be fully tested • might set a precedent for other non- approved / unlicensed drugs to be used Need advantages and disadvantages for Level 2		

Total			11