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.

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 do not form 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 a 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 or three 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	any **two** from: • less (fructose / sugar) needed	ignore fructose is sweeter than glucose	2	AO3 4.2.2.1
	• cheaper to produce / buy the drink	allow less (sugar) tax allow more profit ignore cheaper unqualified		
	• less energy in the drink (so people are more likely to buy it)	allow less calories / J / KJ in the drink allow less (fructose / sugar) needed so would be cheaper for **2** marks		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	add Benedict's (reagent / solution)		1	AO1 4.2.2.1 RPA3
	heat reagent / solution	allow appropriate method of heating if a temperature is given, must be at least 60 °C ignore warm	1	
	green / yellow / orange / brown / (brick) red	ignore starting colour	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	add Biuret (reagent / solution)	allow add Biuret A **and** Biuret B allow add potassium / sodium hydroxide solution **and** copper sulfate solution	1	AO1 4.2.2.1 RPA3
	mauve / purple / lilac / pink-purple	ignore starting colour	1	

Question	Answers	Mark	AO / Spec. Ref
01.4	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6	AO1 4.2.2.1
	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 ***Protein*** • protease ○ (protein) broken down into amino acids ○ (protease) produced in the stomach ○ (protease) produced in the pancreas ○ (protease) produced in the small intestine ○ (hydrochloric) acid provides the correct pH for protease (in the stomach) ***Fat*** • lipase ○ (fat) broken down into fatty acids ○ (fat) broken down into glycerol ○ (lipase) produced by the pancreas ○ (lipase) produced by the small intestine ○ bile ○ (bile) produced by the liver ○ (bile) released from the gall bladder ○ emulsification of fats ○ larger surface area for lipase ○ neutralises acid to provide the correct pH for enzymes For **Level 2**, answers must describe digestion of fat **and** protein linked to correct type of enzyme for both		

Total Question 1	**13**

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	concentration of salt solution		1	AO2 4.1.3.2 RPA2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(water / solution on the tube / tubing) would affect / increase the mass	allow the results would not be valid	1	AO2 4.1.3.2 RPA2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	$\frac{0.96}{15.54} \times 100$		1	AO2 4.1.3.2 RPA2
	6.17 (760618…) (%)		1	
	6.2 (%)	allow answer written in **Table 1** allow correct conversion to one decimal place from students' incorrect percentage change calculation using figures from 0.0 Concentration of salt solution in mol/dm^3	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	all 4 points plotted correctly	allow a tolerance of ± ½ a small square allow **1** mark for 3 points plotted correctly ignore attempt to plot a point for 0 mol/dm^3	2	AO2
	line of best fit	ignore extrapolation	1	AO3 4.1.3.2 RPA2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	value from student's line of best fit	allow a tolerance of ± ½ a small square if no line of best fit drawn allow **1** mark for an answer in the range 0.64 to 0.66	1	AO3 4.1.3.2 RPA2

Total Question 2	**9**

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	virus(es)		1	AO1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	any **two** from: • isolation (of people with measles) • cover your nose / mouth when you cough / sneeze • frequent handwashing / sanitiser	allow wear face coverings allow frequent cleaning of surfaces ignore PPE unqualified ignore public health education programmes unqualified ignore social distancing unqualified	2	AO2 4.3.1.1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	any **four** from: • (vaccine / injection) contains dead / inactive (measles) pathogen / virus • white blood cells produce antibodies • the antibodies produced are specific / correct (for the measles virus / pathogen) • reference to memory cells made • on secondary exposure antibodies are produced faster	 allow vaccine / injection contains weakened / attenuated pathogen / virus allow vaccine / injection contains (measles) antigens ignore vaccine contains dead measles allow leucocytes / lymphocytes produce antibodies do **not** accept phagocytes produce antibodies allow description of memory cells allow on secondary exposure larger quantities of antibodies are produced ignore herd immunity ignore antitoxins if no other marks awarded allow **1** mark for antibodies are produced	4	AO1 4.3.1.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	viruses enter cells (so) cells are damaged / killed	allow viruses exist / reproduce inside cells allow viruses inject genetic material into cells allow cells burst open	1 1	AO1 4.3.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	to check the drugs are not toxic / poisonous	allow to check for side-effects allow to check the drugs are not harmful ignore dangerous	1	AO1 4.3.1.9
	to check efficacy **or** to see if the drugs work **or** check if the drugs treat the disease		1	
	to determine dosage **or** to find out how much is needed		1	
		allow to check interaction with other drugs		

Total Question 3	**12**

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	$6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$		1	AO2 4.4.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	(as temperature increases) the rate of photosynthesis increases **then** (the rate of photosynthesis) decreases	ignore references to volume unqualified	1	AO3 4.4.1.2
	fastest rate between 30 °C **and** 35 °C	allow a fastest rate at a temperature above 30 °C and below 35 °C allow reaches an optimum temperature between 30 °C and 35 °C	1	
	up to 30 °C the rate doubles every 5 °C increase	allow up to 30 °C the rate increases at an increasing rate allow up to 30 °C the rate increases exponentially	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	enzymes (in the plant / chloroplast) become destroyed (because) <u>active site</u> changes shape **OR** the <u>active site</u> changes shape (1) (so) the substrate no longer fits / binds (1) **OR** enzymes (in the plant / chloroplast) become destroyed (1) (so) the substrate no longer fits / binds (1)	allow enzymes become denatured do **not** accept enzymes are killed do **not** accept cells / plants are denatured ignore the plant is killed / dead	1 1	AO2 AO3 4.2.2.1 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	repeat the investigation, measuring the volume of gas to 0.5 cm^3		1	AO3 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	any **two** from: • may have too many tomatoes to eat / sell • other factors could limit photosynthesis • the optimum temperature might be above / below 25 °C • greenhouses are poorly insulated • pollution from the heater • increase the rate of transpiration • increased spread of plant disease(s)	allow the idea of a glut **or** all ripen at the same time allow other named limiting factor could limit photosynthesis allow factors could limit tomato production allow increase carbon dioxide emissions allow increase global warming allow increase the water loss from the plant if no other mark awarded allow it is a fire hazard for **1** mark	2	AO3 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	meristem		1	AO1 4.1.2.3

Total Question 4	**10**

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	*microscope:* electron (microscope) **and** *reason:* (has a) high resolution / magnification		1	AO2 4.1.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	any **three** from: (prokaryotic cell):	allow converse for eukaryotic cell if clearly stated	3	AO1 4.1.1.1 4.1.1.2
	• does not have a nucleus **or** DNA is free in the cytoplasm **or** genetic material is free in cytoplasm	ignore genetic information		
	• does not have mitochondria	if no other mark awarded, allow prokaryotic cell has no membrane-bound organelles		
	• has a single loop of DNA **or** has a single strand of DNA	ignore genetic information		
	• (has) plasmids	allow (small) rings of DNA		
	• (is) smaller	allow bacteria have smaller ribosomes		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3		allow correct calculations in cm or mm		AO2 4.1.1.5
	measurement of cell 36 (mm)	allow in the range of 35 to 37 (mm) allow in the range 3.5 to 3.7 (cm)	1	
	conversion 36 × 1000 = 36 000 (µm)		1	
	real size of cell (30 × 1.5) = 45 (µm)		1	
	substitution $\text{magnification} = \frac{36\,000}{45}$		1	
	800	do **not** accept if unit given	1	
		if no other mark awarded allow **1** mark for: $\text{magnification} = \frac{\text{image size}}{\text{real size}}$ or correct rearrangement		

Total Question 5	**9**

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1		allow a maximum of **3** marks if the stages are out of order		AO2 4.1.2.2
	DNA replicates **or** two copies of each chromosome form	allow DNA duplicates / doubles allow genetic material doubles ignore genetic information replicates do **not** accept DNA reproduces	1	
	one set of chromosomes is pulled to each end of the cell	allow one set of chromosomes is moved to each end of the cell ignore half the chromosomes are moved to each end of the cell	1	
	nucleus divides	allow two (new) nuclei form	1	
	cytoplasm **or** cell membrane divides **and** two genetically identical cells form	allow cytokinesis **and** two genetically identical cells form ignore names of phases of mitosis if no other mark awarded allow **1** mark for mitosis	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	uncontrolled cell division / growth		1	AO1 4.2.2.7
	invade neighbouring tissues		1	
	(tumour) cells spread to different parts of the body / tissues in the blood / lymph	allow tumour metastasises	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3		allow the converse if clearly stated		AO2 4.2.2.6 4.2.2.2 4.4.2.1 4.4.2.2
	(need to breathe faster / deeper) to get more oxygen		1	
	(because) smaller surface area		1	
	(so) less oxygen in the blood	allow (so) less oxygenation of haemoglobin	1	
	(so) less (oxygen for) respiration	allow (so) anaerobic respiration increases allow (so) lactic acid is produced allow (so) an oxygen debt is created do **not** accept energy produced / made / created	1	

Total Question 6	**11**

Question 7

Question	Answers	Mark	AO / Spec. Ref
07	**Level 3:** Relevant points (factors / effects) are identified, given in detail and logically linked to form a clear account.	5–6	AO3
	Level 2: Relevant points (factors / effects) are identified and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO3
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO2
	No relevant content	0	4.2.2.4 4.2.2.6 4.4.2.1 4.4.2.2
	Indicative content **causes of angina / CHD:** • high cholesterol / fat (in blood / diet), obesity • a lack of exercise • smoking / alcohol • increasing age • a family history of atherosclerosis or heart problems **explanation of symptoms:** • fatty deposits in coronary arteries • narrowing of the coronary arteries • reduced blood / oxygen / glucose to the heart (muscle / tissue / cells) • reduced blood / oxygen / glucose to the body • less oxygen / glucose for respiration • less energy released • (more) anaerobic respiration • lactic acid formed • <u>muscle</u> fatigue **treatment using GTN:** • more blood to the heart (muscle / tissue / cells) • more oxygen / glucose to the heart (muscle / tissue / cells) • increased (aerobic) respiration For **Level 1** explanation(s) of the symptoms of angina **or** the treatment using GTN must be included For **Level 3** explanations must include the causes of angina, explanations of the symptoms of angina and treatment using GTN		

Total Question 7	**6**