GCSE
COMBINED SCIENCE: TRILOGY
8464/B/2H

Biology Paper 2H

Mark scheme

June 2025

Version: 1.0 Final

2 5 6 G 8 4 6 4 / B / 2 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.

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.

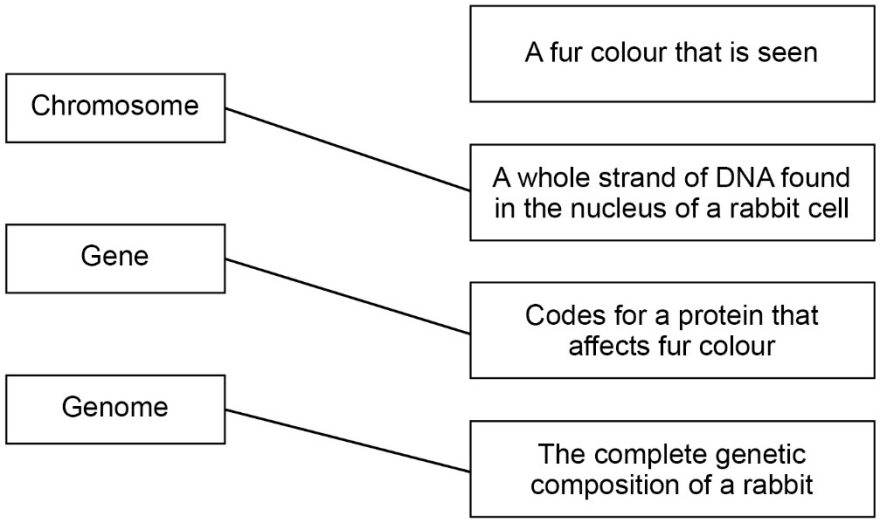
You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

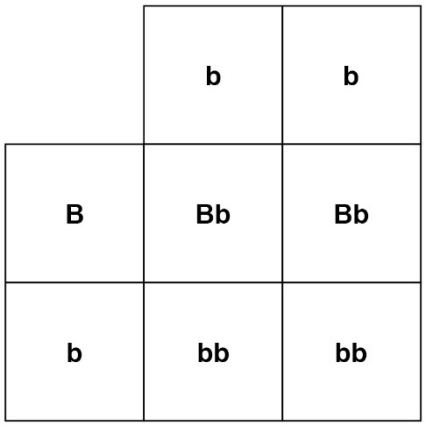
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

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	**Term** / **Meaning of the term**  do **not** accept more than one line from a box on the left	1 1 1	AO1 4.6.1.3 4.6.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2				
	gametes correct	allow in either position in Punnett square	1	AO2
	offspring genotypes correctly derived	allow correct derivation of offspring genotypes from incorrect gametes allow 3 correctly derived offspring genotypes for **1** mark	2	AO2
	any **bb** offspring identified as having white fur		1	AO2
	0.5	probability must match offspring genotypes if given allow 50% **or** 1 in 2 **or** 1:1 **or** $\frac{1}{2}$ do **not** accept 1:2	1	AO3 4.6.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3		allow gamete(s) **or** sex cells for sperm throughout		
	sperm have one of each chromosome (pair)	allow sperm have one **set** of chromosomes / genes allow sperm (only) have one allele for each gene allow sperm are haploid allow sperm have half the (number / amount of) chromosomes (compared with a body cell) allow sperm have 23 / 22 chromosomes ignore sperm have one allele ignore sperm have half the DNA / genes	1	AO2
	sperm are produced by meiosis **or** body cells have two of each chromosome	allow body cells have pairs of chromosomes allow body cells are diploid allow body cells have 46 / 44 chromosomes allow **B** and **b** are (alleles) on 2 chromosomes (of the same pair)	1	AO1 4.6.1.1 4.6.1.2 4.6.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	44	allow 22 pairs	1	AO2 4.6.1.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	has two X (chromosomes)	allow XX allow the rabbit is not XY allow the rabbit does not have a Y (chromosome) allow the rabbit only has X (chromosomes) allow both (X) sex chromosomes are the same size	1	AO1 4.6.1.6

Total Question 1	**12**

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	oestrogen	allow phonetic spelling allow other correct named hormone eg progesterone do **not** accept FSH / LH	1	AO1 4.5.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	any **one** from: • (stimulates / causes) sperm production • (stimulates / causes male) secondary sexual characteristics	 allow (stimulates / causes) puberty allow (stimulates / causes) named male secondary sexual characteristic(s) eg muscle growth	1	AO1 4.5.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3		allow converse if clearly referring to hormonal methods		
	any **one** from:		1	AO3 4.5.3.4
	• protection / prevention against sexual transmitted diseases(s)	allow protects / prevents against STD(s) / STI(s) allow protects / prevents against named STD / STI		
	• fewer / no side effects	allow do not affect menstrual cycle allow fewer / no named (possible) side effects of hormonal contraceptives eg fewer / no headaches / nausea / acne ignore do not affect hormones ignore safer		
	• immediate	allow quicker to use ignore temporary		
	• (may) contain a chemical to kill sperm	allow (may) contain spermicide		
	• (more) easily accessible			
	• described disadvantage of hormonal method(s) eg (contraceptive) pill could be forgotten			

Question	Answers	Mark	AO / Spec. Ref.
02.4	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6	AO1 4.5.3.3 4.5.3.4
	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 **Method** • oral contraceptive **or** pill **Detail of how the contraception is used** ○ taken daily **or** taken every 21/28 days **or** taken in a monthly cycle ○ containing progesterone ○ containing oestrogen ○ (hormones) absorbed into the blood **Method** • injection • patch • implant • intrauterine system / device **or** IUD **or** IUS **or** coil **Detail of how the contraception is used** ○ last several weeks / months ○ containing progesterone ○ slow release of progesterone / hormone ○ into blood **Detail (that can apply to all hormonal contraceptive methods)** ○ to inhibit / reduce / prevent FSH (release) ○ (lack of FSH) so no eggs mature / develop ○ to inhibit / reduce / prevent LH (release) ○ (lack of LH) so no eggs released (from ovary) **or** so prevents ovulation ○ (progesterone) thickens (cervical) mucus ○ (mucus) prevents / reduces sperm movement (to uterus) ○ (oestrogen / progesterone) changes the thickness of the uterus lining ○ (uterus lining thickening / thinning) makes implantation less likely For **Level 2**, answers must give details for the method(s) described.		

Total Question 2	**9**

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	distance from the tree	allow distance	1	AO2 4.7.2.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	7 (squares)		1	AO2
	$\frac{7}{25} \times 100$	allow 0.28×100 allow correct working shown from an incorrect attempt at counting squares (in the range 6 to 10) covered by buttercups	1	AO3
	28 (%)	allow a correct calculation from an incorrect attempt at counting squares (in the range 6 to 10) covered by buttercups	1	AO2 4.7.2.1 RPA7
		alternative route (percentage cover of one small square) $(\frac{100}{25} =) 4$ 7×4 allow correct working shown with incorrectly calculated percentage cover of one small square 28 (%) allow a correct calculation from an incorrect attempt at counting squares (in the range 6 to 10) covered by buttercups		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	any **two** from: • whether the sample is representative • the size of the quadrat • the number of students • how many quadrats fit around the tree at 1 m • factors such as buildings **or** other tree(s)	allow the number of quadrats (available) allow size of tree allow if the same (quadrat) area is being sampled repeatedly	2	AO3 4.7.2.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4		allow converse if clearly referring to quadrat **A** ignore references to time		AO3 4.7.2.1 RPA7
	(quadrat **B**) samples a larger area	allow (quadrat **B**) is larger / wider	1	
	(because) 0.25 (m^2) rather than 0.0625 (m^2)	allow $\frac{1}{4}$ (m^2) rather than $\frac{1}{16}$ (m^2) allow 2500 cm^2 rather than 625 cm^2 allow by 4 times	1	
	(quadrat **B**) gives more accurate / precise results	allow (quadrat **B**) is more representative allow (quadrat **B**) has greater resolution allow need to use quadrat **A** 4 times (as many times) to have the same accuracy / precision as quadrat **B** ignore (quadrat **B**) is more reliable / valid / repeatable	1	
	(because) to the nearest 1% (of the quadrat) rather than nearest 4%	allow (because) quadrat **B** has 100 (small) squares rather than 25 (small) squares do **not** accept quadrat **B** has smaller squares (within quadrat)	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	with a point quadrat, a plant that is smaller than half a square is more likely to be counted		1	AO3 4.7.2.1 RPA7
	with a point quadrat, no judgement of cover is needed		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	$7 = \frac{n}{30 \times 50} \times 100$	allow $7 = \frac{n}{1500} \times 100$	1	AO2 4.7.2.1
	$n = \frac{7}{100} \times 1500$	allow n = 0.07 × 1500 allow n = 7 × 15 allow a correct rearrangement using 50 pins as total number of pins used allow correct rearrangement with an incorrect calculation of number of pins used	1	
	n = 105	allow a correct calculation using 50 pins as total number of pins used allow correct calculation with an incorrect calculation of number of pins used allow **2** marks for: $(\frac{7}{100} \times 50 =)$ 3.5	1	

Total Question 3	**15**

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	herbicide is added / sprayed (on soil / land / field / crop / maize)		1	AO1
	(so) weeds killed **and** (GM) maize / crop not killed	allow (so) unwanted plants killed **and** (GM) maize / crop not killed allow **only** the weeds are killed	1	AO2
	(so) (GM) maize / crop has less competition for light / water / minerals / ions / space	allow (so) (GM) maize / crop has more light / water / minerals / ions / space ignore reference to nutrients ignore (GM) maize / crop has less competition unqualified	1	AO2
	(so more) photosynthesis to produce glucose which produces protein / cellulose / starch / fat (for growth)	allow (so more) photosynthesis to produce glucose which produces amino acids (for growth)	1	AO2 4.4.1.1 4.6.2.4 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	use of herbicide kills weeds / wildflowers / plants (that are not the crop)	allow increased use of herbicide / weedkiller ignore (more) use of pesticides ignore herbicide kills animals / insects	1	AO3 4.6.2.4 4.7.3.1
	(causes) fewer weeds **or** fewer other plants therefore less food for animals / insects	allow fewer wildflowers therefore less food for animals / insects allow less variety of food therefore lower number of species of animals / insects allow fewer weeds / wildflowers **or** fewer other plants therefore more competition for food	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	crops / plants may be insect / bee pollinated insects may be predators of (crop) pests	allow for pollination allow a description eg insects eat crop pests allow bees may be predators of (crop) pests	1 1	AO2 4.7.1.1 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	provides source of food / shelter (for insects / bees / pollinators)	allow protection / hiding from predators	1	AO2 4.7.3.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	(as oxygen level increases decay increases due to aerobic) respiration of microorganisms (which) releases carbon dioxide causing global warming	allow (aerobic) respiration of bacteria / fungi / decomposers allow (which) releases carbon dioxide which is a greenhouse gas allow (which) releases carbon dioxide causing the greenhouse effect ignore (which) releases carbon dioxide causing climate change	1 1	AO2 AO1 4.7.3.3 4.7.3.5 4.7.2.2 4.4.2.1

Total Question 4	**11**

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	behaviour(al)	allow functional	1	AO2 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	any **two** from: • (new) predators • (new) disease / pathogen • competition for food • lack of mates	ignore habitat ignore competition unqualified allow hunters / poachers allow named example allow lack of food allow competition for mates	2	AO1 4.6.3.3 4.7.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3		allow skeleton **or** hard parts for bones throughout ignore compression ignore reference to oxygen		
	(plesiosaur) died and sank (to bottom of ocean / sea)		1	AO2
	any **two** from: • (plesiosaur died and) is buried in sediment / sand / mud / silt	do **not** accept plesiosaur (died and) is buried in rock(s)	2	AO1 4.6.3.2
	• (only) soft parts decayed / eaten **or** bones were not decayed / eaten			
	• bone(s) / remains replaced by minerals	allow mineralisation of bones allow bone(s) left imprint in mud / sand / sediment (that then hardened to rock) ignore bones turned to stone / rock		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	any **two** from: • fossil record may be incomplete • DNA will be destroyed by <u>fossil</u> formation • no evidence of soft tissues which are decomposed (before fossilisation) • only able to study phenotype (from fossils)	 allow not all fossils have been found allow (some) fossils may have been destroyed allow there are not enough fossils (to study) allow chromosomes / genes / alleles will be destroyed by <u>fossil</u> formation allow <u>fossil</u>s do not contain DNA / chromosomes / genes / alleles allow only able to study observable characteristics (of bones / skeleton)	2	AO2 4.6.2.1 4.6.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	<table><tr><th>Classification group</th><th>Name</th></tr><tr><td></td><td>eukaryota / eukaryote(s)</td></tr><tr><td></td><td></td></tr><tr><td>phylum / phyla</td><td></td></tr><tr><td></td><td></td></tr><tr><td>order</td><td></td></tr><tr><td>family</td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	**2** marks for 4 correct **1** mark for 2 or 3 correct **No** marks for 1 correct ignore italics and upper / lower case letters	2	AO1 AO2 4.6.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	Cryptoclidus eurymerus	ignore italics and upper / lower case letters do **not** accept Cryptoclididae eurymerus	1	AO2 4.6.4

Total Question 5	**11**

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	$y = mx + c$		1	AO1 4.5.3.2

Question	Answers	Mark	AO / Spec. Ref.
06.2	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO3
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO2
	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	4.5.3.2
	Indicative content **Type 1** • in Type 1 (diabetes) the pancreas does not produce (enough) insulin • (so) C-peptide (concentration in blood) would be low(er) • even if patient is taking / injecting insulin **Type 2** • in Type 2 (diabetes) the body / cells no longer respond to insulin • in Type 2 (diabetes) insulin is produced • (so) C-peptide (concentration in blood) would be high(er) / normal **The importance…** • if patient has Type 2 (diabetes) they could stop insulin injections • insulin injections have side effects • insulin injections are expensive • (Type 2 diabetes) can be treated with a carbohydrate-controlled diet and / or (increased) exercise • (Type 2 diabetes) can be treated with other medication (that is not injected) For **Level 3**, details of Type 1 and Type 2 diabetes must be considered, with the link to C-peptide and the importance of the test described.		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	pancreas		1	AO1 4.5.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	(in people with glucagon deficiency) when blood glucose concentration is low not enough glucagon is produced	allow (in people without glucagon deficiency) when blood glucose concentration is low glucagon is produced ignore reference to organ that produces glucagon	1	AO1
	(so) less / no glycogen converted to glucose	allow (so) less glucose produced from glycogen	1	AO1
	(so) less glucose for respiration		1	AO2
	(so) less energy released / transferred	do **not** accept less energy produced / made / created	1	AO2
				4.5.3.2 4.4.2.1 4.4.2.3

Total Question 6	**12**