

INTERNATIONAL GCSE **COMBINED SCIENCE**

9204/BE

Paper 1 Biology Extension

Mark scheme

June 2024

Version: 1.0 Final



2 4 6 Y 9 2 0 4 / B E / 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.

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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 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 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 **not** 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. 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 and not look to pick holes in 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 and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 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.

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	low		1	AO2 3.2.2.e 3.2.2.i 3.2.2.j
	high		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	to speed up absorption of soluble molecules		1	AO2 3.2.3.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	to supply (more) oxygen	idea of more / increase needed at least once for full marks	1	AO1 3.2.5.b 3.2.5.g 3.2.5.h
	(and) to supply (more) glucose	allow to remove more carbon dioxide	1	
	for increased (aerobic) respiration		1	
	to meet increased demand for energy		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	glucose		1	AO1 3.2.5.i

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	(build up of lactic acid causes) muscle fatigue or muscles stop <u>contracting</u> (efficiently)	allow (build up of lactic acid causes) muscle cramp	1	AO1 3.2.5.l

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	any two from: • same type of exercise • same time spent exercising • same intensity of exercise • same environmental conditions	allow example of exercise eg running allow example of condition eg same temperature	2	AO4 3.2.5.g 3.2.5.h

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	any three from: • (vigorous) exercise raises lactic acid (concentration) • lactic acid is removed from blood during recovery time • gentle exercise causes lactic acid to be removed faster (during recovery time) • it takes longer than 40 minutes for lactic acid (concentration) to return to resting level • rate of removal of lactic acid is not constant	allow lactic acid is removed from blood when exercise stops or lactic acid is broken down during recovery allow blood lactic acid (concentration) is lower with gentle exercise allow difference in concentration increases for 20 minutes or difference in concentration the same after 20 minutes if no other mark awarded allow 1 mark for lactic acid (concentration) decreases with time	3	AO3 3.2.5.j 3.2.5.l
Total			14	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	300 – 180 - 44		1	AO2
	76 (kJ)		1	3.3.1.b 6.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	amino acids		1	AO1
	protein		1	3.2.5.f

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	decomposition / decay	allow decomposers for microorganisms throughout	1	AO1
	by microorganisms		1	3.3.3.a 3.3.3.b 3.3.3.c 3.3.3.e
	(microorganisms) release carbon dioxide	allow (microorganisms) release CO ₂	1	
	as a result of respiration (of microorganisms)		1	
	OR			
	(waste materials and dead organisms) broken down (1)			
	by animals (1)	allow examples of animals such as worms, maggots		
	(animals) release carbon dioxide (1)			
	as a result of respiration (of animals) (1)			

Total		8
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any one from: • provide food • provide habitat • provide protection (from predators / hunters) • (assisted) reproduction • research	allow to see how they behave or to see what they eat	1	AO3 3.3.2.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	egg cell		1	AO2 3.5.5.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	(B) nucleus discarded / removed (from egg cell)	allow A for egg cell throughout	1	AO2 3.5.5.a
	(C) skin cell nucleus put in (empty) egg cell		1	
	(E) embryo placed in uterus / womb of host mother		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	electric shock		1	AO1 3.5.5.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	black-footed (ferret)		1	AO2 3.5.1 3.5.5.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	any two from: • deforestation • agriculture • building houses / roads • polluting air / water / land • changes to biotic environment	allow urbanisation allow burning fossil fuels allow overfishing / hunting allow examples of appropriate human activities	2	AO3 3.3.2.a 3.3.2.c
Total			9	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	algae		1	AO1 3.2.1.b 3.3.1.a 3.3.3.e

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	chlorophyll	must be in this order	1	AO1 3.2.1.b
	chloroplasts		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	any one from: - different concentration of carbon dioxide - different light intensity due to particles in the water or different light intensity due to organisms in the water - different pH - different temperature		1	AO2 3.2.1.a 3.2.1.b

Question	Answers	Mark	AO / Spec. Ref.
04.4	Level 3: The plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO4 3.2.1.a 3.2.1.b 3.2.1.c
	Level 2: The plan would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	
	Level 1: The design/plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content.	0	
	Indicative content • independent variable is light intensity • use lamp at different distances from pondweed • increase the distance to decrease light intensity • number of distances between lamp and pondweed (at least five) • dependent variable is number of bubbles or volume of oxygen collected • method to determine number of bubbles or volume of oxygen over a set time • control volume of pond water • control concentration of sodium hydrogencarbonate • control size of pondweed • control species of pondweed • control temperature • use thermometer to measure temperature • method of controlling temperature • time using a stop clock • repeats For Level 2, answers must vary the independent variable, and measure the dependent variable. For Level 3, answers must give detail of changing the independent variable, measuring the dependent variable and control variables.		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	26.5 – 17 (= 9.5)	allow +/- ½ small square for 26.5 subsequent marks may be awarded for the correct use of numbers incorrectly read from the graph	1	AO2 3.2.1.c 6.3.3 6.3.4
	$\frac{9.5}{17} \times 100$		1	
	55.8823		1	
	56 (%)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	(rate of) oxygen production was the measure of the rate of photosynthesis		1	AO3 3.2.1.a 3.2.1.b 3.2.5.b 3.2.5.c
	(value was negative because) there was no photosynthesis as there was no light		1	
	and oxygen was used in respiration (in the dark)		1	

Total		17
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	(bacteria) produce poisons / toxins (to make us feel ill)		1	AO1 3.4.6.b
	(viruses) live and reproduce inside cells which causes damage		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	phagocytosis	ignore phagocytes	1	AO1 3.4.6.c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	protein		1	AO1 3.2.2.n

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	there are (many) different types of pathogen / bacteria / viruses	allow there are (many) different antigens	1	AO2 3.4.6.c 3.4.6.d
	and each antibody is specific to a particular pathogen	allow each antibody is specific to a particular antigen do not accept references to active site	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	antibiotics are not used as they cannot kill viruses		1	(2) AO2 (3) AO3 3.4.6.d
	the person is already infected by the virus that causes an immune response	allow the virus will cause antibodies to be produced already	1	3.4.6.e 3.4.6.f 3.4.6.g
	a vaccine will have no extra effect (after an infection)	allow a vaccine will not cause antibodies to be produced any faster	1	
	antibodies in the injection will kill the virus (immediately)		1	
	there is no time lag until antibodies are produced (using antibody injection)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	19 500 000 000	allow 19.5 ($\times 1\,000\,000\,000$)	1	AO2 3.4.6.f
	1.95×10^{10}		1	6.3.12 6.3.15

Total		13
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	allows some molecules / substances to pass through but not all molecules can pass through	allow not all molecules / substances can pass through ignore ions / water	1	AO1 3.1.5.d

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	water		1	AO1 3.1.5.d

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	any one from: • temperature • volume of liquid in test tube • volume of liquid in dialysis tube • length of dialysis tube		1	AO4 3.1.5.d

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	time on x-axis and mass on y-axis		1	AO2 3.1.5.d
	plot a line (of best fit) for each of the four test tubes		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	there was no concentration gradient		1	AO3 3.1.5.e

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	4 / four		1	AO3 3.1.5.e

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.7	sugar cannot pass through the membrane / dialysis tube	allow sugar cannot pass in to the water (surrounding the dialysis tube)	1	AO2 3.1.5.d
	and so there will always be a higher concentration of sugar in the dialysis tube	allow so there will always be a concentration gradient	1	

Total		9
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	transports substances around the plant	allow transports water / ions / sugar around the plant	1	AO1 3.1.4.a

Question	Answers	Mark	AO / Spec. Ref.
07.2	Level 2: Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6	AO1 AO2 3.1.2.a
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–3	3.1.2.b 3.1.2.c 3.1.2.d
	No relevant content.	0	3.1.4.a 3.1.4.b 3.1.5.i
	Indicative content Exchange with environment - all cells need to exchange materials in order to function - large multicellular organisms need systems to exchange materials with the environment - leaves are organs specialised for gas exchange due to air spaces in spongy mesophyll - roots are organs specialised to absorb water and minerals from the soil due to root hairs Transport around the plant - specialised tissues transport materials around the plant - xylem and phloem tissue through roots, stems and leaves - all parts of the plant obtain what they need from roots / leaves Processes in plants - plant cells / tissues are specialised for different processes - plants need light / water / carbon dioxide to photosynthesise and produce glucose - plants need glucose / minerals to synthesise more complex molecules for protein synthesis and growth - plants need glucose / oxygen for respiration to release energy Adaptive features - leaves have a large surface area to absorb light - palisade tissue has specialised cells that can photosynthesise - palisade cells contain chlorophyll / chloroplasts to capture light - epidermal tissue in roots has root hair cells - root hair cells have a large surface area to absorb water and minerals from the soil Level 2: must relate different cells / tissues / organs to exchange or transport of materials needed for different processes in the plant.		

Total		7
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	meiosis		1	AO1 3.5.2.g

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	all the offspring inherited one tall allele (and one short allele)		1	AO2 3.5.3.e 3.5.3.g
	therefore tall is the dominant allele		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	gametes correct for both parents: T and t		1	(3) AO2 (1) AO3 3.5.3.f 3.5.3.g
	correct derivation of offspring genotypes: TT Tt Tt tt	allow correctly derived offspring from incorrect parental gametes	1	
	correct phenotype identified for each genotype: TT and Tt are tall and tt is short	allow from incorrectly derived offspring	1	
	probability of short plant = $0.25 / \frac{1}{4} / 25\% / 1 \text{ in } 4$	probability must match offspring genotypes allow 1:3 do not accept 1 in 3 do not accept 1:4 allow probability correctly derived from incorrect offspring genotype	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	(similarity) both involve (only) one parent	allow self-pollination may result in variation but no variation in asexual reproduction	1	AO2 3.5.1
	(difference) offspring are not genetically identical in self-pollination but they are genetically identical for asexual reproduction or fusion of gametes in self-pollination but no fusion of gametes in asexual reproduction		1	
Total			9	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	salivary glands and pancreas and small intestine produce enzyme (for starch digestion) or digestion / breakdown of starch occurs in the mouth and small intestine	do not allow stomach	1	AO1 3.2.3.c
	amylase catalyses the digestion of starch	allow amylase (is the enzyme that) breaks down starch	1	
	starch is broken down into glucose	allow starch is broken down into sugars	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	insulin		1	AO2 3.4.4.b

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	(glycogen) converted to glucose when blood glucose levels fall or (glycogen) converted to glucose to raise blood glucose levels		1	AO1 3.4.4.a 3.4.4.c
	(excess) glucose is converted to glycogen for storage	allow glucose is stored as glycogen	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	any one from: - less likely to cause a spike in blood glucose concentration - less likely to lead to obesity - food will contain fewer calories (per gram) - RS acts as fibre in the diet		1	AO3 3.2.3.a 3.2.3.c 3.4.4.b

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	$(46 - 4.5 =) 41.5$		1	AO2 3.2.3.a
	$\frac{4.5}{41.5} = 0.108(4\dots)$		1	6.3.6 6.3.12
	0.11 (:1)		1	

Question	Answers	Mark	AO / Spec. Ref.
09.6	Level 2: A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	3–4	AO3 3.2.3.a
	Level 1: Some logically linked reasons are given. There may also be a simple judgement.	1–2	
	No relevant content.	0	
	Indicative content For - white bread rolls have the lowest mean RS per 100 g - white bread (slices) have the lowest minimum RS per 100 g - wholewheat bread has 0.7 g per 100 g more RS than white bread rolls Against - white bread (slices) have a slightly higher mean RS per 100 g than wholewheat bread - the maximum RS per 100 g for white bread (slices) is the highest in the table 4.4 g per 100 g (maximum for white bread slices) may be an anomaly that skews the mean for white bread (slices) Other relevant comments - the mean for white bread (slices) is closer to the minimum value which supports the idea of skewing - the maximum – minimum range for white bread (slices) is 4.3 grams whereas the range for the other breads is less than 1.2 grams - no information about the number of studies for each type of bread For Level 2, answers must consider examples for and against the scientist's statement.		

Total		14
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