

INTERNATIONAL GCSE **COMBINED SCIENCE**

9204/BE

Paper 1 Biology Extension

Mark scheme

November 2024

Version: 1.0 Final



2 4 B 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	Sun	accept sunlight	1	AO1 3.3.1.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	one less trophic level in A (than in B) any one from: • so less energy is transferred to the environment (in A) • so energy not used by chickens (for movement) (in A) • so (more) energy is transferred directly to humans from plants (in A)	allow converse if clearly describing B allow there are less transfers in A (than in B) allow energy not lost in (chicken's) waste materials (in A)	1 1	AO2 3.3.1.b

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	(fertiliser) (nitrate ions are) used to make proteins or (nitrate ions are) used to make amino acids		1	AO2 3.1.4.b 3.2.1.b 3.2.1.e 3.3.2.a 3.3.2.b 3.5.5.d
	(herbicide) so less competition or so crops have more water / minerals / light	allow so crops have more space / nutrients	1	
	(insecticide) any one from: • more light absorbed • more photosynthesis • more glucose / cellulose produced		1	
	(rooting powder) increase uptake of water or increase uptake of mineral / nitrate (ions)	allow uptake of nutrients	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	any two from: • to increase yield • to increase storage time • to give resistance against disease / pathogens • to give resistance against herbicides	ignore to make crops grow bigger unqualified allow to introduce gene for named characteristic for example vitamin A allow 'to introduce a desired characteristic' for 1 mark if no other mark awarded	2	AO1 3.5.5.c 3.5.5.d 3.5.5.e

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	the effect (of GM food) on health is not known	ignore references to effects on the environment	1	AO1 3.5.5.f
Total			10	

Question	Answers	Mark	AO / Spec. Ref.
02.1	Function Organ Produces amylase, lipase and protease Produces bile Gall bladder Large intestine Liver Pancreas Stomach do not accept more than one line from a box on the left	1 1	AO1 3.2.3.c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	to raise the pH for lipase to work		1	AO2 3.2.3.b 3.2.3.c

Question	Answers				Mark	AO / Spec. Ref.
02.3	Variable	Control variable	Dependent variable	Independent variable	3	AO4 3.2.3.c
	Change in pH		✓			
	Temperature	✓				
	Use of bile solution			✓		
	Volume of milk solution	✓				
	1 mark for each correct column					

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	C		1	AO4 3.2.3.b

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	the breakdown of fat is faster with bile (so bile increases the rate of activity of lipase)		1	AO3 3.2.3.c
	however the conclusion is incorrect because fat did break down without bile		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	$4 \times 3.14 \times 10^2$	allow $4 \times \pi \times 10 \times 10$	1	AO2 3.2.3.c 6.3.3 6.3.10 6.3.14
	1256	allow 1257 allow answer rounded to 3 significant figures	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	bile emulsifies fat	allow bile breaks large droplets of fat into smaller droplets	1	AO2 3.2.3.c
	so the (same volume of) fat has a larger surface area	ignore bile breaks down fat	1	
	so more enzyme / lipase can attach (to the fat)		1	

Total		14
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	dominant		1	AO2 3.5.3.g

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	by gametes		1	AO1 3.5.3.b

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	A and B		1	AO2 3.5.3.f

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	C and D		1	AO3 3.5.3.a 3.5.3.c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	two t alleles needed for the disorder (to develop)		1	AO2 3.5.4.a
	but person B cannot pass t on (to their offspring) or but person B can only pass T on (to their offspring)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	any one from: - to find if there is a chance of their child having the disorder - to prepare for the possibility of a child with the disorder		1	AO3 3.5.4.a
Total			7	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	evolution		1	AO1 3.6.2.a 3.6.2.b

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	variation (in the species / population)	allow examples of characteristics	1	(4) AO1 (1) AO2 3.6.2.b
	(variation) caused by differences in genes / alleles	allow differences caused by mutation	1	
	(as forest changed to grass)			
	faster horses that could escape predators had an advantage or horses with eyes positioned to see predators sooner and escape had an advantage		1	
	horses most suited to (new) environment survive / reproduce	allow examples of (advantageous) characteristics such as faster horses survive / reproduce	1	
	(advantageous) alleles / genes passed on to offspring		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	(classic conditioning) reward horse for correct responses	allow converse	1	AO3 3.4.5.c 3.4.5.d
	(habituation) introduce noises / distractions to horse during training	allow named distractions	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	any two from • intelligent • calm • responds readily to instructions • tall • agile • strong • stamina	allow obedient allow correct references to height allow correct references to balance / movement / speed	2	AO3 3.4.5.d
Total			10	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	trachea	must be in this order	1	AO1 3.2.4.a
	bronchi / bronchus		1	
	bronchiole(s)		1	
		allow 1 mark for mp 2 and mp 3 if both bronchi and bronchioles given but wrong way round		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	thin (alveolus wall)	allow (alveolus wall) one cell thick do not allow thin cell wall	1	AO1 3.1.5.i 3.1.5.j 3.2.4.c
	efficient / good blood supply	allow richly supplied with blood capillaries	1	
	ventilated	allow maintains a concentration gradient	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	diffusion does not use energy	allow converse for active transport	1	AO3 3.1.5.a 3.1.5.f
	diffusion is (movement) down concentration gradient but active transport is (movement) against concentration gradient		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	many / more mitochondria	do not accept produce / make / create energy	1	(2) AO2 (1) AO3 3.1.1.a 3.1.5.f 3.2.5.e
	to release (more) energy		1	
	by (aerobic) respiration		1	

Total		11
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	any two from: • (maintain optimum) enzyme activity or so enzymes do not denature • can live in a variety of climates • active all day / year • (maintain optimum) transport into and out of cells	allow can live anywhere (in the world) allow fast nervous transmission	2	AO3 3.3.2.d 3.4.2.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	pancreas brain ear	must be in this order	1 1 1	AO1 3.4.2.c

Question	Answers	Mark	AO / Spec. Ref.
06.3	Level 3: Relevant points are identified, given in detail and logically linked to form a clear account.	5–6	AO1 3.4.3.a 3.4.3.b 3.4.3.c 3.4.3.d
	Level 2: Relevant points 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 - body temperature is monitored and/or controlled by the thermoregulatory centre - the thermoregulatory centre has receptors sensitive to the temperature of the blood - the brain coordinates a response when temperature receptors are stimulated If core body temperature is too high - blood vessels in skin dilate - so more blood flows through capillaries - sweat glands release more sweat - evaporation of sweat cools the body - more energy transferred from skin to environment If core body temperature is too low - blood vessels in skin constrict - to reduce blood flow through capillaries - blood directed away from the skin surface - sweat glands release less sweat - less energy transferred from skin to environment - muscles shivering is a response to cold temperature - contraction of muscles needs energy from respiration which transfers energy to warm the body For Level 3 there must be an explanation of mechanisms that maintain body temperature when it is both too high and too low linked to coordination of these mechanisms.		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	protein		1	AO2 3.5.3.i

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	39 (°C)	± ½ a small square	1	AO2 3.4.3.b 6.3.11

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	29 to 45.5 (°C)	± ½ a small square	1	AO2 3.4.3.b 6.3.11

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.7	TR1 has maximum activity at 0 °C whereas TR3 has maximum activity at 50 °C or TR1 activity decreases as temperature increases (0 °C to 17 °C) whereas TR3 activity increases as temperature increases (32 °C to 50 °C)		1	AO3 3.4.3.b

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.8	no temperature receptors (on Figure 11) are stimulated by temperatures between 17 °C and 29 °C	allow there is a gap in the temperatures detected by the receptors	1	AO3 3.4.3.b

Total		16
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	(in plant cells) genetic material is in a nucleus or (in plant cells) chromosomes / DNA are in a nucleus	allow (in bacterial cells) genetic material is in plasmids or (in bacterial cells) chromosomes / DNA are in plasmids	1	AO2 3.1.1.a 3.1.1.b 3.1.1.c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	100×2^6 6400 6.4×10^3	allow $100 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$	1 1 1	AO2 3.4.6.b 6.3.15

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	chromosomes are made of DNA and copies of chromosomes are made so each new cell has a full set of chromosomes	 allow to produce two genetically identical cells	1 1 1	AO2 3.5.2.e 3.5.3.h

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	19 (cells in total) $\frac{3}{19} = 0.15789...$ 0.16	allow 21 (cells in total) allow $\frac{3}{21} = 0.14286...$ allow 0.14 if consistent with their substitution allow 1 mark for 0.15 if 20 cells is used	1 1 1	AO2 3.5.2.e 6.3.3 6.3.10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	(×100) bigger sample is more representative	allow more cells can be seen (at the same time) so more representative	1	AO3 3.5.2.e
	(×400) easier to see which cells are dividing or chromosomes are visible		1	

Question	Answers	Mark	AO / Spec. Ref.
07.6	Level 3: The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5–6	AO4 3.5.2.d
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified but the method is not fully logically sequenced.	3–4	
	Level 1: The method 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 concentration of growth substance • at least three concentrations • dependent variable is increase in root length • ruler to measure increase in root length • measure several roots • calculate mean increase in root length • left to grow for reasonable length of time eg more than 2 days • repeats Examples of control variables: • same size of bulb at each concentration • same temperature for each concentration • same volume of solution / liquid • left to grow for the same length of time For Level 3 answers must give detail of independent variable, dependent variable and control variable(s)		
Total		18	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	allow any two from: - to advise about the chance that children will inherit thalassaemia - to arrange for appropriate (genetic) tests - to inform further research		2	AO3 3.5.3.f 3.5.4.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	less haemoglobin to combine with oxygen (in the lungs)		1	AO2 3.2.2.j 3.2.5.b
	so less oxygen transported to brain / muscles / organs / cells		1	
	and there is less (oxygen for) <u>aerobic</u> respiration		1	
	so less energy is released during (aerobic) respiration (in the brain / muscles / cells)	do not accept energy produced / made / created	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	(a cell that) can differentiate into many different types of cell		1	AO1 3.5.2.k

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	bone marrow	allow any correct source of stem cells for example fat tissue, eyes, brain, skin	1	AO1 3.5.2.k

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	(the healthy stem cells) have the normal allele / gene (for haemoglobin)	ignore red blood cells	1	AO2 3.2.2.j 3.5.2.k
	so they specialise / differentiate into (healthy) cells that produce haemoglobin		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.6	any two from: • less / no risk of rejection • less risk of spreading infection (from donors) • no risk to donors (from collection / infection) • no / less need for donor(s)		2	AO3 3.5.2.l 3.5.2.m

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.7	an embryo is produced with the same genes / alleles / DNA as the patient		1	AO1 3.5.2.l
	stem cells from the embryo can be used to replace damaged cells or stem cells from the embryo can be used to repair damaged tissues / organs		1	

Total		14
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