GCSE
COMBINED SCIENCE: TRILOGY
8464/B/2H

Biology Paper 2H

Mark scheme

June 2022

Version: 1.0 Final Mark Scheme

2 2 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.

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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 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 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	Extra information	Mark	AO / Spec. Ref.
01.1	aerobic respiration		1	AO1 4.4.2.1 4.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	1. evaporation	allow evaporate(s) / evaporating	1	AO1 4.7.2.2
	2. condensation	allow condense(s) / condensing	1	
	3. precipitation	allow rain(ing) / rainfall allow named precipitation ignore precipitates	1	
	4. draining / drainage	allow run-off / percolation / infiltration allow groundwater / underground flow	1	
	5. transpiration		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	$6\,000\,000\,000 \times \frac{4.5}{100}$	allow $6\,000\,000\,000 \times 0.045$	1	AO2 4.7.2.2
	$270\,000\,000$		1	
	2.7×10^8	allow an incorrectly calculated number of people given in correct standard form	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	climate change has increased the area of deserts		1	AO3 4.7.2.2
	more water is used to grow crops		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	decay / decomposition of leaves	allow leaves are broken down	1	AO2
	respiration (by microorganisms / decomposers)	ignore aerobic / anaerobic ignore respiration by worms / detritivores / insects / leaves	1	AO1
	respiration releases carbon dioxide **or** microorganisms release carbon dioxide		1	AO1
	carbon dioxide is used in photosynthesis (for new plant growth)	do **not** accept carbon dioxide absorbed in the roots	1	AO1 4.7.2.2 4.4.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	nitrates are released into the soil		1	AO2 4.7.2.2 4.4.1.3

Total Question 1		**16**

Question 2

Question	Answers	Mark	AO / Spec. Ref.
02	**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	AO3 AO1
	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	

2 cont.	**Indicative content**
	Increase in world population
	• sewage (released into rivers / lakes / seas)
	  ○ causes algae to grow
	  ○ algae block light
	  ○ causing plants to die and decompose
	  ○ leading to lack of oxygen in the water
	  ○ (sewage) could contain pathogens
	
	Need to produce more food for world's population
	• fertilisers (used on farms to increase crop yield, leach into rivers / lakes / seas)
	  ○ causes algae to grow
	  ○ leading to lack of oxygen in the water
	• herbicides / pesticides (used on farms to increase crop yield, run into rivers / lakes / seas)
	  ○ build-up in food chains
	
	Increasing demand for products / energy
	• toxic chemicals **or** named toxic chemicals (run into rivers / lakes / seas)
	  ○ from factories / industry **or** power stations
	  ○ build-up in food chains
	  ○ chemicals may cause mutations **or** chemicals may act as hormones
	  ○ radiation leaks from nuclear (power stations)
	  ○ (oil) spills from extraction / rigs / tankers in oceans
	  ○ acid rain formation
	  ○ acidification of lakes
	  ○ increased carbon dioxide emissions causes acidification of oceans
	
	Buildup of waste products
	• litter / plastics (thrown in rivers / lakes / seas)
	  ○ example of effect on living organisms, such as plastics consumed or plastics build up in stomach or plastics get stuck around beaks
	  ○ (most) plastics are not biodegradable
	  ○ build-up of microplastics in water animals
	
	Consequence of the above is that organisms living in rivers / lakes / seas are harmed / die
	
	For **Level 3** students need to consider different types of pollution
			4.7.3.2
			4.7.2.1

Total Question 2		**6**

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **one** from: • competition • herbivores • trampling / mowing • pollinators • pathogens	 allow other plants / trees (growing in the field) allow named herbivore allow pests allow insects or named pollinator allow infection ignore disease unqualified	1	AO2 4.7.1.3 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	any **six** from: • mark out (grid) area in wet and in dry area • method for placing quadrat(s) • count / record number of buttercups (in the quadrat) • use at least 5 quadrats in each area • take soil moisture readings • use suitable equipment for readings, eg soil moisture meter • calculate the mean (in each area) • use the mean and area to calculate total number in wet area and total number in dry area **OR** any **six** from (6): • transect between wet area and dry area • place quadrat(s) regularly along transect • count / record number of buttercups (in the quadrat) • use at least 5 quadrats along transect • take soil moisture readings • use suitable equipment for readings, eg soil moisture meter • repeat transects • calculate the mean at each distance along the transects	allow mark out a transect in each of the two areas allow description of a method to place quadrat(s) randomly / systematically do **not** accept throwing quadrats randomly ignore percentage cover of buttercups allow (for each area) total number of buttercups divided by total area sampled, multiplied by total area for **2** marks allow description of a method to place quadrat(s) systematically	6	AO1 4.7.2.1 RPA7

Total Question 3		**7**

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	any **two** from: • light (intensity) • water • temperature • mass / volume of soil • soil type **or** (soil) pH • other mineral content of the soil • number of plants (in a box) • starting mass / height / age of corn • type / variety of corn • harvested at the same time	do **not** accept nitrate ion concentration allow size of box allow depth of soil ignore fertiliser allow planting density allow species of corn allow harvested when mature	2	AO2 4.7.2.1 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	suitable scale **and** axis labelled (mean <u>mass</u> (of corn) per plant in <u>grams / g</u>)	max **3** marks for bar chart	1	AO2 4.7.2.1 4.7.1.2
	all points plotted correctly	allow a tolerance of ± ½ a small square allow **1** mark for 4 or 5 correct plots	2	
	suitable line of best fit	ignore line extended beyond 50ppm ignore line joined point to point with straight lines	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	as (soil) nitrate / concentration increases, (mean) mass (of corn) increases **and** then decreases		1	AO2 4.7.1.2 4.7.2.1
	with a maximum (mean mass of corn) at 30 (ppm)	allow a maximum consistent with graph in question **04.2** if no other mark awarded, allow **1** mark for (mean mass of corn) increases to 30 (ppm) **or** (mean mass of corn) decreases above 30 (ppm)	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	any **four** from: (economic) • increasing nitrate / ion (concentration) up to 30 ppm will give high(er) yield / income / sales • greater than 30 ppm will decrease yield / mass / income / sales **and** therefore waste money / fertiliser • any increase in yield / mass / income / sales must be balanced with cost (of fertiliser) • quantity to add will depend on original nitrate (ion concentration) of soil (environmental) • (when it rains) fertiliser / nitrate will enter rivers / lakes / sea / ocean causing pollution	max **3** marks if no reference to environmental implication ignore mass for this marking point only allow greater than 30 ppm, the yield / mass / income / sales / will not increase (as much) **and** therefore waste money / fertiliser allow profit / benefit will depend on yield / mass / income / sales **and** cost (of fertiliser) allow fertiliser / nitrate run-off causes pollution allow eutrophication or description of eutrophication allow description of effect of fertiliser / nitrate pollution eg health impact of fertiliser in drinking water allow environmental implication of (significant) energy use in fertiliser production / transport	4	AO3 4.7.3.2 4.7.2.2 4.1.3.3 4.4.2.3

Total Question 4		**12**

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	negative feedback (control)	ignore homeostasis	1	AO2 4.5.3.6 4.5.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	A = glucagon B = insulin	both required in correct order correct or phonetic spelling only	1	AO2 4.5.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3 **indirect marking** **view with 5.2**	(when blood glucose concentration is high after a meal) insulin / B is secreted (by the pancreas) causing glucose to enter cells		1	AO2
	(glucose is) converted to glycogen in the liver / muscle (cells for storage)		1	AO1
	(this causes) blood glucose concentration to return to normal so insulin / B secretion slows / stops / decreases		1	AO2
	when blood glucose concentration is low glucagon / A is secreted (by the pancreas)		1	AO2
	(which causes) breakdown of glycogen in the liver (into glucose)	allow (which causes) breakdown of glycogen in the muscle (cells)	1	AO1
	(this causes) blood glucose concentration to return to normal so glucagon / A secretion slows / stops / decreases		1	AO2 4.5.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	FSH causes (several) ova / eggs to mature (in the ovary)	allow singular ovum / egg allow follicle for ovary	1	AO2 4.5.3.3 4.5.3.5
	(then) LH causes ovulation **or** LH causes release of the ova / eggs	allow singular ovum / egg	1	
	so more eggs / ova present therefore higher probability / chance of fertilisation **or** so more eggs / ova present therefore higher probability / chance of sperm fusing with an egg		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	collection of (mature) egg(s) from the ovary	allow follicle for ovary	1	AO1 4.5.3.5
	(which are) fertilised (in the laboratory)	do **not** accept if in fallopian tube allow egg and sperm fuse	1	
	develop into embryo(s) (in the laboratory)	allow develop / divide into small balls of cells (in the laboratory) do **not** accept foetus	1	
	embryo(s) inserted into uterus / womb		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	any **three** from: • meiosis forms sperm **and** mitosis forms liver (cells) • two cell divisions to form sperm **and** one cell division to form liver (cells) • four genetically different sperm cells **and** two genetically identical liver cells • sperm cells have 23 chromosomes **and** liver cells have 46 chromosomes	ignore reproduction max **2** marks if reference to sperm cells dividing allow four genetically different cells formed from meiosis **and** two genetically identical cells formed from mitosis allow sperm cells have 23 chromosomes **and** liver cells have 23 pairs of chromosomes allow haploid (sperm) and diploid (liver cells)	3	AO1 4.6.1.2 4.1.2.2

Total Question 5		**18**

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	<table><tr><td></td><td>eukaryote / eukaryota</td></tr><tr><td></td><td>animal(ia)</td></tr><tr><td>phylum / phyla</td><td></td></tr><tr><td></td><td></td></tr><tr><td></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 all 4 correct **1** mark for 2 or for 3 correct ignore italics and upper / lower case letters	2	AO1 AO2 4.6.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2 view with Figure 5	*two readings from graph* 7.75 **and** 4.32	allow in range of 7.7 to 7.8 **and** 4.3 to 4.4 allow two readings from two identified points on the line, allowing a tolerance of ± ½ a small square	1	AO2 4.7.3.5
	calculation of gradient $\frac{3.43}{32}$	allow calculation of gradient using correct readings from graph, $\frac{dy}{dx}$	1	
	correct answer 0.1(071875)	allow correct answer using student's correct readings from graph	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	any **two** from: *in autumn* • no / fewer seals left on ice **or** all / most seals are in the sea • seals are adults / older so swim faster • more <u>competition</u> between polar bears	ignore seals are in the sea unqualified	2	AO3 4.7.3.5

Question	Answers	Mark	AO / Spec. Ref.
06.4	**Level 2:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	3–4	AO3
	Level 1: Some logically linked reasons are given. There may also be a simple judgement.	1–2	AO2
	No relevant content	0	
	Indicative content *may decrease because:* • global warming is melting sea ice • less sea ice each year so less habitat / hunting area • as ice / habitat disappears seals will decrease in number • having to swim longer distances to find seals, wastes energy • increased metabolic rate means more food is required • not building up fat stores in the autumn means fewer will survive each winter • decrease in mass / height may reduce hunting ability / strength • hunting in some / most areas continues • less likely to find mates • eventually the species may become extinct *may increase / maintain numbers if:* • more laws put in place to stop hunting **or** laws to stop hunting will allow bears to reproduce • quotas introduced to reduce hunting • nations / people work to reduce carbon dioxide emissions to halt global warming • (feeding / hunting) behaviour of polar bears changes For Level **2** both increase / maintenance **and** decrease of the polar bear population must be considered		4.7.1.1 4.7.3.5

Total Question 6		**11**