GCSE
COMBINED SCIENCE: TRILOGY
8464/B/2H

Biology Paper 2H

Mark scheme

June 2021

Version: 1.0 Final Mark Scheme

2 1 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 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 error / 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 <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.

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.

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	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	endocrine (system)	ignore hormonal (system)	1	AO1 4.5.3.1
01.2	D		1	AO1 4.5.3.1 4.5.3.2
01.3	A		1	AO1 4.5.3.1
01.4	(in / through / via) blood	allow (in / through / via) bloodstream allow (in / through / via) plasma allow (in / through / via) blood vessels **or** named blood vessel	1	AO1 4.5.3.1
01.5	ovary / ovaries testis / testes	in either order allow testicle(s) allow placenta if no other mark awarded allow gonad(s) for **1** mark	1 1	AO1 4.5.3.1 4.5.3.3
01.6	luteinising hormone (LH)		1	AO2 4.5.3.3

Question	Answers	Mark	AO / Spec. Ref.
01.7	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3 4.5.3.4 4.3.1.9
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content	0	
	Indicative content Advantages • non-permanent like condom / diaphragm / IUDs / spermicides / abstinence **or** unlike surgical sterilisation • longer lasting than condom / diaphragm / IUDs / spermicides • no need to remember unlike oral contraceptive • one injection rather than surgery for sterilisation • surgery (for sterilisation) has risks, for example, infection • no other method of long-lasting contraception (rather than sterilisation) relies on men Disadvantages • no protection from sexually transmitted diseases unlike barrier methods **or** named barrier method • not as long lasting as (surgical) sterilisation • at clinical / drug trial stage, so unknown side effects • at clinical / drug trial stage, so unknown efficacy • do not know how long it will last (as info only states 'up to 13 years') • can stop taking a pill **or** using a condom if you change your mind / want to get pregnant, whereas have to wait 13 years with the injection • (minor) risk of infection posed with an injection compared to no risk with the oral contraceptive For **Level 3** references to advantages **and** disadvantages of the new drug compared to named existing methods are required.		
Total		**13**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	increases (from 2005) to 690 million **or** increases to 2008 decreases (from 2008) to 630 million	allow peak in 2008 allow peak at 690 million if no other mark awarded, allow overall increase from 470 million **or** overall increase to 630 million **or** (overall) increase of 160 million **or** increases to 690 and decreases to 630 (without units) for **1** mark	1 1	AO2 4.7.3.1 4.7.3.6
02.2	$\frac{690(\text{million}) - 460(\text{million})}{690(\text{million})} \times 100$ 33.3 (%) 33 (%)	allow $\frac{230(\text{million})}{690(\text{million})} \times 100$ ignore number of decimal places allow calculated value from incorrect graph readings allow calculated answer correctly given to 2 significant figures	1 1 1	AO2 4.7.3.1 4.7.3.6
02.3	compost burning **or** as a fuel	allow improving soil (texture / drainage / quality) ignore farming unqualified ignore as fertiliser	1 1	AO1 4.7.3.3

02.4	any **two** from: • reduce pollution • plant trees • breeding programmes (for endangered species) • rewilding / regeneration of habitats / hedgerows / meadows • (reintroducing) wider field margins • plant a variety of crops • reduce use of pesticide / herbicide / insecticide	ignore references to carbon dioxide, greenhouse gases or global warming allow reduce named example of pollution, eg smoke **or** acidic gases **or** sewage **or** fertiliser allow reduce toxic waste dumping allow afforestation allow reforestation ignore reduce / stop deforestation allow planting wild flower seeds allow reduce monoculture ignore recycling ignore protect / conserve habitat(s) / areas	2	AO1 4.7.3.1 4.7.3.2 4.7.3.4 4.7.3.6

Total			**9**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	*Ourasphaira*	ignore italics ignore capitalisation do **not** accept *Ourasphaira giraldae*	1	AO2 4.6.4
03.2	the mud stopped oxygen reaching the fungus		1	AO2 4.6.3.2
03.3	any **one** from: • 2.1×10^8 (years) • 210 000 000 (years)		1	AO2 4.6.3.2
03.4	any **one** from: • fossil(s) of the fungus may have been destroyed (by geological activity) • fossil(s) of the fungus may not have been found (yet) • dating methods are not precise / accurate • the time at which an organism / fungus evolves from ancestors is difficult to pinpoint	ignore some destroyed ignore some not found (yet) allow point of speciation is not known	1	AO3 4.6.3.2
03.5	eukaryota	allow eukaryote(s)	1	AO1 4.6.4

03.6	can survive in extreme environments cytoplasm contains DNA		1 1	AO1 AO2 4.6.4 4.1.1.1 4.1.1.2 4.6.2.4
03.7	any **three** from: • studies of internal / cell structures with light microscopes • studies of internal / cell structures with electron microscopes • chemical analysis • comparison of biochemical processes • DNA / genetic analysis • studies of evolution(ary relationships)	allow organelles for internal / cell structures if neither mark awarded allow studies of internal / cell structures (with microscopes) for **1** mark	3	AO1 4.6.4
Total			**10**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	13.55 (mm) **and** 13.60 (mm)		1	AO2 4.6.2.2
	$\frac{13.60\ (mm) - 13.55\ (mm)}{2000 - 1984}$	allow $\frac{0.05}{16}$ allow correct working from other pairs of readings	1	
	0.003125 (mm/year) **or** 3.125×10^{-3} (mm/year)	allow correct answer from other pairs of readings allow a correct answer given to any number of significant figures	1	

Question	Answers	Mark	AO / Spec. Ref.
04.2	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO2
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	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	
	Indicative content • there is variation in beak length (in this bird population) • variation is due to mutations • beak length is controlled by gene(s) • birds with longer beaks can reach more nuts / food **or** birds with longer beaks can fight with **or** outcompete birds with shorter beaks • therefore have more energy from food • so can produce more offspring **or** reproduce more • those offspring that inherit the long beak allele more likely to survive • which is natural selection • pass allele **/** gene (for long beak) on • repeated over many generations • birds are evolving to have longer beaks For **Level 3** detail of process of evolution must be linked to beak length **and** implication of several generations is required.		4.6.2.1 4.6.2.2

04.3		allow converse if clearly referring to human evolution		AO2
	shorter life cycle / span	ignore shorter life	1	AO2
	more offspring		1	AO3
	(so) the genetics of the population changes faster		1	4.6.2.2 4.6.3.1
		allow effect of mutations seen sooner / faster **or** humans can see evolution in birds during the course of a human life(time)		
		allow more fossil evidence		
04.4	similar / same phenotype		1	AO1 4.6.2.2
	similar genotype / DNA (profile)		1	4.6.3.1
	(can reproduce / breed and) produce fertile offspring		1	
Total			**15**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	any **one** from: • previous intake of caffeine that day • usual intake of caffeine (on previous days) • concentration of caffeine • volume of caffeine • time of day • amount of sleep • body mass • previous experience of the test • which hand (of student **B**) holds the stopwatch	allow named caffeinated drink for caffeine allow amount / mass / type of caffeine for **1** mark allow fatigue allow (body) weight / BMI	1	AO1 4.5.2 RPA6
05.2	any **two** from: • (student **A**) does not press both start buttons simultaneously • (student **A**) may not say stop and press button simultaneously • student **B** could be distracted • idea that student **B** anticipated student **A** stopping the stopwatch • stopwatch malfunction	allow (stop)watches may not be <u>accurate</u>	2	AO3 4.5.2 RPA6
05.3	no value / result / number occurs more than once **or** all the values / results / numbers are different		1	AO2 4.5.2 RPA6

05.4	add(ed) the other (7) results and divide(d) by 7	allow correctly shown calculation ignore leave out the result for pair 8	1	AO2 4.5.2 RPA6
05.5	(adrenaline) increases heart rate	allow increases blood flow	1	AO1
	(which) increases oxygen / glucose to brain / muscle (cells)		1	AO1
	(which) increases rate of respiration		1	AO2
	(so) releasing more energy for (faster / more) muscle <u>contraction</u>	allow (so) releasing more ATP for (faster / more) muscle <u>contraction</u> do **not** accept energy produced / made / created	1	AO2 4.5.3.6 4.5.2
05.6	synapse	allow synaptic cleft	1	AO1 4.5.2
05.7	fewer adenosine (molecules) can bind to the receptors **or** adenosine has no / less effect on the (relay) neurone		1	AO2
	therefore impulses in relay neurone are more frequent	allow impulses in relay neurone are faster allow there are more impulses in relay neurone allow impulses in relay neurone not delayed / reduced (in number) ignore caffeine binds to adenosine receptors	1	AO3 4.5.2
Total			**12**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	any **one** from: • (having two) different alleles for a gene / trait / characteristic / disorder • (having) the dominant **and** recessive allele for a gene / trait / characteristic / disorder	ignore examples such as Hh ignore having two different alleles unqualified	1	AO1 4.6.1.4
06.2	father / person 7 **hh** mother / person 8 **Hh**	allow **hh** and **Hh** parental genotypes with each parent unidentified **or** reversed for **1** mark	1 1	AO2 AO2
	(possible offspring correctly derived) **hh** (× 2) **Hh** (× 2)	allow correctly derived offspring from incorrect parental genotype(s)	1	AO2
	(each different phenotype identified) **hh** = has the disorder **Hh** = does not have the disorder	allow from incorrectly derived offspring if incorrectly have **HH** = does not have the disorder	1	AO2
	0.5	allow 50% **or** ½ **or** 1:1 **or** 1 out of 2 **or** 1 in 2 do **not** accept 1:2 allow probability of having disorder correctly derived from incorrect parental genotypes	1	AO3
	(probability of male with disorder) 0.25	allow 25% **or** ¼ **or** 1:3 **or** 1 out of 4 **or** 1 in 4 do **not** accept 1:4 allow probability of male with disorder correctly derived from incorrect probability of having the disorder	1	AO3 4.6.1.4 4.6.1.5 4.6.1.6

06.3	caused by mutation	allow description, for example change in the genetic code **or** change in base sequence	1	AO2 4.6.2.1 4.6.1.4 4.6.1.5 4.6.1.3
	during meiosis	allow in (germ) cells prior to meiosis allow in (the formation of) gametes / egg / sperm allow during mitosis between fertilisation and birth	1	4.6.1.1 4.6.1.2
	causing a change in amino acid sequence		1	
	causing a different (specific) protein to be produced **or** causing none of a (specific) protein to be produced	causing a different (specific) enzyme to be produced **or** causing none of a (specific) enzyme to be produced allow polydactyly is caused by a dominant allele so if child has one / the allele (with the mutation) they will have the disorder if no other mark awarded allow parents used donated egg / sperm for **1** mark	1	

Total			**11**