SPECIMEN MATERIAL

GCSE
COMBINED SCIENCE: TRILOGY

PAPER 2: BIOLOGY 2H

Mark scheme

Specimen 2018

Version 1.0

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 Assessment Writer.

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.

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 his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded
- 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.

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 e.c.f. 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 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient are 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.

Do not allow 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.

Level of response marking instructions

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 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.

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	asexual reproduction		1	AO1/1 4.6.1.1
01.2	mitosis		1	AO2/1 4.1.2.2 4.6.1.1
01.3	clones		1	AO1/1 4.6.1.1
01.4	44		1	AO2/1 4.6.1.1
Total			**4**	

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	(placed) randomly	allow description of placement	1	AO1/2 4.7.2.1
	sufficient number (of quadrats) used		1	AO1/2 4.7.2.1
	count (dandelions) in each quadrats		1	AO1/2 4.7.2.1
	use mean number of dandelions, area of quadrat and area of field to estimate population	accept (area of field / area quadrat) × mean number of dandelions per quadrat	1	AO1/2 4.7.2.1
02.2	(40 × 145) / 0.25 = 23 200		1	AO2/2 4.7.2.1
	(0.42 × 23 200 =) 9744	allow 9744 with no working shown for **2** marks allow ecf from correct attempt at the previous step) × 0.42 for **1** mark	1	AO2/2 4.7.2.1

Question 2 continues on the next page

Question 2 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	**Level 2:** A detailed and coherent explanation is given. Logical links between clearly identified relevant points are made to explain why dandelion growth may be limited.		3–4	AO2/1 4.1.3.3 4.4.1.1 4.4.1.2 4.4.1.3 4.7.1.1
	Level 1: Discrete relevant points are made. The logic may be unclear.		1–2	AO1/1 4.1.3.3 4.4.1.1 4.4.1.2 4.4.1.3 4.7.1.1
	No relevant content		0	
	Indicative content **factors that may be considered:** competition for resources including: • light • water • space • mineral ions (allow nutrients / salts / ions from the soil) **reference to why growth may be limited:** • (light) energy for photosynthesis • water as a raw material for photosynthesis / support • surface area exposed to light • sugar / glucose produced in photosynthesis • (space) to grow bigger • (space) for growth of root system • (mineral ions) for growth • (mineral ions / sugar) for production of larger molecules **or** named example			
Total			**10**	

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	fast reaction to reduce / protect from harm	allow named examples	1	AO1/1 4.5.2
03.2	higher caffeine concentration causes shorter reaction time	allow converse ignore 'faster / slower reaction time'	1	AO3/3a 4.5.2
03.3	**Level 3:** A coherent method is described with relevant detail, which demonstrates a broad understanding of the relevant scientific techniques and procedures. The steps in the method are logically ordered. The method would lead to the collection of valid results.		5–6	AO3/3b 4.5.2
	Level 2: The bulk of a method is described with mostly relevant detail, which demonstrates a reasonable understanding of the relevant techniques and procedures. The method may not be in a completely logical sequence and may be missing some detail.		3–4	
	Level 1: Discrete relevant points are made which demonstrate some understanding of the relevant scientific techniques and procedures. They may lack a logical structure and would not lead to the production of valid results.		1–2	
	No relevant content.		0	
	Indicative content • use decaffeinated coffee as control • control volume of coffee • blind trial or don't tell students which coffee they are drinking • control start position of ruler • left for standard time between drink and test • at least 10 minutes • control start position of ruler • control other factors such as light in the room • same person for different concentrations • repeat for each caffeine concentration • use a range of caffeine concentrations • start with lowest concentration of caffeine • use caffeine solution instead of coffee to control other ingredients • repeat investigation with more people and calculate means			
Total			**8**	

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	wolves		1	AO2/1 4.7.2.1
04.2	moose and wolves are on different scales		1	AO2/2 4.7.2.1
04.3	wolf population has increased so more moose are eaten	do **not** accept there are more wolves than moose	1	AO2/1 4.7.2.1
04.4	any **two** from: • (other) predators • (new) pathogens • competition	allow correct examples allow 'humans hunting moose' allow diseases	2	AO1/1 4.7.1.3
04.5	any **four** from: • variation (within species) of antler size • (caused by) different genes • as a result of sexual reproduction / process of meiosis / mutation • (phenotype) most suited to environment most likely to survive and breed • genes for large antlers (more likely to be) passed on to next generation reference to mate selection **or** fighting **or** gaining territory **or** competition for mates **or** avoiding predation	allow description relating to antlers ignore natural selection unqualified	4 1	AO1/1 4.6.1.1 4.6.2.2 AO2/1 4.7.1.1
Total			**10**	

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	human cells have cell membrane **or** human cells have no cell wall		1	AO2/1 4.1.1.1 4.6.3.4
05.2	can no longer synthesise proteins		1	AO2/1 4.1.1.1 4.6.3.4
05.3	antibiotics are being developed at a slower rate than emergence of new resistant strains		1	AO2/1 4.6.3.4
	resistant strains mean we cannot treat (common) infections		1	AO2/1 4.6.3.4
	reduce (future) cost of antibiotic resistant infections		1	AO3/1b 4.6.3.4
Total			**5**	

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	a change in the DNA / gene		1	AO1/1 4.6.2.1
06.2	produces a different protein / enzyme that is responsible for colour		1	AO1/1 4.6.1.3 4.6.2.1
06.3	parents genotype both Bb	allow correctly derived gametes	1	AO2/2 4.6.1.4
	offspring genotypes correctly derived		1	AO2/2 4.6.1.4
	bb identified as blue	allow ring around bb only	1	AO3/1b 4.6.1.4
	65 000	allow ecf or 260 000 $\times$ 0.25	1	AO2/2 4.6.1.4
	6.5×10^4		1	AO2/2 4.6.1.4
06.4	cross with **bb** / blue carp	allow annotated Punnett square diagram(s) of cross with **bb** carp	1	AO2/2 4.6.1.4
	if any offspring are blue, the parent was **Bb** / heterozygous	allow converse allow cross with known **Bb** carp if any offspring are blue, other parent was **Bb** / heterozygous	1	AO2/1 4.6.1.4
Total			**9**	

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	reduces biodiversity		1	AO1/1 4.7.3.3
	peat is being used faster than it forms	allow peat is non-renewable	1	AO3/2a 4.7.3.3
07.2	decay / decomposition / rotting of peat		1	AO2/1 4.7.3.3
	by microorganisms / bacteria / microbes / fungi / decomposers introduced when peat is mixed with air		1	AO2/1 4.7.2.2
	that respire using substances in peat as reactant		1	AO2/1 4.4.2.1
	and using oxygen that is introduced when peat is mixed with air		1	AO2/1 4.4.2.1
Total			**6**	

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	same name to everyone		1	AO3/1b 4.6.4
	(genus) part gives information on ancestry		1	AO3/1b 4.6.4
08.2	any **one** from: • DNA / RNA analysis • improvements to (electron) microscopes • improved understanding of biochemical processes • evidence of internal structures being more developed		1	AO1/1 4.6.4
08.3	<u>primitive</u> bacteria / prokaryotes		1	AO1/1 4.6.4
	(often) from extreme environments / extremophiles		1	AO1/1 4.6.4
Total			**5**	

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	(76 − 28) × 2		1	AO2/2 4.5.3.2
	96 (units / h)	allow 96 (units /h) with no working shown for **2** marks allow 1.6 units / min for **1** mark allow answer in range of 94–104 (units / h) for **1** mark	1	AO2/2 4.5.3.2
09.2	increased blood glucose concentration causes insulin release from pancreas		1	AO2/1 4.5.3.2
	which stimulates cells to absorb glucose / sugar from the blood, so blood glucose concentration decreases		1	AO2/1 4.5.3.2

Question 9 continues on the next page

Question 9 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3		at least one advantage **and** one disadvantage of the system(s) must be given for full marks allow responses phrased in terms of the meter and injection systems		
	any **three** from: **advantages of the new system:** • better control so reduces risk of future health problems • no need to estimate dose of insulin • less chance of giving too much / little insulin • system works automatically / continuously so no need to test / inject **disadvantages of the new system:** • system is always attached so may restrict activities • pump has to be carried somewhere • pump will need re-filling • risk of infection **or** risk of tissue damage (at injection site) • line might come out	allow fewer low / high blood glucose periods so safer allow pump is difficult to hide allow risk of discomfort accept new system more expensive	3	AO3/1b 4.5.3.2
	qualified conclusion: a statement as to which system is better with reference to at least one advantage and one disadvantage	for example, the new system is better because although it is more expensive, it works automatically	1	AO3/2a 4.5.3.2

Question 9 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	blood glucose concentration goes too low		1	AO1/1 4.5.3.2
	blood glucose concentration detected by pancreas		1	AO1/1 4.5.3.2
	pancreas releases glucagon		1	AO1/1 4.5.3.2
	(glucagon causes) cells to convert to glycogen into glucose		1	AO1/1 4.5.3.2
	glucose released into blood		1	AO1/1 4.5.3.2
Total			**13**	

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21 April 2016