AQA

GCSE
Combined Science: Synergy

8465/1H – Paper 1 – Life and environmental Sciences – Higher Tier

Mark scheme

8465

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Version/Stage: 1.1 Final

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
- 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 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.

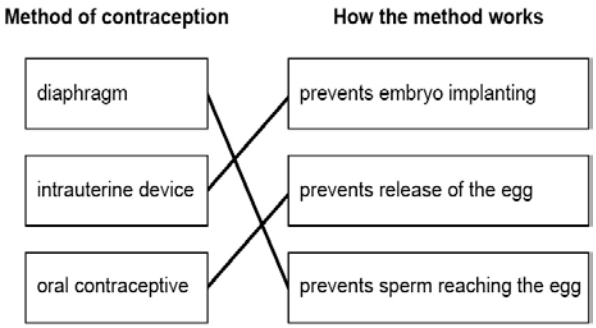
An answer which contains nothing of relevance to the question must be awarded no marks.

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	any **two** from: • amino acids • glycerol • fatty acids	do **not** accept fat allow salt / minerals allow vitamins	2	AO1 4.2.1.5
01.2	11.79 (g)	allow 11.8 (g) **or** 12 (g)	1	AO2 4.2.1.5

Question	Answers	Mark	AO / Spec. Ref
01.3	**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 • carbon dioxide enters the leaf through stomata • glucose / sugars produced by photosynthesis (in leaves) • some detail of photosynthesis • transport / translocation (of glucose / sugars) • in phloem • glucose is converted to starch • (starch is a) long chain of glucose / sugar molecules • starch as storage (of glucose / sugars)		4.2.1.5 4.2.2.5 4.2.2.7
Total		**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	*x*-axis labelled **and** suitable scale		1	AO2 4.1.1.4
	points plotted correctly	allow 5 correctly plotted for **2** marks, 3–4 correctly plotted for **1** mark allow ± ½ square	2	
	line of best fit		1	
02.2		an answer of 0.075 (ºC/s) scores **2** marks		AO2 4.1.1.4
	$\frac{4.5}{60}$	allow ecf from line of best fit in question **02.1**	1	
	0.075 (ºC/s)		1	
02.3		an answer of 15.525 (kJ) **or** 15.53 (kJ) **or** 15.5 (kJ) scores **4** marks an answer of 15 525 (kJ) scores **3** marks		AO2 4.1.1.4
	$\Delta\theta = 11.5$ (ºC)	a calculation using an incorrect temperature scores **max 3** marks	1	
	$\Delta E = 1.50 \times 900 \times 11.5$		1	
	$\Delta E = 15\,525$ (J)		1	
	$\Delta E = 15.525$ (kJ)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	any **two** from: • mass of block • size / dimensions of block • material of block • current through heater • thickness of insulation • material of insulation • time interval • starting temperature (of block / heater)	allow same block for **1** mark allow power of heater allow same insulation for **1** mark	2	AO1 4.1.1.4
Total			**12**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	 **2** marks for all 3 correct allow **1** mark for 1 or 2 correct		2	AO1 4.3.1.7
03.2	to test for safety / toxicity **or** to test for dangerous / harmful side effects	ignore to test for side effects unqualified	1	AO1 4.3.3.7

Question	Answers	Mark	AO / Spec. Ref
03.3	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	AO3
	Level 1: Relevant points are made. They are not logically linked.	1–2	AO2
	No relevant content	0	
	Indicative content allow converse where applicable • condom effectiveness is lower than oral contraceptive and patch • hormone patch slightly more effective than oral contraceptive • all are highly effective • condoms more easily accessible • condoms have no serious side effects, oral contraceptive and patch have possible side effects • only condoms protect against STIs / STDs or named STIs / STDs • side effects don't affect all women • could forget to take oral contraceptive, but patch is applied for long time • could forget to replace patch • patch is visible ignore costs ignore how the contraceptive works		4.3.1.7 4.3.3.2
Total			**9**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	4.6×10^9 years		1	AO2 4.4.1.1
04.2		an answer of 2800 (%) scores **3** marks allow 2788.88889 (%) or correctly rounded answer for **2** marks		AO2 4.4.1.1
	$\frac{780\,000 - 27\,000}{27\,000} \times 100$		1	
	$= 2788.\dot{8}$		1	
	= 2800 (%)	allow an answer from an incorrect calculation correctly given to 2 significant figures	1	
04.3	incomplete combustion		1	AO1 4.4.1.6
04.4		allow steam for water vapour		AO1 4.4.1.1
	volcanoes (on early Earth) released water vapour		1	
	(water vapour then) condensed (to form the oceans)		1	
04.5	ice caps have melted		1	AO1 4.4.1.5
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	(gamma emission) does not change the number of protons		1	AO1 4.3.2.2
	(because gamma emission) is not a particle	allow (gamma emission) is an (electromagnetic) wave	1	
05.2	prevents food poisoning		1	AO1 4.3.3.2
	(by) killing the bacteria / microorganisms / moulds		1	AO1 4.3.2.5 4.3.2.6
	that produce toxins	ignore references to decay	1	AO2 4.3.3.2
05.3	(only) gamma rays can pass (all the way) through packaging (to reach the food / bacteria)	allow converse	1	AO2 4.3.2.4 4.3.2.5
	(and also) gamma rays pass all the way through the food without damaging / ionising the food	allow converse ignore contamination ignore no damage to food unqualified	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	radioactive food contains a source of radiation **or** radioactive food is emitting radiation (whereas) irradiated food has been exposed to (an external source of nuclear) radiation		1 1	AO1 4.3.2.5
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	(dead hollow) tubes **or** (dead) hollow cells		1	AO1 4.2.2.3
	(strengthened by) lignin (and cellulose)		1	
06.2		an answer of 32.5 **or** 33 (micrometres) scores **3** marks		
	size of real object = $\frac{\text{size of image}}{\text{magnification}}$	allow $\frac{26}{800}$ for **1** mark	1	AO1 4.1.3.1
	= 0.0325 (millimetres)	allow 0.0325 (millimetres) for **2** marks	1	AO2 4.1.3.1
	= 32.5 (micrometres)	allow **1** mark for incorrect length × 1000	1	AO2 4.1.3.1
06.3	water enters (the guard cells)		1	AO1 4.2.2.3
	(by) osmosis	allow diffusion (of water) through a partially permeable membrane	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	water is lost through leaves by transpiration / evaporation (no leaves is a benefit) when low / no rainfall so less / no water lost (because) temperatures are high therefore transpiration would be rapid **or** water is used in the leaves for photosynthesis (1) (if there are no leaves) there is no photosynthesis then no water is needed (which is a benefit) when there is low / no rainfall (1) (because) temperatures are high therefore photosynthesis would be rapid (1)		1 1 1	AO1 4.2.2.3 AO2 4.2.2.3 AO3 4.2.2.3
Total			**10**	

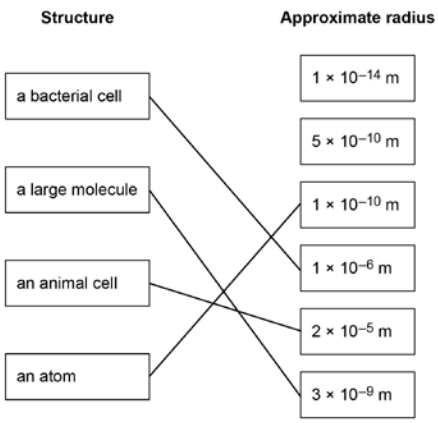
Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	a short section of DNA		1	AO1 4.4.3.1
07.2	a sequence of amino acids		1	AO1 4.4.3.1
07.3	genome		1	AO1 4.4.3.1
07.4	phenotype		1	AO1 4.4.3.4
07.5	(parents genotype shown one homozygous recessive, one heterozygous dominant) rr and Rr	may be on diagram	1	AO2 4.4.3.3
	(possible offspring genotypes shown) Rr Rr rr rr	allow correct derivation of offspring genotypes from incorrect gametes	1	
	all offspring with Marfan syndrome phenotype circled / labelled		1	
	probability 0.5 / ½ / 50%	allow correct probability from incorrectly derived offspring	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	gametes / sperm / eggs are produced by meiosis (cell division)		1	AO1 4.1.3.5
	when gametes fuse this mutation is in the fused / new cell	allow at fertilisation for when gametes fuse allow zygote for fused cell	1	AO2 4.1.3.5
	(after fertilisation) <u>mitosis</u> produces every cell of embryo / offspring		1	AO1 4.1.3.4
	(which) will be genetically identical **or** (mutated) DNA from gamete is in every cell of offspring		1	AO1 4.1.3.4
Total			**12**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	(boil ethanol) in a water bath		1	AO1 4.2.1.5
08.2	(test) add iodine (solution) (result) blue-black	 allow black allow blue / black allow dark blue ignore purple unqualified	1 1	AO1 4.2.1.5
08.3	 solvent moves through paper different pigments have different solubilities in solvent **or** different pigments have different attractions for the paper (and so) are carried different distances	allow references to solvent as the mobile phase and paper as the stationary phase	 1 1 1	AO1 4.2.2.4
08.4	any **one** from: • R_f values overlap **or** 0.20 is within range for two pigments • (R_f) ranges overlap • could be chlorophyll b or xanthophyll • there may be other pigments (that are not in table 6)		1	AO2 4.2.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5		an answer of (from) 125 / 124.6 (mm to) 137 / 137.2 (mm) scores **5** marks calculation using an incorrect distance moved by solvent scores a maximum of **4** marks		
	(R_f value) = $\frac{\text{distance moved by substance}}{\text{distance moved by solvent}}$		1	AO1 4.2.2.4
	$0.89 = \frac{\text{distance moved by substance}}{140}$ **or** $0.98 = \frac{\text{distance moved by substance}}{140}$		1	AO2 4.2.2.4
	(distance moved by substance) = 0.89 × 140 **or** = 0.98 × 140		1	AO2 4.2.2.4
	= 125 / 124.6 **or** 137 / 137.2		1	AO2 4.2.2.4
	(from) 125 / 124.6 (mm to) 137 / 137.2 (mm)		1	AO2 4.2.2.4

Question	Answers	Mark	AO/ Spec. Ref
08.6	**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 logically linking. The resulting account is not fully clear.	3–4	AO1 AO2
	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 • variation arising from mutations • mutations occurring randomly • produce a different protein / pigment / enzyme responsible for pigment production • if more likely to survive • will pass on favourable genes • idea of timescale • if more light captured, faster rate of photosynthesis • increased photosynthesis causes faster growth • outcompete neighbouring plants • different colours of light have different wavelengths • absorbing wider range of wavelengths means more light is absorbed • more likely to survive in changing conditions		4.4.4.1 4.4.4.2 4.4.2.2 4.4.2.5 4.4.4.2 4.1.4.3
Total			**18**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1			1 1 1 1	AO2 AO2 AO2 AO1 4.1.2.2 4.1.3.2
09.2	1.5:0.125 **and** 6:1 converted to same scale for example 12:1 and 6:1 **or** 6:0.5 and 6:1 as the length of the side of the cube increases the surface area to volume ratio decreases	 allow 1.5:0.125 and 1.5:0.25 **or** allow 1.5:0.125 and 0.75:0.125 allow size for length of side allow converse	1 1 1	AO2 4.2.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	animal has a small(er) surface area to volume ratio (than a bacterium)	allow converse	1	AO1 4.2.1.2
	(so) diffusion distance is larger in animals **or** volume to be supplied (with gas) by each unit of surface area is greater	allow converse	1	AO2 4.2.1.2
	(therefore) diffusion would not supply enough oxygen for the volume / size **or** diffusion would not remove enough carbon dioxide for the volume / size **or** diffusion rate per unit volume is slower	allow converse	1	AO2 4.2.1.2
09.4	active transport requires <u>energy</u> because (sugar molecule) movement is from low concentration (outside cell) to high concentration (inside cell)	allow active transport requires <u>energy</u> because (sugar molecule) movement is against / up concentration gradient	1	AO1 4.1.3.3
	(this) energy is transferred by <u>respiration</u> which requires oxygen		1	AO3 4.1.3.3
	(and a) higher concentration of oxygen allows a faster (rate of) respiration (or energy transfer)		1	AO3 4.1.3.3
Total			**13**	