AQA

GCSE
Combined Science: Synergy

8465/2F – Paper 2 – Life and Environmental Sciences – Foundation Tier

Mark scheme

8465

June 2018

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.

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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 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.

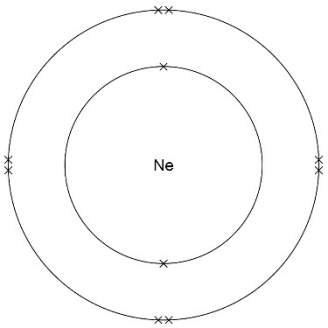
The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine 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.

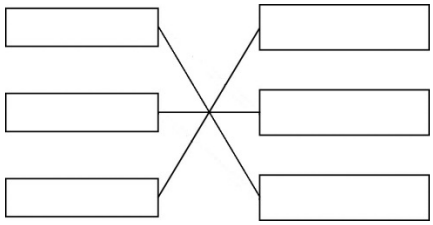
You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

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	the mass number **or** number of protons **and** neutrons	ignore (relative) atomic mass	1	AO1 4.1.2.4
01.2	18		1	AO2 4.1.2.3
01.3	22		1	AO2 4.1.2.4
01.4		ignore pairing of electrons	1	AO2 4.1.2.5
01.5	positive		1	AO1 4.1.2.3
01.6	equal number of protons **and** electrons (therefore) the positive cancels out the negative charge	do **not** accept equal number of protons, electrons and neutrons allow (therefore) equal number of positives and negatives	1 1	AO1 4.1.2.3
01.7	isotopes		1	AO1 4.1.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.8		allow **1** mark for one correct	2	AO1 4.1.1.1
Total			**10**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	mitochondria ribosomes		1 1	AO1 4.1.3.4
02.2	to repair the muscles		1	AO1 4.1.3.4
02.3	$\frac{5}{100}$ × 21 1.05 (hours)	an answer of 1.05 hours scores **2** marks allow $\frac{1}{20}$ × 21 allow for **2** marks 1 hour 3 minutes **or** 1:03 (hours)	 1 1	AO2 4.1.3.4
02.4	$\frac{7}{20}$ × 100 35 (%)	an answer of 35 (%) scores **2** marks allow 5 × 7	 1 1	AO2 4.1.3.4
02.5	78		1	AO2 4.1.3.5
02.6	fertilisation		1	AO1 4.1.3.5
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	all points plotted accurately	allow ± 0.5 small square tolerance allow **1** mark for 3 or 4 points plotted accurately	2	AO2 4.3.1.5
	line of best fit drawn		1	
03.2	extrapolation on graph		1	AO2 4.3.1.5
	9.5 (%)	allow value in range 9.4–9.6 allow correct reading from incorrect extrapolation	1	AO3 4.3.1.5
03.3	any **one** from: • eating habits may change • people are more informed about the causes of diabetes • change in exercise patterns	allow new cure	1	AO3 4.3.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	any **two** from: • diabetes (in the world) is increasing • diabetes in low-income countries is rising faster (than high-income / world) • high-income countries and low-income countries were the same in 2010 • high-income countries have been higher than low-income but now / 2018 the situation is reversed • diabetes in high-income countries was higher than the world total (from 1986 – 1993) but is now lower	allow correct use of data allow low / high income countries are increasing	2	AO3 4.3.1.5
03.5	people are becoming more obese people are eating more sugar		1 1	AO3 4.3.1.5
Total			**10**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	virus	allow viral ignore communicable / airborne / microorganism / microbe do **not** accept bacteria / bacterial / fungus / fungal / protist	1	AO2 4.3.3.6
04.2	white blood cells		1	AO1 4.3.3.4
04.3	57	allow any answer in range 55–59	1	AO3 4.3.3.5
04.4	85	allow any answer in range 84–86	1	AO3 4.3.3.5
04.5	children are less likely to come into contact with someone with the disease more people will have the correct antibodies		1 1	AO2 4.3.3.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	any **two** from: • cost (to the NHS / government) • money saved through not treating people with chickenpox • how effective the vaccine is • severity of the disease • less effect of disease on people with weaker immune systems / elderly / HIV or on unborn babies		2	AO3 4.3.3.5
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	*Triticum spelta*		1	AO2 4.4.4.4
05.2	(pig) 2 **and** (wheat) 4	both needed for **1** mark	1	AO3 4.4.4.4
05.3	pig	allow ecf from question **05.2**	1	AO3 4.4.4.4
05.4	only a small sample (of DNA)	ignore references to structure and appearance	1	AO3 4.4.4.4
05.5	any **three** from: • (farmer) selects heaviest / largest chickens / parents • (cross) breeds these chickens together • (farmer) selects the heaviest / largest offspring (to breed) • repeats this many times (until you have the desired chicken)	allow (farmer) selects chickens with the best / most meat	3	AO1 AO2 4.4.4.5
05.6	high(er) income / profit		1	AO3 4.4.4.5
05.7	the chickens may weigh too much to be able to stand		1	AO3 4.4.4.5
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	(use a) displacement / eureka can filled with water collect the water that is displaced (by the stone) measure volume of water with a measuring cylinder **or** (use a) measuring cylinder of water (1) take a start and end level of the water (in the measuring cylinder) (1) calculate volume of water rise (1)	 allow idea of measure how far water has risen from original level	1 1 1	AO1 4.1.1.2
06.2	vernier callipers		1	AO3 4.1.1.2
06.3	11.2 (cm^3)	allow 11	1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4		an answer of 5(.0) scores **2** marks		AO2 4.1.1.2
	$\frac{56}{11.2}$	allow ecf from question **06.3**	1	
	5(.0)(g/cm^3)		1	
06.5	haematite		1	AO3 4.1.1.2
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1		ignore references to blotting the potato chips		AO2 4.1.3.3
	measure the mass / length of the chip at the start	if neither mark awarded allow **1** mark for measure the increase in length / mass	1	
	measure the mass / length of the chip at the end		1	
	divide the change in mass / length by time taken		1	
07.2	use cork borer	allow a description allow a potato chip cutter	1	AO3 4.1.3.3
07.3	(rate) would be higher / faster	ignore more diffusion / osmosis	1	AO3 4.1.3.3
	(as) surface area (for diffusion / osmosis) is greater		1	AO2 4.1.3.3
07.4	(as temperature increases the) rate (of osmosis) would increase	ignore more water taken in	1	AO3 4.1.3.3
	as (water) molecules / particles have more energy to move (faster) **or** as (water) molecules / particles have more kinetic energy	allow (water) molecules / particles move faster	1	
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	(water that is) safe to drink	allow suitable to drink ignore filtered / purified / pure / clean	1	AO1 4.4.1.8
08.2	to filter the water **or** to remove solid objects	 allow to remove bacteria from the water allow example of solids	1	AO2 4.4.1.8 RPA11
08.3	 29 × 6 × 2 (£)3.48	an answer of (£)3.48 scores **2** marks allow **1** mark for 174(p) **or** (£)1.74	 1 1	AO2 4.4.1.8
08.4	have to wait longer before you can use the water not portable (if concrete used)	allow have to wait 2 weeks before you can use the water	1 1	AO3 4.4.1.8
08.5	any **two** from: • filters a lot of water per hour **or** high filtration rate • (concrete) heavy so cannot be knocked over / stolen • higher reduction in pathogens (that cause diarrhoea) • low maintenance • faster (than SODIS) **or** don't have to wait 8 hours • not weather dependent (like SODIS) • needs replacing less frequently	 allow produces more clean water (in a given time) allow 47% reduction instead of 31% reduction	2	AO3 4.4.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.6	ozone **or** chlorine	allow boiling the water allow distillation allow sterilising tablets allow gamma rays ignore filtration / sunlight / heat	1	AO1 4.4.1.8
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	any **three** from: • same surface area of bag (exposed to sun) • same volume / mass of water • use same starting temperature of water • place all bags out at the same time • place all bags out in same area / conditions • same thickness of material / bag • same type of material (for each bag) • use IR lamp in a lab	allow same sized bag allow same amount of water allow measure temperature at the start	3	AO3 4.1.4.3
09.2	0.1 (˚C)		1	AO2 4.1.4.3
09.3	any **one** from: • more cloudy • less sunny • less sunlight • cooler day	ignore less Sun	1	AO3 4.1.4.3
09.4	24.3 (˚C)		1	AO2 4.1.4.3
09.5	black (it has the) greatest (temperature) rise	reason only scores if black is given allow it is the best absorber of IR (radiation) ignore best emitter of IR (radiation)	1 1	AO3 4.1.4.3
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	ionising radiation	allow UV / X-rays / gamma (radiation) allow environmental factors qualified eg carcinogenic chemicals	1	AO1 4.4.4.1
10.2	enzymes vectors		1 1	AO1 4.4.4.6

Question	Answers	Mark	AO/ Spec. Ref
10.3	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6	AO2 AO1
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–3	AO1
	No relevant content	0	
	Indicative content • pre-clinical trials of the new drug on cells / tissues / live animals • to test for toxicity / dosage / efficacy • clinical trials / tests on healthy volunteers • clinical trials / tests on children with Dravet syndrome at very low doses • so you can monitor for safety / side effects • and only after these stages trial to find optimum dosage / test for efficacy • trial could be double blind / use a placebo • which does not contain the new drug • children with Dravet syndrome would be randomly allocated to the test groups • so no one knows who has the drug / placebo • comparison to existing drugs • peer review of data • to help prevent false claims • approval by NICE to access **level 2** the key ideas of testing on healthy volunteers followed by testing on patients must be given		4.3.3.7
Total		**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
11.1	trachea		1	AO1 4.2.1.3
11.2	any **one** from: • can see more detail in lungs • you can see the bronchus / bronchioles / soft tissues	ignore gives clearer image ignore bones allow it doesn't use ionising radiation allow X-rays can cause cancer / mutation	1	AO3 4.2.1.3
11.3	you can see the ribs / bones	allow cheaper allow takes less time	1	AO3 4.2.1.3
11.4	any **three** from: (aerobic) • uses / needs / requires oxygen (and anaerobic does not) • transfers more energy (than anaerobic) • produces carbon dioxide / water (anaerobic does not) • does not produce lactic acid (anaerobic does) • does not cause an oxygen debt (anaerobic does)	allow converse in terms of anaerobic allow releases more energy (than anaerobic) do **not** accept energy is created / produced / made allow aerobic takes place in mitochondria **and** anaerobic takes place in cytoplasm	3	AO1 4.2.1.1

Question	Answers	Mark	AO/ Spec. Ref
11.5	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO2 4.2.1.2 4.2.1.3 4.3.1.2
	Level 2: Relevant points (reasons / causes) 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 (stopping smoking will improve health because): • smoking is a risk factor for cardiovascular disease • raises blood pressure • increases cholesterol and / or lowers HDL • increases artherosclerosis **or** thickened artery walls • increases the risk of blood clots forming • increases risk of stroke • smoking is a risk factor for lung cancer • as it can cause mutations • caused by carcinogenic chemicals in smoke (tar) • leading to uncontrolled growth of cells • smoking damages alveoli • causing the surface area of the alveoli to decrease • causes emphysema / COPD • causes shortness of breath **or** reduces gas exchange • chemicals / tar / nicotine in the smoke irritate / inflame the bronchi / lung / bronchioles • which damage the cilia • causes goblet cells to secrete more mucus • causes shortness of breath **or** reduces gas exchange • causing chronic bronchitis **or** increases risk of infections		

Question	Answers	Mark	AO/ Spec. Ref
11.5 cont.	• carbon monoxide is produced • which is toxic / poisonous • binds / attaches to haemoglobin / Hb • so oxygen carrying capacity of blood is decreased		
Total		**12**	