



GCSE
COMBINED SCIENCE: SYNERGY
8465/1F

Foundation Tier Paper 1 Life and environmental sciences

Mark scheme

June 2019

Version: 1.0 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 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 / ; e.g. 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 not 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, i.e. 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

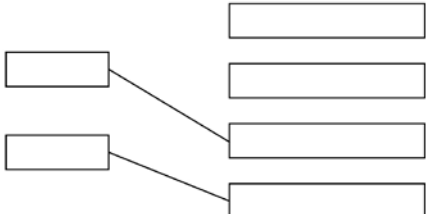
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	valve(s)	ignore names of valves	1	AO1 4.2.1.3
01.2	arteries		1	AO1 4.2.1.3
01.3	blood in arteries has less carbon dioxide	do not accept if also ticked blood in arteries has more carbon dioxide	1	AO2 4.2.1.3
	blood in arteries has more oxygen	do not accept if also ticked blood in arteries has less oxygen	1	
01.4	resting heart rate would decrease		1	AO2 4.2.1.3
01.5	67		1	AO2 4.2.1.3
01.6	any one from: (the student) <ul style="list-style-type: none"> • was (more) active • was stressed / anxious / nervous • slept less • was ill • drank (more) caffeine 	allow did exercise allow took drugs / alcohol allow warm(er) weather	1	AO3 4.2.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	<p>82 × 60 or 4920</p> <p>(beats per minute or beats per hour) × 24</p> <p>118 080</p>	<p>an answer of 118 080 scores 3 marks</p> <p>allow incorrect value of beats per hour × 24 if working shown</p> <p>if no other mark awarded, allow 24 x 60 for 1 mark</p>	<p>1</p> <p>1</p> <p>1</p>	<p>AO2 4.2.1.3</p>
Total			10	

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	carbon		1	AO2 4.1.1.5
02.2	(temperature) increases to / for 1 minute or (temperature) increases to 45 °C or (temperature) increases by 25 °C	allow values in range 44 °C to 46 °C throughout	1	AO2 4.1.1.5
	(temperature) stays constant / 45 °C for 2 minutes or (temperature) stays constant / 45 °C between 1 and 3 minutes		1	
	(then) temperature increases after / for 3 minutes or (then) temperature increases to 90 °C or (temperature) increases by 45 °C	allow values in range 89 °C to 91 °C ignore references to rate of increase if no other marks awarded, allow 1 mark for increase, stays the same, increase	1	
02.3	45 (°C)	allow values between 44 °C and 46 °C	1	AO3 4.1.1.5
02.4	all points correctly plotted	allow a tolerance of $\pm \frac{1}{2}$ small square allow 1 mark if at least 3 plots are correct	2	AO2 4.1.1.5
	plots correctly joined	allow incorrect plots correctly joined	1	
Total			8	

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1		additional line from a box on the left negates the mark for that box	2	AO1 4.4.2.4
03.2	distance from the school building		1	AO2 4.4.2.4
03.3	straight line from building, across field in any direction		1	AO2 4.4.2.4
03.4	any four from: <ul style="list-style-type: none"> • lay out a tape measure or lay out a transect • place quadrats at known intervals • identify plant species • count / record number (of plants) present or percentage cover (in each quadrat) • repeat for other transect(s) / line(s) 	allow at 3 or more different distances allow record which species touches tape / transect	4	AO1 4.4.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	any one from: <ul style="list-style-type: none"> • less light (near the tree) • less water (near the tree) • fewer mineral ions / nitrates / nutrients (near the tree) 	allow converse for further from the tree allow roots of the tree take up space ignore trampling	1	AO3 4.4.2.2 4.4.2.3 4.4.2.4
03.6	any two from: <ul style="list-style-type: none"> • water • (soil) pH • minerals / ions • light • competition (for space) • seed dispersal • trampling • how often the grass is cut • time of year 	must be different to answer given in question 03.5 allow type of soil allow nutrients (from the soil) ignore weather / climate / wind / temperature / weeds / disease / animals	2	AO1 4.4.2.2 4.4.2.3
Total			11	

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	(male) testosterone	must be in this order allow phonetic spelling for both	1	AO1 4.3.1.6
	(female) oestrogen	allow estrogen	1	
04.2	$\frac{5}{28} \times 100$	an answer of 17.8571429 % or fewer significant figures with correct rounding scores 2 marks	1	AO2 4.3.1.6
	17.8571429 (%)		1	
04.3	any one from: <ul style="list-style-type: none"> length of bleeding / menstruation / cycle varies could be affected by contraceptive pill / patch / injection / implant / IUD 	allow menopause	1	AO3 4.3.1.6 4.3.1.7
04.4	the egg is maturing		1	AO2 4.3.1.6
04.5	ovary / ovaries	allow phonetic spelling do not accept oviduct ignore left / right	1	AO1 4.3.1.6
04.6	LH / luteinising hormone		1	AO1 4.3.1.6
04.7	egg cannot travel to uterus or sperm cannot reach the egg		1	AO2 4.3.1.7
	(therefore) cannot be fertilised		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.8	any one from: <ul style="list-style-type: none"> • oral contraceptives • condom • (progesterone) injection / implant / skin patch • diaphragm / cap • IUD / coil • abstinence • male sterilisation / vasectomy 	do not accept female sterilisation allow 'pill' allow barrier method allow hormonal method	1	AO1 4.3.1.7
Total			11	

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	the average kinetic energy decreases		1	AO1 4.1.1.3
05.2	the average speed decreases		1	AO1 4.1.1.3
05.3	gas pressure outside the syringe > gas pressure inside the syringe		1	AO2 4.1.1.3
05.4	density = $\frac{\text{mass}}{\text{volume}}$	allow $\rho = \frac{m}{V}$	1	AO1 4.1.1.2
05.5	0.000031 kg		1	AO2 4.1.1.2
05.6	density = $\frac{0.000031}{0.000025}$ density = 1.24 density = 1.2 (kg/m ³)	an answer of 1.2 (kg/m ³) scores 3 marks allow ecf from question 05.5 an answer of 1240 (kg/m ³) scores 1 mark an answer of 1200 (kg/m ³) scores 2 marks	1 1 1	AO2 4.1.1.2
05.7	the density of helium is less than the density of air		1	AO3 4.1.1.2
05.8	measure the mass of the stone fill displacement can with water (to spout level) put stone in and measure volume of water displaced (in a measuring cylinder)	allow weight for mass allow add water to a measuring cylinder (to a certain level) allow put stone into measuring cylinder and calculate the increase in volume. mp2 and mp3 must correspond ignore calculation of density	1 1 1	AO1 4.1.1.2
Total			12	

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	desalination		1	AO1 4.4.1.8
06.2	increased evaporation at location X		1	AO2 4.4.1.7
06.3	any one from: <ul style="list-style-type: none"> • (more) sewage • (more) industrial waste 	allow industrial pollution allow (more) fertiliser / run-off allow (more) desalination plants ignore less precipitation	1	AO2 4.4.1.8
06.4	weigh (evaporating) basin / dish add (25 cm ³ of) sea water (to evaporating dish) heat to evaporate / remove water (from evaporating dish) re-weigh subtract mass before from mass after	allow calculate the difference in mass (before and after heating)	1 1 1 1	AO1 4.4.1.8
Total			8	

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.															
07.1	plasmid		1	AO1 4.1.3.2															
07.2	genetic engineering		1	AO1 4.4.4.6															
07.3	<table border="1"> <thead> <tr> <th>Disease</th> <th>Caused by a bacterium</th> <th>Caused by a virus</th> </tr> </thead> <tbody> <tr> <td>Measles</td> <td></td> <td>(✓)</td> </tr> <tr> <td>Gonorrhoea</td> <td>✓</td> <td></td> </tr> <tr> <td>AIDS</td> <td></td> <td>✓</td> </tr> <tr> <td>Salmonella</td> <td>✓</td> <td></td> </tr> </tbody> </table>	Disease	Caused by a bacterium	Caused by a virus	Measles		(✓)	Gonorrhoea	✓		AIDS		✓	Salmonella	✓		3 rows correct for 2 marks 2 rows correct for 1 mark	2	AO1 4.3.3.2
Disease	Caused by a bacterium	Caused by a virus																	
Measles		(✓)																	
Gonorrhoea	✓																		
AIDS		✓																	
Salmonella	✓																		
07.4	any three from: <ul style="list-style-type: none"> • fever • (red skin) rash • cough • sneezing 	allow descriptions of symptoms allow spots allow runny nose allow sore throat allow vomiting allow inflamed eyes or conjunctivitis ignore sick / cold / sweating do not accept flu	3	AO1 4.3.3.2															
07.5	(bacteria are more likely to evolve) antibiotic resistance	allow allergic reaction	1	AO1 4.4.4.3															

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	person with fungus / athlete's foot walks barefoot (somewhere damp) or fungus is left on shower floor / towel skin of another person comes into contact with surface or (fungus) gets on to the foot of the next person	 if no other mark awarded allow sharing towels / socks / shoes or walking barefoot or direct contact for 1 mark	1 1	AO2 4.3.3.1
07.7	(mucus) traps pathogens / bacteria / viruses / microorganisms / microbes (cilia) move mucus (containing pathogens then they are swallowed)	 ignore reference to stomach acid	1 1	AO1 4.3.3.3
Total			12	

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	Canis	ignore italics ignore capitalisation	1	AO2 4.4.4.4

Question	Answers	Mark	AO / Spec. Ref.
08.2	Level 2: Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3–4	AO1 4.4.4.4
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–2	AO1 4.4.4.4
	No relevant content	0	
	Indicative content (originally) <ul style="list-style-type: none"> • organisms placed in groups based on similar structures • or characteristics • influenced by where organisms are found • classification by Carl Linnaeus (more recent) <ul style="list-style-type: none"> • organisms with similar internal structures grouped together • because of development of microscopes • organisms with similar biochemical processes grouped together • organisms with similar DNA grouped together • more fossils / species have been found / studied • the three domain system • classification by Carl Woese for full marks answers must refer to both original and more recent classification		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	population is the number of one species (in the area / habitat)		1	AO1 4.4.2.1
	(whereas a) community is all the individuals / populations of the different species (living in the area / habitat)	allow (whereas a) community is all the different organisms (living in the area / habitat) ignore reference to time	1	

Question	Answers	Mark	AO / Spec. Ref.
08.4	Level 3: Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO3 4.4.2.1 4.4.2.2 4.4.2.3
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO2 4.4.2.1 4.4.2.2 4.4.2.3
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO2 4.4.2.1 4.4.2.2 4.4.2.3
	No relevant content	0	
	Indicative content		
	<ul style="list-style-type: none"> • no / fewer wolves means more food for (Brown) bears • so less competition • so population of bears may increase • therefore elk / bison population may decrease • less predation of elk / bison by wolves • and / or Brown bears unable to control populations of herbivores • would increase populations of elk / bison • rabbits predated less • therefore rabbit population may increase • grass decreases due to more rabbits • grass decreases due to more elk / bison • grass increases due to fewer elk / bison • decline in all herbivores due to over-grazing 		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	to reduce the effect of inbreeding		1	AO2 4.4.2.7 4.4.4.5
08.6	7.5	allow 6.93 to 8.15 if clearly calculated from graph values $\pm \frac{1}{2}$ square	1	AO2 4.4.2.1
08.7	population has been stable	allow population has increased (slightly) ignore population increased in 2014	1	AO3 4.4.2.2
Total			16	

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	the number of neutrons		1	AO1 4.1.2.4
09.2	neutrons protons		1 1	AO1 4.3.2.2
09.3	206 Pb 82	allow correct symbol from incorrectly calculated atomic number	1 1 1	AO2 4.3.2.2
09.4	138 (days)	allow 135 to 140	1	AO2 4.3.2.3
09.5	(8.8 days is) 5 (half lives) (mass after 44 days =) 0.15625 (mg)	an answer of 0.15625 (mg) correctly rounded scores 2 marks $\left(\frac{44}{8.8} =\right) 5$ allow evidence of dividing 5 (mg) by 2 five times $\left(\frac{3.125 \times 5}{100} =\right) 0.15625$ (mg)	1 1	AO2 4.3.2.3
09.6	(alpha radiation) is highly ionising or (alpha radiation) is absorbed by cells any one from: • can cause (DNA) mutations • can cause cell death	allow (alpha radiation) cannot leave the body allow can cause cancer / tumour allow can damage DNA / chromosomes	1 1	AO1 4.3.2.6 4.4.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.7	alpha radiation stopped by glass	allow alpha radiation cannot pass through glass reference to alpha radiation being stopped by paper is insufficient	1	AO2 4.3.2.4
Total			12	