GCSE
COMBINED SCIENCE: SYNERGY
8465/1F

Foundation Tier Paper 1 Life and Environmental Sciences

Mark scheme

June 2021

Version: 1.0 Final Mark Scheme

2 1 6 G 8 4 6 5 / 1 F / 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 1

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.1	any **one** from: • carbon dioxide • water vapour	allow CO_2 allow $H_2O(g)$ ignore water unqualified allow other correct greenhouse gases eg nitrous oxide(s) / nitrogen oxide / ozone / chlorofluorocarbons / CFCs / hydrofluorocarbons / HFCs / perfluorocarbons / sulfur hexafluoride	1	AO1 4.4.1.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.2	the variety of organisms in an area		1	AO1 4.4.2.5 4.4.2.6

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.3	(for) compost / fertiliser	allow (for) burning / fuel ignore building / development	1	AO1 4.4.2.6

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.4	growing hedgerows between fields planting more woodlands		1 1	AO1 4.4.2.5 4.4.2.7

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.5	1.0×10^{-9} m		1	AO2 4.1.2.2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.6	a protein		1	AO2 4.1.2.2 4.1.2.3 4.2.1.5

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.7	1838		1	AO2 4.4.1.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.8	(concentration of) methane increased (from 2015 to 2019)		1	AO3. 4.4.1.3

Total Question 1		**9**

Question 2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
02.1	beta		1	AO1 4.3.2.2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
02.2	30 (years)		1	AO2 4.3.2.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
02.3	8 kg		1	AO2 4.3.2.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
02.4	a line that is sampled along		1	AO1 4.3.2.6 4.4.2.4

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
02.5	mutations proteins tumours	this order only	1 1 1	AO1 4.3.2.7 4.4.3.1 4.4.4.1

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
02.6	air temperature water		1 1	AO1 4.4.2.3

Total Question 2		**9**

Question 3

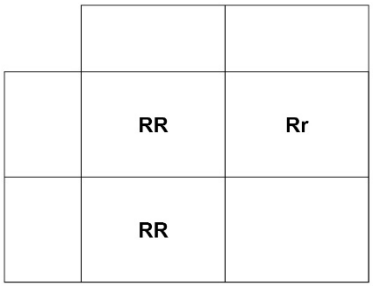
Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.1	there is a **Y** (chromosome)	ignore reference to (one) **X** chromosome	1	AO1 4.4.3.2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.2	any **one** from: • (body) mass • strength • skin colour	ignore height allow (body) weight allow hair colour	1	AO2 4.4.3.4

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.3	difficulty breathing / exercising	allow breathlessness allow short of breath allow they don't get enough oxygen allow cough / asthma / wheeze allow fatigue allow feeling tired	1	AO2 4.2.1.3 4.3.3.10

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.4	**rr**		1	AO2 4.4.3.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.5	homozygous		1	AO2 4.4.3.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.6		all correct for **2** marks 1 **or** 2 correct for **1** mark	2	AO2 4.4.3.3

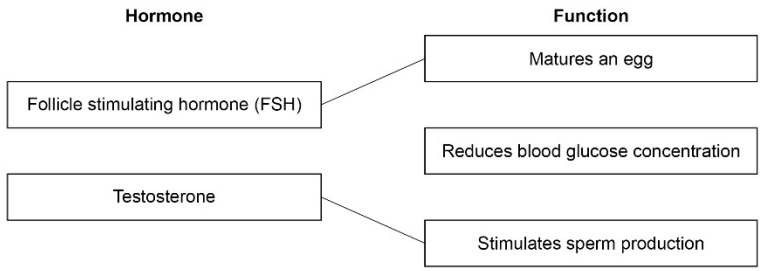
Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.7	0%	response must match **03.6** if no answer in **03.6** allow 0%	1	AO3 4.4.3.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.8	any **two** from: • can see side effects / toxicity • can judge dose • effectiveness	allow to see they are safe allow to see if the drug works	2	AO1 4.3.3.7

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.9	sheep may be harmed	allow sheep will suffer ignore it is cruel unqualified ignore references to religion / cost	1	AO3 4.3.3.8

Total Question 3		**11**

Question 4

Question	Answers	Mark	AO/ Spec. Ref.
04.1	 do not accept more than one line from a box on the left	1 1	AO1 4.3.1.6

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.2	luteinising hormone		1	AO1 4.3.1.6

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.3	oral contraceptive pill skin patch		1 1	AO1 4.3.1.7

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.4	fertilisation	ignore description of fertilisation	1	AO2 4.1.3.5

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.5	mitosis	allow phonetic spelling	1	AO2 4.1.3.4 4.1.3.5

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.6	differentiation into (sensory / motor / relay) neurone(s)	allow specialisation allow into (sensory / motor / relay) nerve cells	1 1	AO1 AO2 4.1.3.6 4.2.1.6 4.3.3.9

Total Question 4		**9**

Question 5

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.1	using chlorine using ozone		1 1	AO1 4.4.1.8

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.2	bacteria / microorganisms / microbes / pathogens have been killed	allow no (living) bacteria / microorganisms / microbes / pathogens are present allow viruses have been killed ignore germs	1	AO2 4.4.1.8

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.3	reverse osmosis		1	AO1 4.4.1.8

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.4	water evaporates / boils (then water vapour) cools / condenses (in delivery tube) (pure / distilled) water collects in the beaker	allow water vapour is given off allow steam is given off	1 1 1	AO1 AO2 AO2 4.4.1.8 RPA11

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.5	any **one** from: • ice around beaker • use a (Liebig) condenser	 allow add a (loose) lid on the beaker	1	AO3 4.4.1.8 RPA11

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.6	$\frac{4500}{28\ 125}$ = (£)0.16 (per dm^3)	 allow 16p (per dm^3)	1 1	AO2 4.4.1.8

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.7	(water produced in 1 year = 6 × 365 =) 2190 2190 × 15 = 32 850 (dm^3) **alternative approach** (number of days in 15 years = 15 × 365 =) 5475 (1) 5475 × 6 (1) = 32 850 (dm^3) (1) **alternative approach** (15 × 6 =) 90 (1) 90 × 365 (1) = 32 850 (dm^3) (1)	 allow correct use of incorrect calculation of volume in 1 year allow correct use of incorrect calculation of days in 15 years allow correct use of incorrect calculation of 6 (dm^3) × 15 (years)	1 1 1	AO2 4.4.1.8

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.8	any **one** from: • system is expensive • rain / lakes / rivers provide (fresh) water • (UK) is not sunny (enough)	allow cost / expense (to set up) allow rains frequently (in UK) allow (most of UK) has mains / pipes (supplying water)	1	AO3 4.4.1.8

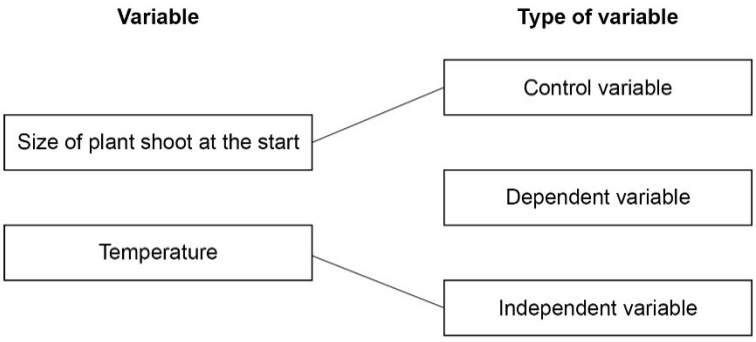
Total Question 5		**14**

Question 6

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.1	translocation		1	AO1 4.2.2.7

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.2	xylem	allow phonetic spelling	1	AO1 4.2.2.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.3	to move the air bubble to zero		1	AO3 4.2.2.3

Question	Answers	Mark	AO/ Spec. Ref.
06.4	 do not accept more than one line from a box on the left	1 1	AO2 4.2.2.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.5	as temperature increases (rate of) water uptake / loss increases (because of) greater / more / increased (rate of) evaporation / transpiration	allow as temperature decreases (rate of) water uptake / loss decreases allow (because of) greater / more / increased water loss / release allow converse if clearly referring to temperature decrease	1 1	AO2 4.2.2.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.6	more / faster water uptake	allow more / faster water loss	1	AO2 4.2.2.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.7	3.14 × 0.5 × 0.5 × 3 2.355 (mm^3)	 allow 2.36 **or** 2.4 **or** 2 (mm^3)	1 1	AO2 4.2.2.3

Total Question 6		**10**

Question 7

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
07.1	we do **not** know who will get the common cold		1	AO3 4.3.3.1

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
07.2	placebo		1	AO1 4.3.3.7

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
07.3	to improve the taste of the tablet		1	AO1 4.3.3.6

Question	Answers	Mark	AO/ Spec. Ref.
07.4	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6	AO1 4.3.3.3 4.3.1.1 4.3.3.1
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–3	
	No relevant content	0	
	Indicative content **General** • (many / infectious) diseases are caused by pathogens / microorganisms / bacteria / viruses / microbes • skin / airways / stomach prevent entry of pathogens **Skin** • skin is a (physical) barrier • scabs form over cuts forming a barrier • platelets are needed to form the scab • skin produces antimicrobial secretions • that kill pathogens / microorganisms / bacteria / viruses / microbes **Airways** • some pathogens / microorganisms / bacteria / viruses / microbes spread via air **or** are breathed in • trachea / airways secrete mucus • mucus traps pathogens / microorganisms / bacteria / viruses / microbes • mucus moved by cilia • mucus moved upwards • mucus is swallowed **Stomach** • (mucus / pathogens) enter(s) stomach which contains acid • stomach acid kills pathogens / microorganisms / bacteria / viruses / microbes in mucus • stomach acid kills (most) pathogens / microorganisms / bacteria / viruses / microbes that are in food Responses referring to only skin **or** airways **or** stomach are **Level 1**.		

Total Question 7	**9**

Question 8

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
08.1	W		1	AO1 4.2.1.7

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
08.2	liver		1	AO1 4.3.1.5 4.3.1.4

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
08.3	hormones travel more slowly than impulses		1	AO1 4.2.1.6 4.2.1.7 4.3.1.4

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
08.4	(the hormones) act on other glands to (stimulate / cause) release of other hormone(s)		1 1	AO1 4.2.1.7 4.3.1.4

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
08.5	(**A**) white blood cell (**B**) red blood cell	this order only ignore WBC allow named white blood cell ignore RBC	1 1	AO1 4.2.1.4

Question	Answers	Extra information	Mark	AO/

				Spec. Ref.
08.6	$500 = \frac{3.5}{\text{diameter of real cell}}$ $\text{diameter of real cell} = \frac{3.5}{500}$ diameter of real cell = 0.007 (diameter of real cell = 0.007 × 1000 =) 7 (micrometres)	allow conversion of unit at any point in the calculation	1 1 1 1	AO2 4.1.3.1 RPA3

Total Question 8		**11**

Question 9

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.1	(**A**) evaporation (**B**) condensation	this order only	1 1	AO1 4.4.1.7

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.2	$0.3 \times \frac{83}{100}$ 0.249 (%)	allow $\frac{0.3}{100} \times 83$ allow 0.25 / 0.2 (%)	1 1	AO2 4.4.1.7

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.3	any **two** from: • sewage • toxins • fertilisers		2	AO1 4.4.2.6

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.4	deep(er) / middle layer is warmer (than surface) **or** deep(er) / middle layer does not freeze **or** (organisms) move to deep(er) / middle layer	 allow deep(er) layer is insulated by ice allow only the surface freezes	1	AO3 4.1.1.2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.5	3.8 °C (at 15 m) $\left(\frac{\text{change in temperature}}{\text{change in depth}} =\right)$ $\frac{3.8 - 0}{15 - 7}$ = 0.475 (°C/m)	 allow $\frac{3.8}{8}$	1 1 1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.6	density = $\frac{\text{mass}}{\text{volume}}$ **or** $\rho = \frac{m}{V}$	allow any correct rearrangement	1	AO1 4.1.1.2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.7	$920 = \frac{2.3}{V}$ $V = \frac{2.3}{920}$ V = 0.0025 (m^3)		1 1 1	AO2 4.1.1.2

Question	Answers	Mark	AO/ Spec. Ref.
09.8	**Level 2:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	3–4	AO1 4.1.1.2 RPA1
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content • measure mass of empty measuring cylinder **or** other vessel **or** place measuring cylinder on balance and zero • measure volume with a measuring cylinder **or** 10 / 20 cm^3 pipette **or** volumetric pipette **or** volumetric flask. **Not** beaker. • measuring to lowest point on meniscus • view level with meniscus / liquid • pour liquid into vessel • measure mass of liquid with balance • subtract mass of measuring cylinder		

Total Question 9	**18**