GCSE
COMBINED SCIENCE: SYNERGY
8465/1F

Foundation Tier Paper 1 Life and Environmental Sciences

Mark scheme

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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.

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 their 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 (for example, a scientifically correct answer that could not reasonably be expected from a student's knowledge of the specification).

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**.
Alternative words in the mark scheme are shown by a solidus 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 errors / 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** magnetic materials.

[2 marks]

Student	Response	Marks awarded
1	iron, steel, tin	1
2	cobalt, nickel, nail*	2

3.2 Use of symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, or uses symbols to denote quantities in a physics equation, 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. At any point in a calculation students may omit steps from their working. If a subsequent step is given correctly, the relevant marks may be awarded.

Full marks are **not** awarded for a correct final answer from incorrect working.

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

An error can be carried forward from one question part to the next and is shown by the abbreviation 'ecf'.

Within an individual question part, an incorrect value in one step of a calculation does not prevent all of the subsequent marks being awarded.

3.6 Phonetic spelling

Marks should be awarded if spelling is not correct but the intention is clear, **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.

3.11 Numbered answer lines

Numbered lines on the question paper are intended to support the student to give the correct number of responses. The answer should still be marked as a whole.

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, if necessary, 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. 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	(**A**) precipitation (**B**) evaporation (**C**) condensation		1 1 1	AO1 4.4.1.7

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.2	desalination		1	AO1 4.4.1.8

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.3	the process requires energy		1	AO1 4.4.1.8

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.4	adding chlorine exposure to ultraviolet light		1 1	AO1 4.4.1.8

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.5	any **one** from: • to make the water safe (to drink) • (bacteria) can cause disease / infection • to prevent / stop people becoming ill	allow to prevent / stop people becoming sick allow to prevent / stop harm to people ignore to prevent / stop people drinking bacteria	1	AO1 4.3.3.1 4.4.1.8

Total Question 1	**8**

Question 2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
02.1	cell division		1	AO1 4.2.2.1

Question	Answers	Mark	AO/ Spec. Ref.
02.2	<table><tr><th>Feature of tissue</th><th>Xylem only</th><th>Phloem only</th><th>Both xylem AND phloem</th></tr><tr><td>Involved in transport of substances in the plant</td><td></td><td></td><td>✓</td></tr><tr><td>Transports water and mineral ions from roots to leaves</td><td>✓</td><td></td><td></td></tr><tr><td>Consists of hollow tubes of dead cells</td><td>✓</td><td></td><td></td></tr><tr><td>End walls of the cells have pores</td><td></td><td>✓</td><td></td></tr></table> do **not** accept more than one tick for each row	1 1 1 1	AO1 4.2.2.3 4.2.2.7

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
02.3	(guard cells) change shape / curve	allow become more curved allow (guard cells) gain water allow water enters (guard cells)	1	AO2
	to open the stomata	allow to open pores	1	AO1 4.2.2.3
		if no other mark awarded allow **1** mark for guard cells open		

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
02.4	osmosis active transport translocation	must be in this order	1 1 1	AO1 4.1.3.3 4.2.2.3 4.2.2.7

Total Question 2	**10**

Question 3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.1	neutrons		1	AO1 4.1.2.4

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.2	plants are eaten / consumed	allow plants are digested	1	AO2 4.4.1.2 4.4.2.1

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.3	$^{0}_{-1}e$		1	AO1 4.3.2.2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.4	nitrogen		1	AO2 4.3.2.2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.5	1 metre of concrete 10 centimetres of lead		1 1	AO1 4.3.2.4

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.6	microorganisms		1	AO1 4.4.1.2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.7	70 (%)		1	AO2 4.3.2.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.8	5750 (years)	allow answers in range 5700 to 5800 (years)	1	AO2 4.3.2.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.9	the radiation dose absorbed by the scientists was low		1	AO3 4.3.2.6

Total Question 3	**10**

Question 4

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.1	10 × 40		1	AO2 4.1.3.1 RPA3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.2	magnification = $\frac{\text{size of image}}{\text{size of real object}}$	allow size of real object = $\frac{\text{size of image}}{\text{magnification}}$ allow size of image = size of real object × magnification	1	AO1 4.1.3.1 RPA3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.3		allow conversion to mm at any step		AO2 4.1.3.1 RPA3
	$250 = \frac{1.5}{\text{size of real cell}}$		1	
	$\frac{1.5}{250}$		1	
	0.006 (cm)		1	
	0.06 (mm)	allow an incorrectly calculated answer in cm multiplied by 10	1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.4	to avoid damage to lens / slide	ignore references to focusing	1	AO2 4.1.3.1 RPA3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.5	electron (microscope)		1	AO2 4.1.3.1

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.6	47 **and** 21 (decrease =) 26 (fruits)	 allow correct subtraction from incorrect readings from graph	1 1	AO2 4.2.2.8

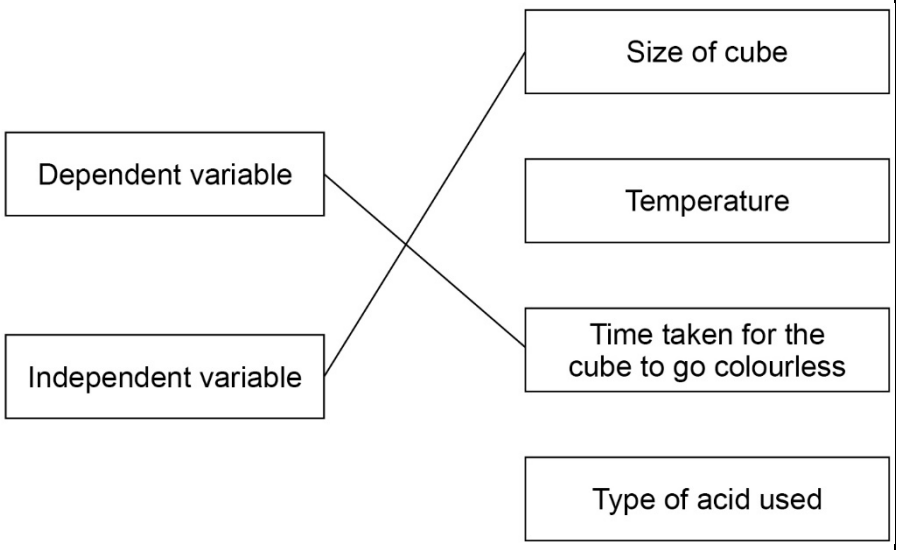
Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.7	any **one** from: • to stop TMV spreading • make more profit • plants with TMV produce fewer chillis / fruits • (TMV) less likely to decrease crop	 allow so other plants do not get infected allow because the plants grow more slowly	1	AO3 4.2.2.8

Total Question 4	**11**

Question 5

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.1	(**A**) trachea		1	AO1 4.2.1.3
	(**B**) bronchus	allow bronchi do **not** accept bronchiole(s)	1	
	(**C**) alveolus	allow alveoli	1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.2	any **one** from: • many alveoli • large surface area • short diffusion distance (from air to blood) • wall of alveolus is (only) one cell thick • wall of blood capillary is (only) one cell thick • good / efficient blood supply • well ventilated	allow short distance for gas to travel across allow (wall of) alveolus is thin do **not** accept cell wall allow wall of capillary is thin do **not** accept cell wall ignore moist	1	AO1 4.2.1.2

Question	Answers	Mark	AO/ Spec. Ref.
05.3	 do **not** accept more than one line from a box on the left	1 1	AO2 4.1.3.3 4.2.1.2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.4	(surface area) 24 (cm^2)		1	AO2 4.1.3.3 4.2.1.2
	(volume) 8 (cm^3)		1	
	(surface area : volume ratio) 3:1	allow 24:8 allow 12:4 allow 6:2 allow ratio from incorrectly calculated surface area and / or volume	1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.5	(as size increases, time taken) increases **or** (as length of side increases, time taken) increases	allow positive correlation allow it increases allow it goes up do **not** accept directly proportional	1	AO2 4.1.3.3 4.2.1.2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.6	repeat the method three times and calculate a mean for each size cube		1	AO3 4.1.3.3 4.2.1.2

Total Question 5	**11**

Question 6

Question	Answers	Mark	AO/ Spec. Ref.
06.1	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3–4	AO1 4.3.3.3
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–2	
	No relevant content	0	
	Indicative content Skin • (physical) barrier • prevents entry of pathogens • antimicrobial secretions or sebum / sweat has antimicrobial properties • (that) kill pathogens • scabs form on wounds / cuts Stomach • (hydrochloric) acid • (acid) kills pathogens • if pathogens enter with food via the mouth • if pathogens are breathed in via nose / mouth (if trapped in mucus) allow bacteria / microorganisms / microbes / viruses / fungi for pathogens For **Level 2** descriptions of protection by both skin and stomach are required		

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.2	nucleus	allow in chromosomes ignore in DNA	1	AO1 4.1.3.2 4.1.3.4

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.3	DNA	allow deoxyribonucleic acid	1	AO1 4.4.3.1

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.4	any **one** from: • one from each parent / gamete • humans have pairs of chromosomes		1	AO2 4.1.3.5

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.5	heterozygous		1	AO2 4.4.3.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.6	(offspring derived) ee identified as having dry earwax 0.5	allow 2 or 3 correct for **1** mark allow 50% **or** 1 in 2 **or** 2 in 4 **or** 1:1 **or** ½ do **not** accept 1:2 answer must match the Punnett square allow 0.5 if Punnett square not completed	2 1 1	AO2 AO2 AO3 4.4.3.3

	Ee	ee
	Ee	ee

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.7	named human characteristic that shows variation due to genes and the environment	ignore height eg mass / weight / fitness / strength / (type 2) diabetes allow skin colour allow hair colour	1	AO2 4.4.3.4

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.8	named environmental cause of variation	cause must match named characteristic eg diet / exercise / training / obesity ignore lifestyle allow hair dye	1	AO2 4.4.3.4

Total Question 6	**14**

Question 7

Question	Answers	Mark	AO/ Spec. Ref.
07.1			

	Increase	Stays the same	Decreases	Mark	AO/ Spec. Ref.
Average kinetic energy of the gas particles	✓			1	AO1 4.1.1.3
Average speed of the gas particles	✓			1	
Pressure exerted on the inside of the container	✓			1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
07.2	42.5 (°C)	do **not** accept - 42.5 (°C)	1	AO2 4.1.1.4

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
07.3	892.5 (kJ)		1	AO2 4.1.1.4

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
07.4	$E = 5.0 \times 4200 \times 45.0$ $E = 945\ 000$ (J)		1 1	AO2 4.1.1.4

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
07.5	the energy required increases		1	AO3 4.1.1.4

Total Question 7	**8**

Question 8

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
08.1	(red blood cells) transport / carry oxygen	ignore reference to haemoglobin	1	AO1 4.2.1.4 4.3.3.4
	(white blood cells) defend against pathogens	allow kill pathogens / bacteria / viruses allow produce antibodies / antitoxins allow phagocytosis ignore reference to diseases / infections	1	
	(platelets) make blood clot	allow clotting allow form scab(s)	1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
08.2	arrow drawn from left atrium to left ventricle	do **not** accept more than one arrow	1	AO2 4.2.1.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
08.3	D		1	AO2 4.2.1.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
08.4	C		1	AO1 4.2.1.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
08.5	valve(s)	allow named heart valves eg tricuspid / bicuspid / mitral valve	1	AO1 4.2.1.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
08.6	capillaries		1	AO1 4.2.1.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
08.7	right atrium		1	AO1 4.2.1.3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
8.8	carbon monoxide combines / bonds with haemoglobin	ignore carbon monoxide combines / bonds with red blood cells ignore carbon monoxide replaces oxygen in red blood cells	1	AO1
	(so) red blood cells carry less oxygen	allow (so) haemoglobin carries less oxygen allow (so) blood carries less oxygen ignore red blood cells carry no oxygen	1	AO2
	(therefore) blood flow must increase (to meet demand)		1	AO2 4.2.1.3 4.2.1.4 4.4.1.6

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
8.9	$\frac{130 - 80}{80} \times 100$	allow $\frac{50}{80} \times 100$	1	AO2 4.4.1.6
	(=) 62.5 (%)	allow 63 (%)	1	

Total Question 8	**14**

Question 9

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.1	*Lolium*	ignore italics ignore capitalisation do **not** accept *Lolium perenne*	1	AO2 4.4.4.4

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.2	chlorophyll(s)		1	AO1 4.2.2.4 4.2.2.5

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.3	magnesium ion		1	AO1 4.2.2.2

Question	Answers	Mark	AO/ Spec. Ref.
09.4	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5–6	AO1 4.2.2.4 RPA9
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3–4	
	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 • add / mix solvent / ethanol / water with crushed leaves • filter • to remove insoluble parts of leaves • draw start line on (chromatography) paper • use pencil to draw line • place drop of extract / filtrate on pencil / start line • allow to dry • repeat adding drop and drying • place (chromatography) paper in a solvent • solvent level below pencil / start line • allow the solvent to move / run up the paper • mark the position of the solvent front • remove from the solvent and dry For **Level 3** responses must refer to using pigment from leaves		

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.5	(distance moved by pigment) 5.3 (cm)	allow a value in the range 5.2 to 5.4 (cm)	1	AO2 4.2.2.4 RPA9
	(distance moved by solvent) 8.5 (cm)		1	
	(R_f =) $\frac{5.3}{8.5}$	allow correct use of incorrectly determined distance moved by one of the pigments allow correct use of incorrectly determined distance for solvent	1	
	= 0.62	allow 0.624 / 0.6235 ignore 0.6	1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.6	any **one** from: • in dark	allow no light allow lack of light allow no / little water allow no / little carbon dioxide	1	AO2 4.2.2.5
	• (grass) could not photosynthesise			
	• less photosynthesis			
	• the pigment has broken down	ignore less chlorophyll / chloroplasts		

Total Question 9	**14**