GCSE
COMBINED SCIENCE SYNERGY
8465/2F

Foundation Tier Paper 2 Life and Environmental Sciences

Mark scheme

June 2020

Version: 1.0 Final Mark Scheme

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.

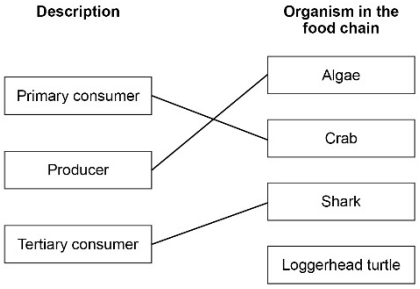
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	nitrogen		1	AO2 4.4.1.1
01.2	1.0%		1	AO2 4.4.1.1
01.3	(Earth's early atmosphere had) any **three** from: • more carbon dioxide • less nitrogen • less oxygen • more other gases	allow converse for Earth's atmosphere today if clearly stated ignore references to values allow similar values for other gases	3	AO3 4.4.1.1
01.4	volcanoes		1	AO1 4.4.1.1
01.5	**A** boiling **B** freezing	allow evaporating allow solidifying	1 1	AO1 4.4.1.7
01.6	any **one** from: • sleet • snow	allow hail(stones) ignore ice	1	AO1 4.4.1.7
01.7	86 (mm)	allow a value in the range 85 to 87 (mm)	1	AO2 4.4.1.7

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01.8	rainfall decreases from 104 (mm) to 35 (mm) (then) increases to 105 (mm)	allow rainfall decreases (from March) to June allow rainfall (then) increases from June / July (to September) if no other mark awarded allow rainfall decreases then increases for **1** mark	1 1	AO2 4.4.1.7

Total			**12**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1		additional lines from a box on the left negates the mark for that box	1 1 1	AO2 4.4.2.1
02.2	population		1	AO1 4.4.2.1
02.3	the number of (loggerhead) turtles will decrease because there will be less crab to eat	ignore (loggerhead) turtles die allow less food	1 1	AO3 AO2 4.4.2.2 4.4.2.3
02.4	biotic		1	AO1 4.4.2.3
02.5	(as) length of the turtle increases, the number of eggs laid increases	allow the number of eggs increases as the length of the turtle increases allow size for length allow positive correlation	1	AO2 4.4.2.1
02.6	(as sea levels rise) the numbers will decrease as there will be fewer beach(es) to nest on	allow extinction allow the beach they normally return to may be underwater / flooded allow fewer egg laying sites available allow eggs may be washed away	1 1	AO3 4.4.1.5

02.7	2.6		1	AO2 4.4.1.3
02.8	burning wood on a fire travelling by aeroplane		1 1	AO1 4.4.1.4 4.4.2.6
Total			**13**	

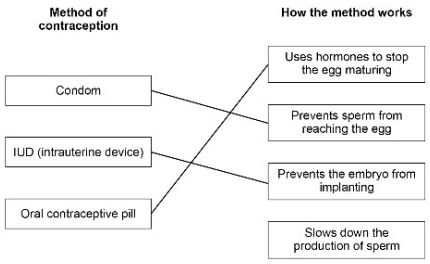
Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	insulin		1	AO1 4.3.1.5
03.2	pancreas		1	AO1 4.3.1.5
03.3 mark with 03.4	$11 \times \frac{25}{100}$ 2.75 (g)	allow 11 × 0.25	1 1	AO2 4.3.1.2
03.4 mark with 03.3	(11 – 2.75 =) 8.25 (g)	allow ecf from Question **03.3**	1	AO2 4.3.1.2
03.5	helps control body mass	allow reduces tooth decay allow reduces the risk of coronary heart disease allow reduces the risk of high blood pressure	1	AO2 4.3.1.2

Question	Answers	Mark	AO / Spec. Ref.
03.6	**Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar / different is made clear and (where appropriate) the magnitude of the similarity / difference is noted.	3–4	AO3 4.3.1.1 4.3.1.2
	Level 1: Relevant features are identified and differences noted.	1–2	
	No relevant content	0	
	Indicative content • both types of exercise reduce the risk of suffering from all the conditions • walking reduces the risk of all three conditions more than running • walking reduces the risk of coronary heart disease more than running • (the percentage) reduction in risk of coronary heart disease by walking is almost double that of running • (the percentage) reduction in risk of diabetes is similar with walking and running • walking reduces the risk of high cholesterol more than running • walking and running have a bigger effect on the reduction in risk of diabetes (than other conditions)		
Total			**10**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	glucose + oxygen ⟶ carbon dioxide + water		1	AO1 4.2.1.1
04.2 **view with Figure 5**	**X** = alveoli **Y** = bronchi	allow alveolus allow bronchus	1 1	AO1 4.2.1.3
04.3	any **one** from: • thin wall • large surface area • good blood supply • well ventilated	 allow one cell thick do **not** accept thin cell wall ignore thin cell membrane ignore moist	1	AO1 4.2.1.2
04.4	narrows the airways		1	AO2 4.2.1.3
04.5	**C**		1	AO3 4.2.1.2 4.2.1.3
04.6	any **two** from: • sex • age • fitness level • medication /drugs • lung cancer / disease • (chest) infection • mass • smoking • stress / anxiety	ignore asthma allow gender allow emphysema allow exercise	2	AO3 4.2.1.2 4.2.1.3 4.3.1.2

04.7	(breathing rate) increases (during exercise) (because) more oxygen is needed (for respiration)	 allow (because) more carbon dioxide has to be removed	1 1	AO3 AO2 4.2.1.1 4.2.1.2

Total			**10**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1		additional lines from a box on the left negates the mark for that box	3	AO1 4.3.1.7
05.2	condom		1	AO1 4.3.3.2
05.3	any **one** from: • forget to take it • taken at the wrong time • taking antibiotics **or** other medicine • diarrhoea / vomiting	allow the pill is not 100% effective	1	AO3 4.3.1.7
05.4	any **one** from: • need an operation • (higher) risk of infection • difficult to be reversed	ignore side effects allow cannot be reversed allow it is permanent	1	AO3 4.3.1.7
05.5	any **two** from: • woman is already pregnant • they want a baby • abstinence • menopause • religious belief • infertile		2	AO3 4.3.1.7
Total			**8**	

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>06.1</td><td>light</td><td></td><td>1</td><td>AO2
4.2.1.6</td></tr>
<tr><td>06.2</td><td>brain</td><td></td><td>1</td><td>AO2
4.2.1.6</td></tr>
<tr><td>06.3</td><td>any one from:
• pedal pressed
• (leg) muscle contracted
• leg / foot moved</td><td></td><td>1</td><td>AO2
4.2.1.6</td></tr>
<tr><td>06.4
view with Table 5</td><td>
<table>
<tr><th rowspan="2">Student</th><th rowspan="2">Student age in years</th><th colspan="4">Reaction time in seconds</th></tr>
<tr><th>Test 1</th><th>Test 2</th><th>Test 3</th><th>Test 4</th></tr>
<tr><td>A</td><td>11</td><td>0.74</td><td>0.72</td><td>0.71</td><td>0.71</td></tr>
<tr><td>B</td><td>14</td><td>0.80</td><td>0.79</td><td>0.78</td><td>0.76</td></tr>
<tr><td>C</td><td>15</td><td>0.85</td><td>0.84</td><td>0.83</td><td>0.82</td></tr>
<tr><td>D</td><td>16</td><td>0.87</td><td>0.86</td><td>0.99</td><td>0.84</td></tr>
</table>
answer in table takes precedence
allow a clear indication of the correct test.
allow a written value of 0.99 if nothing circled in table</td><td></td><td>1</td><td>AO3
4.2.1.6
RPA8</td></tr>
<tr><td>06.5</td><td>any one from:
• discard the result
• repeat the result
• do not include result in calculating (the mean)</td><td>ignore ignore the result unqualified</td><td>1</td><td>AO3
4.2.1.6
RPA8</td></tr>
</table>

06.6	any **one** from: • student was distracted • student blinked • the student's foot was not on the pedal properly • student anticipated the light (and pressed the pedal too early)	allow student was not concentrating	1	AO3 4.2.1.6 RPA8
06.7	any **two** from: • student A has the shortest reaction time • student D has the longest reaction time • reaction time decreases with practice • reaction time increases with age • there was little difference in reaction times between 15 and 16 years	allow student A has the fastest reaction allow student D has the slowest reaction allow reaction time improves with practice allow older people react slower allow younger students react faster (than older students)	2	AO3 4.2.1.6 RPA8
06.8	any **two** from: • test more students of each age • test a greater range of ages **or** everyone is the same age • test on only male / female students • do all the tests at the same time of day • test each student more times **and** calculate a mean		2	AO3 4.2.1.6 RPA8
Total			**10**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7.1	cells with a similar structure and function		1	AO1 4.2.1.2 1–3
7.2	meristem		1	AO1 4.2.2.1
7.3	repair / replace (damaged) tissue **or** replace (damaged) cells	ignore repair unqualified ignore repair cell(s) allow asexual reproduction allow cloning	1	AO1 4.1.3.4
7.4	the chromosomes are copied the organelles increase in number		1 1	AO1 4.1.3.4
7.5	(for mitosis) any **three** from: • 2 cells produced instead of 4 cells • cells contain 4 chromosomes instead of 2 chromosomes • (cells produced) are (genetically) identical to each other • (cells produced) are (genetically) identical to parent cell	allow converse for meiosis if clearly stated allow cells contain 2 pairs of chromosomes instead of single chromosomes allow cells contain same number of chromosomes as parent cell allow cells are diploid allow contain the full number of chromosomes	3	AO2 4.1.3.4 4.1.3.5

7.6	any **two** from: • the further from the (shoot) tip the longer the cells are • the further from the (shoot) tip the lower the percentage of dividing cells • as the percentage of cells dividing decreases the length of the cells increases • no cells dividing from 30 mm from shoot tip **or** cell division stops from 30 mm from shoot tip • the increase in length is greater the further from the (shoot) tip	allow converse allow the cell length is greatest at 40mm	2	AO3 4.1.3.4 4.2.2.1
Total			**10**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	P		1	AO1 4.1.4.2
08.2	R		1	AO1 4.1.4.2
08.3	any **one** from: • number of masses • length of string • type of string	allow tension (in the string) allow position of the wooden bridge (after first wave formed)	1	AO1 4.1.4.1 RPA 5
08.4	any **two** from: • the metre rule is too short • the string is raised up • the string moves	allow the string was longer than the metre rule	2	AO3 4.1.4.1 RPA5
08.5	any **one** from: • wavelength is inversely proportional to frequency • as frequency increases wavelength decreases	allow frequency is inversely proportional to wavelength allow as wavelength decreases frequency increases	1	AO3 4.1.4.1 RPA5
08.6 view with Table 7	length of one loop= $\frac{1.50}{5}$ wavelength **X** = 0.6 (m)	allow length of one loop = 0.3 (m) allow wavelength = $\frac{1.50}{2.5}$	1 1	AO2 4.1.4.1 RPA5

08.7	period = $\frac{1}{30}$ 0.0333 (s) 0.033 (s)	 allow correct rounding to 2 significant figures of incorrectly calculated period.	1 1 1	AO2 4.1.4.2

Total			**11**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	carbon dioxide (+ water) ⟶ oxygen (+ glucose) both gases needed for the mark allow correct formulae words take precedence		1	AO1 4.2.2.5
09.2	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.		5–6	AO1 4.2.2.6 RPA10
	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 • measure the distance between the pondweed and the light source • count the number of bubbles or measure the volume of oxygen / gas produced • (measure oxygen / gas produced) in a set period of time • change the distance between the light source and the pondweed or use a different power lamp • control colour of light • control temperature using a heat screen / water bath • use the same pondweed • use the same length / size of pondweed • control carbon dioxide supply • idea of allowing time for pondweed to equilibrate • repeat each test two or more times • calculate a mean For Level 3 the method described must include; • how the light intensity is changed • the measurements needed to determine the rate of photosynthesis • at least one control variable			

09.3	$1.65 \times 10^6 = 1\ 650\ 000$ (1 650 000 + 200 000) = 1 850 000 **or** $200\ 000 = 2.0 \times 10^5$ (1) $(1.65 \times 10^6) + (2.0 \times 10^5)$ $= 1.85 \times 10^6$ (1)		1 1	AO2 4.2.2.6
09.4	all points plotted correctly correct line of best fit	allow ± half a square allow **1** mark for 3 or 4 correct plots ignore extrapolation	2 1	AO2 4.2.2.6
09.5	increasing light intensity increases the number of (extra algal) cells the increase in the number of (extra algal) cells plateaus at 1 250 lux **or** the increase in the number of (extra algal) cells plateaus at 2.50×10^6 (extra algal) cells	do **not** accept as number of cells increases, light intensity increases allow the number of cells does not increase above 1 250 lux allow the number of cells is the same at 1 250 and 1 500 Lux allow the number of (extra algal) cells does not increase above $2.50\ x10^6$	1 1	AO3 4.2.2.6
09.6	there would be an increase in the number of cells (because) the rate of photosynthesis would increase	 allow (because) enzyme action increases allow (because) cells divide faster ignore temperature is a limiting factor unqualified	1 1	AO3 AO2 4.2.2.6
Total			**16**	