GCSE
BIOLOGY
8461/2F

Paper 2 Foundation Tier

Mark scheme

June 2020

Version: 1.0 Final 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.

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Level of response marking instructions

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 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. 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 and not look to pick holes in 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 and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 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.

An answer which contains nothing of relevance to the question must be awarded no marks.

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.

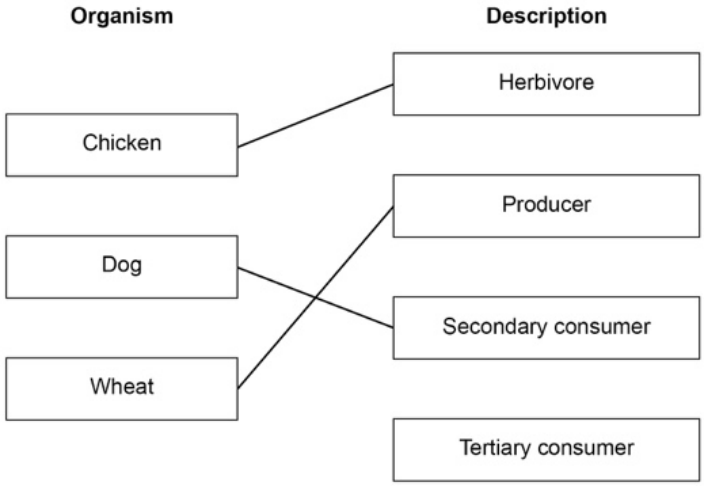
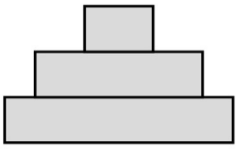
The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine 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	3		1	AO2 4.7.4.1 4.7.4.2
01.2	 additional line from a box on the left negates the mark for that box		3	AO2 4.7.4.1
01.3	photosynthesis		1	AO1 4.7.2.1
01.4	the dog produces waste in faeces		1	AO2 4.7.4.3
01.5			1	AO2 4.7.4.2
01.6	farming cows needs more land than farming insects fewer cows being farmed will slow down global warming		1 1	AO3 4.7.3.4 AO3 4.7.3.5
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	put all the dishes the same distance from the radiator use equal numbers of seedlings in each dish		1 1	AO3 4.5.4.1 RPA8
02.2	the height of the seedlings		1	AO1 4.5.4.1 RPA8
02.3	any **two** from: • light • water • mineral(s) / ions / salts	allow nitrate / magnesium / nitrogen / nutrients allow space ignore food ignore carbon dioxide / oxygen ignore heat	2	AO2 4.7.1.2
02.4	side **P** has grown less than side **Q**		1	AO3 4.5.4.1 RPA8
02.5	phototropism		1	AO1 4.5.4.1 RPA8
02.6	auxin		1	AO1 4.5.4.1
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	4 / four		1	AO1 4.6.1.2
03.2	23 / twenty three	do **not** accept 23 pairs	1	AO1 4.6.1.2
03.3	a different form of a gene		1	AO1 4.6.1.6
03.4	heterozygous		1	AO2 4.6.1.6
03.5 **mark with 3.6 and 3.7**	<table><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td>**Dd / dD**</td></tr><tr><td></td><td>**dd**</td><td>**dd**</td></tr></table>	allow 2 correct for **1** mark	2	AO2 4.6.1.1 4.6.1.2 4.6.1.6
03.6 **mark with 3.5 and 3.7**	ring around any **Dd**	allow ecf from question **03.5**	1	AO2 4.6.1.6
03.7 **mark with 3.5 and 3.6**	percentage must match answer given to questions **03.5** and **03.6**	if no answer in question **03.5** allow 50 %	1	AO3 4.6.1.6
03.8	mutation / mutated	do **not** accept mutant	1	AO1 4.6.2.1

03.9	any **one** from: • to help them prepare • to inform whether to consider having an abortion • to find out if they have passed on the disorder	allow to see if the child / embryo has the disorder allow answers referring to genetic disorders, or specific example such as Dupuytren's / cystic fibrosis	1	AO3 4.6.1.7
Total			**10**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	$\frac{1430}{2600} \times 100$ 55 (%)		1 1	AO2 4.5.1 4.5.3.3
04.2	(volume) increases	allow (volume) goes up	1	AO2 4.5.1 4.5.2.4 4.5.3.3
04.3	drink (a lot / more)		1	AO2 4.5.1 4.5.3.3
04.4	filtration reabsorption excretion	this order only	1 1 1	AO1 4.5.3.3

Question	Answers	Mark	AO / Spec. Ref.
04.5	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3–4	AO3 4.5.3.3
	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 **Advantages of kidney transplant** • no need for regular / long hospital visits **or** is a long-term solution • flexible lifestyle, such as can go on holidays • may not live near a hospital **or** reference to transport costs • no risk of infection from frequent needles / treatment • less / no need to control diet • maintains correct concentration of substances in blood / body • cheaper long term for NHS / hospital **Disadvantages of kidney transplant** • may be rejected • have to keep taking anti-rejection drugs **or** immunosuppressants • (suitable) donor may not be available **or** need for tissue matching • risk from surgery (e.g. anaesthesia or infection) • recovery from surgery will take a long time • does not last forever (therefore further surgery needed) For Level **2**, answers must refer to both advantages **and** disadvantages		

Total			**11**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	(A) cerebellum		1	AO1 4.5.2.2
	(B) pituitary gland		1	AO1 4.5.3.1
	(C) cerebral cortex		1	AO1 4.5.2.2
05.2	cerebellum		1	AO1 4.5.2.2
05.3	coordinator		1	AO1 4.5.1 4.5.2.1
05.4	neurone	allow nerve (cell) ignore names of neurone	1	AO1 4.5.2.1
05.5	retina		1	AO1 4.5.2.3
05.6	can see fruit / food (so) get more food	allow can find fruit / food	1 1	AO2 4.5.2.3 4.7.1.4
05.7	accommodation		1	AO1 4.5.2.3
05.8	light rays are refracted less		1	AO1 4.5.2.3
05.9	any **one** from: • myopia • short-sightedness	allow near-sightedness	1	AO1 4.5.2.3
Total			**12**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	*Elasmotherium*		1	AO2 4.6.4
06.2	eukaryota		1	AO2 4.6.4
06.3	Carl Woese		1	AO1 4.6.4
06.4	any **one** from: • fighting / competing for mates / food / territory • to kill predators / prey	allow for defence / protection	1	AO2 4.7.1.1 4.7.1.4
6.5	(bones **or** hard tissues) did not decay	allow soft tissues decayed **or** were eaten allow other parts decayed or were eaten allow horn could be damaged / lost in fighting	1	AO1 4.6.3.5
06.6	any **one** from: • compare to other fossils of known age • by the age of the rocks (where fossil was found)	allow compare with the fossil record allow depth underground (where fossil was found) allow (radio)carbon / isotope dating allow DNA analysis	1	AO2 4.6.3.5 4.6.3.6

06.7 mark with 06.8	0.05 (million years ago)		1	AO2 4.6.3.6
06.8 mark with 06.7	0.2 – 0.05 0.15 150 000 (years)	allow 0.05 × 3 allow ecf from question **06.7** allow 0.15 million (years)	1 1 1	AO2 4.6.3.6
06.9	any **two** from: • drought • ice age / global warming • volcanic activity • asteroid / meteor collision • (new) predators • (new) disease • competition for food • competition for mates • lack of habitat **or** habitat change	ignore pollution allow earthquakes / tsunami allow hunters / poachers / eaten allow named pathogen allow lack of food allow isolation **or** lack of mates if no other marks awarded allow natural disaster **or** climate change **or** catastrophic event for **1** mark	2	AO2 4.6.3.6
Total			**12**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	any **two** from: • double • helix • long / thin	allow two strands allow twisted / spiral / coiled	2	AO1 4.6.1.4
07.2	bases		1	AO1 4.6.1.5
07.3	protein		1	AO1 4.6.1.4 4.6.1.5
07.4	nucleotide		1	AO1 4.6.1.5
07.5 **mark with 07.6**	0.34 × 6 000 2040 (million nm)		1 1	AO2 4.6.1.4 4.6.1.5
07.6 **mark with 07.5**	answer from question **07.5** correctly converted	if no answer to question **07.5**, allow 2.04 (m)	1	AO2 4.6.1.4 4.6.1.5
07.7	any **one** of: • to determine if the cancer is genetic (or caused by lifestyle factors) • to inform / help treatment • to allow embryo screening to ensure allele is not passed on • to inform relatives if they have inherited (affected) gene / allele • to detect cancer early **or** before symptoms show • to understand cause of the cancer		1	AO3 4.6.1.7 4.2.2.7
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	bacteria fungi	allow singular allow mould ignore microbes / germs / decomposers do **not** accept viruses	1 1	AO1 4.7.2.2 4.7.2.3
08.2	fatty acid(s)		1	AO2 4.7.2.3 4.2.2.1 RPA10
08.3	any **one** from: • universal indicator (paper / solution) • pH meter	allow UI (paper / solution) ignore pH paper unqualified allow pH probe ignore datalogger unqualified ignore Cresol red ignore phenolphthalein / litmus	1	AO1 4.7.2.3 RPA10
08.4	any **two** from: • volume of milk • exposure to air / oxygen • sterilise test tubes • treatment of milk before investigation • freshness / age of milk (at start) • time of day pH was measured	allow amount of milk allow bungs on test tubes allow example such as pasteurised or not allow starting pH of milk	2	AO1 4.7.2.3 RPA10
08.5	almond (milk)		1	AO3 4.7.2.3 RPA10

08.6	as temperature increases up to 15 °C the time taken (to reach pH 5) decreases above 15 °C the time taken (to reach pH 5) stays the same	allow converse if no other mark awarded allow **1** mark for as temperature increases the time taken (to reach 5 °C) decreases and then stays the same	1 1	AO2 4.7.2.3 RPA10
08.7	any **one** from: • bacteria / microbes / microorganisms / fungi dividing faster (when warmer) • reactions (in the bacteria) are happening faster (to decay milk) • (because there is) more (kinetic) energy • enzyme activity is higher (at 10 °C than at 5 °C)	allow converse if clearly describing 5 °C allow number of bacteria / microbes / microorganisms / fungi increasing (when warmer) allow more bacteria microbes / microorganisms / fungi allow particles move faster allow more collisions between particles allow enzymes work faster ignore enzymes work better	1	AO2 4.7.2.3 4.1.1.6 RPA10
08.8	any **two** from: • different concentration / type of fat / lipid • different concentration / type of proteins / carbohydrate / sugar • different (amount / type of) bacteria present • may have been pasteurised by a different process • different starting pH	allow different amounts of fat / lipid allow different amounts of proteins / carbohydrate / sugar allow may have been treated in different ways (before the investigation) ignore different oxygen concentration	2	AO3 4.7.2.3 RPA10

08.9	determine the types of bacteria present in the milk		1	AO3 4.7.2.3 RPA10
Total			**13**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	$\frac{6.0}{1.6}$ 3.75	allow a range of 5.9 to 6.1 for 6.0 do **not** accept if a unit is given if no other marks awarded, allow a correct answer using a value of 5.8 or 6.2 for **1** mark	1 1	AO2 4.7.3.2
09.2	$\frac{2.5 - 1.6}{50}$ 0.018 (billion per year)	allow $\frac{0.9}{50}$	1 1	AO2 4.7.3.2
09.3 view with Figure 12	suitable extrapolation line on Figure **2** reading taken at 2050 from student's line	allow straight extrapolation allow a tolerance of ± ½ small square allow **1** mark for 10 billion if no extrapolation drawn	1 1	AO2 4.7.3.2
09.4	fewer fish caught **or** limit the number of fish caught (remaining fish) can reproduce	allow a method of doing this, eg increase mesh size **or** do not catch young fish allow more fish (survive to) reproduce	1 1	AO1 4.7.5.1 4.7.5.3

Question	Answers	Mark	AO / Spec. Ref.
09.5	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4-6	AO1 4.7.3.1 4.7.3.2 4.7.3.3 4.7.3.4 4.7.3.6 4.7.3.5 4.7.5.1 4.7.5.2
	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 **human land use** • increasing population requires more food • crops / livestock for food • farming crops for biofuels • peat use as compost • peat use as fuel • increased use of pesticide / insecticide / herbicide / fertilisers • use of free-range / organic methods increases land use (for same yield) **link to biodiversity** • deforestation • monocultures • loss of hedgerows to make fields larger • loss of habitat • consequence of loss of habitat eg (change in) migration • fertiliser run off polluting water • use of pesticide / insecticide / herbicide reduces insects / plants which damages food chains • more soil erosion **link to atmospheric pollution** • more carbon dioxide (from farm animals / machinery) • more methane (from cows) • climate change **or** global warming • example of impact on biodiversity • acid rain • desertification Answers referring to only land use or only biodiversity are level 1		

09.6	golden rice has improved nutritional value		1	AO1 4.7.5.4
09.7	any **one** from: • gene may contaminate / enter other breeds / species • reduction / extinction of population of wild / traditional rice • reduction / extinction of population of flowers / insects • high cost of seeds • may have too much vitamin A (in diet)	ignore references to religious beliefs allow decrease in biodiversity allow decrease in gene pool allow may harm (human) health allow may cause side effects (on humans) ignore may harm humans unqualified	1	AO3 4.6.2.4
Total			**16**	