GCSE
BIOLOGY
8461/2F

Paper 2 Foundation Tier

Mark scheme

June 2021

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.

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 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.

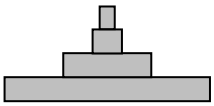
You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

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	Alfred Russel Wallace Charles Darwin		1 1	AO1 4.6.3.1 4.6.3.2
01.2	remains of an organism from a long time ago	allow remains of an animal / plant allow from thousands / millions of years ago	1 1	AO1 4.6.3.5
01.3	the animal walked on mud		1	AO2 4.6.3.5
01.4	any **two** from: • flooding • drought • ice age • global warming • volcanic activity • asteroid collision • (new) predators • (new) disease / pathogen • competition for food • competition for mates • lack of habitat **or** habitat change	 if none of these, allow climate change for **1** mark ignore weather if neither of these, allow catastrophic event **or** natural disaster for **1** mark allow hunters / poachers allow named example allow lack of food allow lack of mates ignore competition unqualified ignore environment change ignore isolation ignore pollution	2	AO1 4.6.3.6
01.5	bacteria can become resistant to an antibiotic older fossils are simpler than more recent ones		1 1	AO1 4.6.2.2 4.6.3.4
Total			**9**	

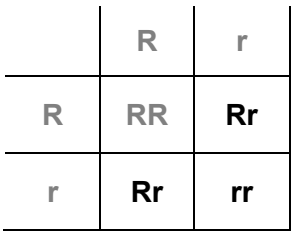
Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	A		1	AO1 4.5.3.1
02.2	D		1	AO1 4.5.3.1 4.5.3.2
02.3	liver		1	AO1 4.5.3.2
02.4	glycogen		1	AO1 4.5.3.2
02.5	2.6 7.6 ($mmol/dm^3$)	allow answers in the range 2.5 to 2.7 allow a correctly calculated value using student's value from graph + 5	1 1	AO2 4.5.3.2
02.6	30 (minutes)	allow ½-hour **or** 0.5 hour	1	AO2 4.5.3.2
02.7	points too far apart **or** no reading between 30 and 50 mins **or** points joined by straight lines **or** values could have fallen to zero change before 50 mins	 allow no reading at 40 mins allow not a curve of best fit	1	AO3 4.5.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	higher values of y than given line		1	AO2
	returning to(wards) zero change later than given line		1	AO3 4.5.3.2
Total			**10**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	carbon dioxide water		1 1	AO1 4.7.2.2 4.4.1.1
03.2	light		1	AO1 4.7.4.3 4.4.1.1
03.3			1	AO3 4.7.4.2
03.4	 2.3 **and** 0.5 $\frac{(2.3 - 0.5)}{2.3} \times 100$ **or** $\frac{1.8}{2.3} \times 100$ 78.2(6087....) 78	allow figures in millions allow in range 2.25 to 2.3 for 2.3 allow in range 0.5 to 0.55 for 0.5 allow correct substitution of student's incorrect graph readings allow correct answer from student's substitution of incorrect graph readings ignore incorrect rounding allow correct rounding of calculated value	 1 1 1 1	AO2 4.7.5.3
03.5	increase (in biomass of herring) from 0.1 to 1.8 (million tonnes) **or** change of 1.7 (million tonnes) **or** change of 1700%	 allow a tolerance of ± ½ small square for graph readings	1 1	AO3 AO2 4.7.5.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	smaller / 4-yr-old fish not caught	allow younger fish not caught allow (only) older fish caught	1	AO3 4.7.5.3
	(so) escaping fish can reproduce	allow so younger fish can survive to reproduce	1	
Total			**12**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	A = cornea B = lens C = optic nerve		1 1 1	AO1 4.5.2.3
04.2	by becoming thicker		1	AO1 4.5.2.3
04.3	ciliary muscles suspensory ligaments		1 1	AO1 4.5.2.3
04.4	retina	allow rods / cones / fovea	1	AO1 4.5.2.3
04.5	retina brain muscles	in this order only 3 correct = **2** marks 1 or 2 correct = **1** mark	2	AO2 4.5.2.1
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	*Phytophthora*		1	AO2 4.6.4 4.7.5.1
05.2	the fungus can get oxygen from the air		1	AO2 4.4.2.1 4.7.5.1
05.3	the variety of species of organisms in the river		1	AO1 4.7.3.1
05.4	pesticide washed into river pesticide kills (some) organisms / plants / animals in river	allow spray drift allow reference to run-off allow carried by rainfall	1 1	AO2 4.7.3.1 4.7.3.2 4.7.3.6 4.7.5.1
05.5		all 3 correct = **2** marks 2 correct = **1** mark 0 or 1 correct = **0** marks	2	AO2 4.6.1.6 4.7.5.1
05.6	ring drawn around **RR** / **rr** in **Figure 9**	allow around both **RR** and **rr**	1	AO2 4.6.1.6 4.7.5.1
05.7	75%	percentage must match student's answer in **Figure 9** allow 75% if no answer to question **05.5**	1	AO3 4.6.1.6 4.7.5.1

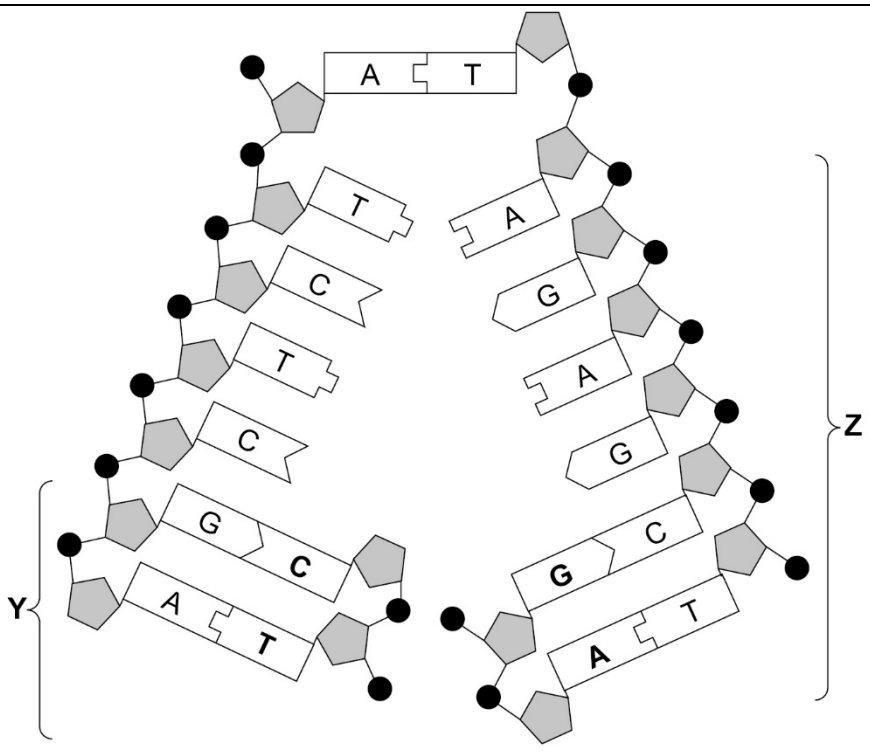
Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.8	no fusion of gametes **or** (asexual reproduction involves) mitosis	allow no fertilisation	1	AO2 4.6.1.1 4.6.1.3 4.7.5.1
	(so) offspring are genetically identical (to parent plant)	allow offspring are a clone allow offspring have same DNA allow no mixing of genes / DNA allow no mixing of genetic material allow all offspring inherit **R**	1	
Total			**11**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	place the quadrat using random coordinates		1	AO1 4.7.2.1 RPA9
06.2	$\frac{40 + 52 + 88 + 80 + 40}{5}$ **or** $\frac{300}{5}$ 60		1 1	AO2 4.7.2.1 RPA9
06.3	the area of buttercup plants in quadrat 5 is much larger		1	AO3 4.7.2.1 RPA9
06.4	any **two** from: • place (many) more quadrats • divide quadrats into more / smaller squares • estimate actual percentage cover in quadrat (instead of counting squares) • only count squares with at least 50% cover	 allow repeat allow combine results with results of other students allow use a point quadrat ignore place quadrats randomly	2	AO3 4.7.2.1 8.2.9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	any **three** from: • light • water • minerals / ions / salts • pH • temperature • herbivores • trampling / cultivation • pathogens / disease • use of weedkiller	 allow rain / moisture allow named example such as nitrate / phosphate allow fertiliser allow named example allow wind allow oxygen / air in the soil ignore carbon dioxide ignore weather	3	AO1 4.7.1.1 4.7.1.2 4.7.1.3
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	(overall) increase (in concentration of CO_2)		1	AO2
	(overall increase) by 54 (arbitrary units) **or** from 364 to 418 (arbitrary units)	allow in range 45 to 65 (arbitrary units) allow from 357 to 422 (arbitrary units) allow other correct data	1	AO3
	peaks and troughs	allow description	1	AO3
	each cycle is 1 year **or** variation per cycle is 8 to 16 (arbitrary units)	allow multiples such as 5 cycles every 5 years allow answer in range 8 to 16 (arbitrary units)	1	AO3 4.7.3.5
07.2	combustion	allow a named example such as burning (named) fuels **or** driving cars **or** power stations ignore factories unqualified	1	AO1 4.7.2.4 4.7.3.3 4.7.3.4 4.7.3.5 4.4.1.1
	deforestation	allow a description allow human activities that decrease carbon dioxide concentration such as tree-planting **or** growing crops if no other mark awarded allow respiration for **1** mark	1	

Question	Answers	Mark	AO / Spec. Ref.
07.3	**Level 2:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	3–4	AO3 AO2
	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 AO1
	No relevant content	0	
	Indicative content • (higher CO_2 concentration causes) global warming • plants photosynthesise faster o due to more CO_2 o due to higher temperature • temperature rise causes changes in rainfall patterns **or** extreme weather conditions such as storms • less rainfall causes desertification o many plant species die out o many animal species lack food and die o other (drought-adapted) plants become more common • more rainfall causes flooding o loss of habitat o may lead to extinction • temperature rise melts (polar) ice caps **or** glaciers o causes flooding o loss of habitat o may lead to extinction • changes in animal / bird migration patterns / times **or** changes in distribution of animals		4.7.2.4 4.7.3.5 4.4.1.1
Total		**10**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	chromosome(s)	allow chromatid(s) / gene(s) / allele(s)	1	AO1 4.6.1.4
08.2	sugar	allow deoxyribose allow pentose do **not** accept ribose	1	AO1 4.6.1.5
08.3	base(s)	allow nitrogenous base(s) allow adenine **and** cytosine **and** guanine **and** thymine	1	AO1 4.6.1.5
08.4	 all four required for the mark		1	AO3 4.6.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	replication		1	AO3 4.6.1.5 4.1.2.2
08.6	protein	allow polypeptide	1	AO1 4.6.1.4
08.7	3×10^{-12} grams		1	AO2 4.6.1.2
08.8	meiosis		1	AO1 4.6.1.2
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	(put beaker in a) water bath	allow (put beaker in an) incubator	1	AO1 4.7.2.3 RPA10
09.2	volume of the milk **or** type of milk	allow amount of milk allow named type of milk, eg cows' or semi-skimmed	1	AO1 4.7.2.3 RPA10
09.3	correct scale and axis labelled all points plotted correctly suitable curved line of best fit	scale must be at least 1 cm for 1 day allow a tolerance of ± ½ small square allow 4 or 5 correct plots for **1** mark ignore line joined point to point with straight lines	1 2 1	AO2 4.7.2.3 RPA10
09.4	similar shaped line drawn to left of 20 °C line on **Figure 4** same start pH	 allow a tolerance of ± ½ small square allow from student's line of best fit or student's plot for 0 days	1 1	AO2 4.7.2.3 RPA10
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	any **one** from: • movement would release (extra) heat • movement would increase body temperature • movement would increase sweating		1	AO2 4.5.1 4.5.2.4
10.2	37.4 °C		1	AO2 4.5.1 4.5.2.4
10.3	<u>blood</u> is cooled at stomach / mouth (cooled) blood flows to the brain		1 1	AO2 4.5.1 4.5.2.4
10.4	via nerve(s) / neurones **or** via (nerve) impulse(s)	ignore type of neurone allow electrical signals allow via the nervous system	1	AO2 4.5.1 4.5.2.4
10.5	less sweating occurs so less heat is lost **or** less cooling	allow less sweat evaporates do **not** accept no sweating allow less heat used for evaporation of sweat / water	1 1	AO3 AO2 4.5.1 4.5.2.4
10.6	dilation of blood vessels in the skin		1	AO2 4.5.1 4.5.2.4
Total			**8**	

Question	Answers	Mark	AO / Spec. Ref.
11	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6	AO1 4.7.2.1 4.7.2.2 4.7.2.3 4.2.2.1 4.2.3.1 4.2.3.2 4.4.1.1 4.4.1.3 4.4.2.1
	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 *in microorganisms* • digestion **or** large molecules to small molecules • enzymes **or** named example • respiration • production of carbon dioxide • release of mineral ions **or** named example such as nitrate / phosphate / magnesium *in plants* • carbon dioxide (from air) taken in by leaves • by diffusion • via stomata • carbon dioxide used in photosynthesis • making glucose / sugar / starch / cellulose **or** making other correctly named example • (named) ions taken in by roots • by active transport • nitrate ions for making amino acids / proteins / DNA / chlorophyll • phosphate for making DNA For **Level 2** processes in microorganisms and in plants should be considered		
Total		**6**	