GCSE
BIOLOGY
8461/1F

Paper 1 Foundation Tier

Mark scheme

June 2021

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.

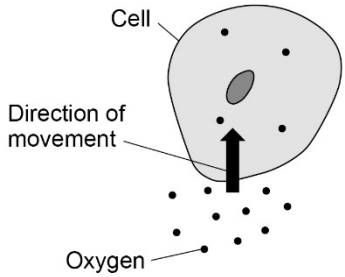
The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine 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.

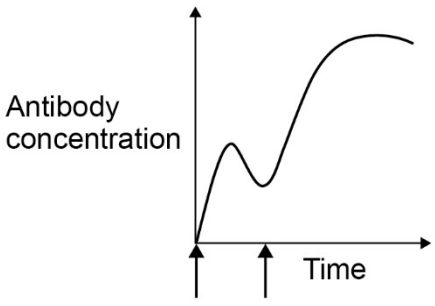
You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

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			1	AO3 4.1.3.1
01.2	water mineral ions energy	in this order only allow minerals / ions	1 1 1	AO1 4.1.3.2 4.1.3.3 4.2.3.2
01.3	root hair (cell)	ignore root / hair unqualified	1	AO1 4.1.1.3 4.2.3.2
01.4	large surface / area	allow it has a long projection allow the walls are thin allow it has lots of mitochondria	1	AO1 4.1.1.3 4.2.3.2
01.5	**Feature of sperm cell** / **How the feature helps** Contains a nucleus → To provide the chromosomes for fertilisation Has a long tail → To help the cell to swim to the egg To break the outer layer of the egg To release energy do **not** accept more than one line from a box on the left		1 1	AO1 4.1.1.3

01.6	nerve (cell) any **one** from: • long • has branches • has insulation	allow neuron(e) ignore motor / sensory / relay allow myelin / fat	1 1	AO1 4.1.1.3

Total			**10**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	pathogens		1	AO1 4.3.1.1
02.2	viruses reproduce inside cells, damaging them		1	AO1 4.3.1.1
02.3	any **one** from: • they do not have a cell membrane • they do not have cytoplasm • they do not have a nucleus • they do not have mitochondria (like most eukaryotic cells) • they do not have ribosomes	do **not** accept they do not have a cell wall do **not** accept they do not have chloroplasts / chlorophyll ignore they are not living / alive ignore they can only replicate inside cells ignore virus has a protein coat	1	AO2 4.1.1.2
02.4	a weakened form of a virus		1	AO1 4.3.1.7
02.5			1	AO2 4.3.1.7
02.6	leaf		1	AO1 4.3.1.2

02.7	y-axis labelled rate of photosynthesis in arbitrary units correct scale all bars plotted correctly all bars correctly labelled	 allow a tolerance of ± ½ small square allow 2 correct bars for **1** mark allow bars touching allow any width of bars ignore letters	1 1 2 1	AO2 4.4.1.1
02.8	as the level of infection (with TMV) increases, (the rate of) photosynthesis decreases	allow as TMV increases, photosynthesis decreases allow (the rate of) photosynthesis decreases as the level of infection (with TMV) increases allow as infection gets worse, photosynthesis decreases allow TMV reduces photosynthesis	1	AO3 4.4.1.1
02.9	less chlorophyll (so) less glucose / starch / protein made	allow fewer chloroplasts allow less light absorbed ignore less photosynthesis	1 1	AO2 4.4.1.1 4.4.1.3 4.3.1.2
Total			**14**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	(has) spikes / thorns / prickles	allow (has a) tough outer layer	1	AO2 4.3.3.2
03.2	chemical		1	AO1 4.3.3.2
03.3	the plant will not lose as much water		1	AO2 4.2.3.2
03.4	chlorophyll / chloroplasts		1	AO2 4.1.1.2
03.5	to allow it to photosynthesise **or** to make sugar / glucose / carbohydrate / starch		1	AO2 4.4.1.1
03.6	organ		1	AO1 4.2.1
03.7	water / mineral ions	allow named mineral ions allow minerals / ions	1	AO1 4.2.3.1 4.2.3.2
03.8	phloem (tissue)		1	AO1 4.1.1.3 4.2.3.1 4.2.3.2
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	$C_6H_{12}O_6$		1	AO1 4.4.1.1 4.4.2.1
04.2	carbohydrase		1	AO1 4.2.2.1
04.3	beaker	allow water bath	1	AO1 4.2.2.1 RPA5
04.4	so that both solutions could reach 10 °C		1	AO2 4.2.2.1 RPA5
04.5	10 / ten (minutes)		1	AO3 4.2.2.1 RPA5
04.6	test the mixture with iodine solution every 30 seconds		1	AO3 4.2.2.1 RPA5
04.7	35 °C		1	AO3 4.2.2.1 RPA5
04.8	enzyme / amylase is denatured **or** enzyme / amylase stops working (so) starch is not broken down **or** starch is still present	allow active site / enzyme has changed shape do **not** accept enzyme / amylase has died	1 1	AO2 4.2.2.1 RPA5
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	less blood flows through **or** less blood flows to the heart (muscle / cells / tissue) less oxygen (reaches the heart muscle)	 allow less respiration allow less energy released do **not** accept less energy produced / made / created	1 1	AO1 4.2.2.3 4.2.2.4
05.2	D		1	AO3 4.2.2.4
05.3	B		1	AO3 4.2.2.4
05.4	is more likely to get a blockage (with high cholesterol) **or** blockage could be biggest	ignore has the highest blood cholesterol concentration	1	AO2 4.2.2.4
05.5	4 **and** 5.6 $\left(\frac{5.6}{4}\right) = 1.4$	 allow correct division using either 5.3 or 5.8 (for person D)	1 1	AO2 4.2.2.4
05.6	opens / widens (artery) so (more) blood can flow through	allow pushes blockage to the side allow (more) oxygen(ated blood) can flow through	1 1	AO1 4.2.2.4
05.7	platelets		1	AO1 4.2.2.3

05.8	**Level 2:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	3–4	AO3 4.2.2.4
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content	0	
	Indicative content: *Advantages:* • **only** have to take the tablet once a day • **only** a tablet so easy to take **or only** a tablet so not painful to take • (drugs are effective so) less likely to get a blood clot • drugs are cheap so less cost to NHS **or** drugs are cheap so (more) people can afford them • drugs have been used for a long time so must be safe / trusted *Disadvantages:* • patients have to make sure they always have a supply of drugs • patients could forget to take the drugs (every day) • patients could still get a blood clot in the first week • restrictions on lifestyle because patients have to have a blood test every few weeks • restrictions on lifestyle because patient can't eat certain foods • patients may get a blood clot if they eat the wrong food • risks associated with puncturing skin / infection • patient may have a fear of needles • higher risk of bleeding / bruising For **Level 2** students must evaluate, including consideration of, the advantage and disadvantage of anti-clotting drugs.		

Total			**14**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	trachea		1	AO2 4.2.2.2
06.2	any **two** from: • only one air space (per balloon) **or** alveoli not represented • blood vessels / capillaries not represented • bronchioles not represented • glass tube not flexible (like trachea / bronchi) • bell jar does not move during breathing (like ribs) • ribs have gaps between them • rib cage contains muscles • pleural cavity not represented	do **not** accept bronchi not represented	2	AO3 4.2.2.2
06.3	any **two** from: • speed (of treadmill) • type of exercise **or** all were running • (biological) sex **or** all male • all were non-smokers • time spent running	allow ran for 8 minutes ignore reference to time interval for counting breaths	2	AO2 4.4.2.2
06.4	0 minutes = 20 8 minutes = 42 (42 - 20) ÷ 20 × 100 **or** 22 ÷ 20 × 100 110 (%)	allow value for 8 minutes in the range 41.5 to 42.5 allow correct substitution from incorrect graph readings (i.e. ±1 small square) at 0 minutes and / or 8 minutes allow correct calculation from incorrect graph readings from previous step	1 1 1	AO2 4.4.2.2

06.5	to get more oxygen (into the blood) for use in respiration **or** for releasing energy (for muscle contraction) **or** to remove more carbon dioxide (1) produced in respiration (1)	allow using more oxygen (in muscles) allow to reduce anaerobic respiration do **not** accept produces / makes / creates energy	1 1	AO2 4.4.2.2 4.4.2.1
06.6	any **one** from: • heart / pulse rate • depth / volume of breathing • volume of sweat • body temperature	allow heart beat per minute allow amount of sweat allow body mass / measurement	1	AO3 4.4.2.2
06.7	any **one** from: • (lung) cancer • increased blood pressure • lung disease • low birth weight in babies of mothers who smoke • increased risk of heart / cardiovascular disease	allow named example of lung disease e.g. asthma allow persistent cough ignore cough unqualified	1	AO1 4.2.2.6
Total			**12**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	any **two** from: • (microscope) slide • cover slip • dye / stain • (mounted) needle • pipette / dropper • scalpel • forceps / tweezers	allow named dye / stain ignore water ignore knife allow swab (to collect cells)	2	AO1 4.1.1.5 RPA1
07.2	eyepiece / lens	do **not** accept objective lens	1	AO1 4.1.1.5 RPA1
07.3	to focus (the image / cells)	allow to make the cells / image clear(er) allow to improve resolution (of the image) ignore to move the stage up / down do **not** accept reference to magnification	1	AO1 4.1.1.5 RPA1
07.4	any **one** from: • no cells in the field of view • slide not in the correct position • mirror not in correct position • (objective) lens not clicked into place **or** (objective) lens dirty • (student is) looking at a (large) air bubble • (the microscope is) not focussed	allow light / microscope not switched on / plugged in allow student did not stain the cells allow idea of magnification not being high enough	1	AO3 4.1.1.5 RPA1

07.5	**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.	4–6	AO2
	Level 1: Relevant features are identified and differences noted.	1–3	AO1
	No relevant content	0	
	Indicative Content **Differences:** • red blood cell has no nucleus **or** plant cell has a nucleus • red blood cell has no cell wall **or** plant cell has a cell wall • red blood cell is a biconcave disc **or** there are many different shapes of plant cell • red blood cell contains haemoglobin **or** plant cells do not contain haemoglobin • red blood cells do not contain chlorophyll **or** plant cells (may) contain chlorophyll • red blood cell has no chloroplasts **or** plant cell has chloroplasts • red blood cell has no (permanent) vacuole **or** plant cell has (permanent) vacuole • red blood cells are (much) smaller than plant cells **Similarities:** both have: • cytoplasm • cell membrane • pigments (although they are different) ignore references to mitochondria and ribosomes for **Level 2**, consideration of both red blood cells and plant cells is required.		4.1.1.2 4.2.2.3

07.6	water enters (the cells) by osmosis / diffusion	allow water enters **and** the cell starts to swell ignore explanations of osmosis	1	AO2
	plant cell has a cell wall (which prevents it from bursting)	allow red blood cell has no cell wall (so it swells and bursts)	1	AO1 4.1.3.2 4.1.1.2

Total			**13**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	any **two** from: • sterilise equipment / surfaces (before use) • (use) sterilised agar • secure lid of the Petri dish with (adhesive) tape • only lift lid of Petri dish a little (when setting up plate) **or** lift lid of Petri dish at an angle (when setting up plate)	ignore 'clean' unqualified ignore wash hands allow description of how to sterilise equipment allow description of how to sterilise agar	2	AO1 4.1.1.6 RPA2
08.2	B **and** it kills the fewest bacteria **or** it has the smallest area where no bacteria were growing	 allow it has the smallest clear / white area	1	AO3 4.1.1.6 RPA2

08.3	*(correct measurement)* r = 1.1 (cm) **or** r = 11 (mm) *(recall of the equation)* πr^2 *(calculation/substitution)* 3.14 x 1.1^2 **or** 3.14 x 11^2 = 3.799(4) (from 3.14 x 1.1^2) **or** = 379.9(4) (from 3.14 x 11^2) *correct unit* (3.7994) cm^2 **or** (379.94) mm^2	an incorrect answer for one step does not prevent allocation of marks for subsequent steps ignore calculation and subtraction of filter paper disc area from total area allow d = 2.2 (cm) **or** d = 22 (mm) allow a tolerance of ±1 mm allow correct calculation / substitution using an incorrect measurement allow 3.8 allow 380 do **not** accept unit with no attempt at working / answer	1 1 1 1 1	AO2 4.1.1.6 RPA 2
08.4	any **one** from: • repeat **and** calculate a mean • repeat **and** eliminate anomalies • use a control disc • use different types of bacteria	 allow description of control disc e.g. disc with water / nothing ignore set up a control	1	AO3 4.1.1.6 RPA2
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	normal		1	AO2 4.2.2.5 4.2.2.6
09.2	$92 \div 1.71^2$ 31.46(…) 31.5	 allow correctly calculated value using 92 ÷ 1.71	1 1 1	AO2 4.2.2.5 4.2.2.6
09.3	any **two** from: • the higher the BMI (category) the lower the number of years living in good health • the higher the BMI (category) the higher the number of years living in bad health • the higher the BMI (category), the lower total life expectancy	allow 'more overweight' or 'more obese' for higher BMI category throughout allow the lower the BMI (category) the higher the number of years living in good health allow the lower the BMI (category) the lower the number of years living in bad health allow the lower the BMI (category), the higher total life expectancy if no other marks awarded, allow for **1** mark idea that as BMI increases, quality of life decreases	2	AO2 4.2.2.5 4.2.2.6

09.4	costs the NHS / UK health service / Government / hospitals more money (because need to pay for) additional surgery / medication / hospital stay to treat stroke / diabetes **or** more time off work (if in hospital / unwell) (1) (so) employer / Government have to give financial support (1)	 allow other correct named conditions e.g. heart attack / immobility / disability / arthritis allow more people unable to work allow (so) decreased productivity (in workplace)	1 1	AO3 4.2.2.6
09.5	allow any **one** from: • movement issues • loss of job / income • disability • mental health impact of lack of movement **or** mental health impact of pain • need to visit the doctor / take medication regularly • may need surgery	 allow example of movement issue	1	AO3 4.2.2.6
09.6	<u>type 2</u> diabetes CVD / CHD **or** heart attack / disease **or** stroke	 allow atherosclerosis allow **two** named vascular conditions for **2** marks from heart attack **or** stroke **or** high blood pressure **or** high (blood) cholesterol allow cancer allow liver disease	1 1	AO1 4.2.2.4 4.2.2.6
Total			**11**	