GCSE
BIOLOGY
8461/1F

Paper 1 Foundation Tier

Mark scheme

June 2024

Version: 1.0 Final

2 4 6 G 8 4 6 1 1 F / M S

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.

No student should be disadvantaged on the basis of their gender identity and/or how they refer to the gender identity of others in their exam responses.

A consistent use of 'they/them' as a singular and pronouns beyond 'she/her' or 'he/him' will be credited in exam responses in line with existing mark scheme criteria.

Further copies of this mark scheme are available from aqa.org.uk

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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 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 do not form 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 a 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 should be awarded for a correct numerical answer, without any working shown.
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 or three 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.

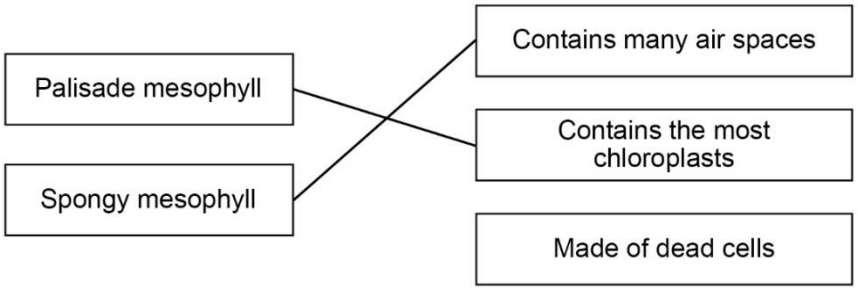
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

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	organ		1	AO1 4.2.1

Question	Answers	Mark	AO / Spec Ref.
01.2	**Leaf tissue** **Feature**  do **not** accept more than one line from a box on the left	1 1	AO2 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.3	transpiration		1	AO1 4.2.3.2 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.4	lignin		1	AO1 4.2.3.2 4.2.3.1 4.1.1.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.5	(so) light can reach (palisade / spongy) mesophyll for photosynthesis	allow (so) light can reach (other / lower) layers / tissues allow (so) light can reach other / lower cells allow (so) light can reach chloroplasts / chlorophyll ignore (so) light can get through	1 1	AO2 4.2.3.1 4.4.1.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.6	stomata guard cells	must be in this order	1 1	AO1 4.2.3.1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.7	(permanent) vacuole		1	AO1 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.8	active transport		1	AO1 4.1.3.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.9	mitochondria		1	AO1 4.1.1.2 4.1.3.3

Total Question 1	**12**

Question 2

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.1	(physical) barrier **or** stops pathogens entering (blood / body)	allow named pathogen throughout allow produces antimicrobial secretions allow produces oil / sebum / sweat ignore reference to scabs / clots	1	AO1 4.3.1.6

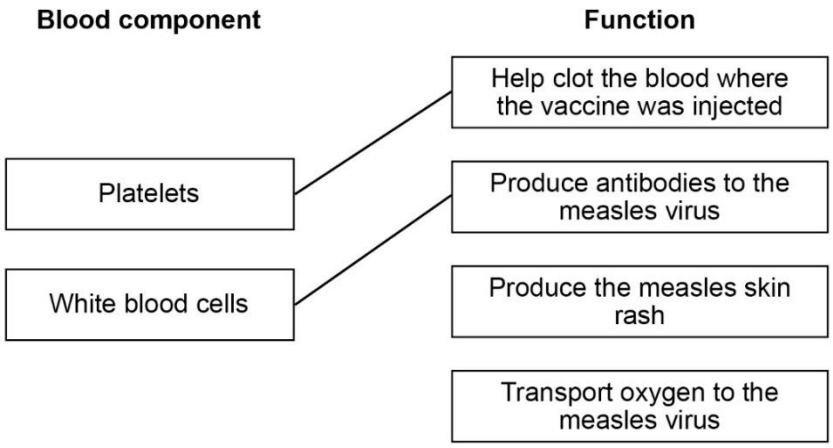
Question	Answers	Extra information	Mark	AO / Spec Ref.
02.2	$\frac{63}{210}$ $\frac{3}{10}$	 allow 0.3 ignore 30% if neither mark awarded allow $\frac{210}{63} = \frac{10}{3}$ for **1** mark	1 1	AO2 4.3.1.6 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.3	*(at pH1)* 187 (killed) *(at pH5)* 31 (killed) (187 – 31) = 156 (more bacteria killed)	ignore negative symbol throughout allow correct subtraction using incorrect calculation at pH1 and/or pH5	1 1 1	AO2 4.3.1.6 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.4	(the student) calculated the midpoint (between) 23 and 63 **OR** any **two** from: • $\frac{63 - 23}{2} = 20$ • 20 + 23 = 43 • 63 – 20 = 43	 allow (between values at) pH1 and pH3 allow $\frac{23 + 63}{2} = 43$ for **2** marks allow plot data from **Table 1** on graph (1) then read off value for pH2 (1) allow other correct methods for up to **2** marks	1 1	AO3 4.3.1.6 4.2.2.1

Total Question 2	**8**

Question 3

Question	Answers	Mark	AO / Spec Ref.
03.1	 do **not** accept more than one line from a box on the left	1 1	AO2 4.3.1.7 4.3.1.6 4.2.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.2	1968	allow 1969	1	AO3 4.3.1.2 4.3.1.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.3	increases (then) levels off / plateaus (then) decreases	 allow (then) stays the same allow reaches a maximum between 1956 and 1968 ignore use of numbers of people if no other mark awarded allow **1** mark for (overall) decrease	1 1 1	AO3 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.4	(the percentage) decreased	allow (the percentage) decreased then increased allow (the percentage) changed from 92% to 80%	1	AO3 4.3.1.2 4.3.1.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.5	parents were worried their children would get condition **X**		1	AO3 4.3.1.2 4.3.1.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.6	have the research peer reviewed		1	AO2 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.7	any **one** from: • (the author was) biased • (the author was) influenced by money • because the research was not peer reviewed • there was not enough evidence • small sample size	ignore (the author) was paid	1	AO3 4.3.1.9

Total Question 3	**10**

Question 4

Question	Answers	Mark	AO / Spec Ref.
04.1	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3–4	AO1 4.2.2.1 RPA4
	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: **Starch** • iodine (solution) tests for starch • iodine (solution) turns to blue-black **or** black **or** dark blue (if starch is present) • iodine (solution) remains unchanged / yellow / orange / brown (if no starch is present) **Sugar** • Benedict's (reagent / solution) tests for sugar • boil or heat (to at least 60 °C) • Benedict's (reagent / solution) turns green / yellow / orange / brown / (brick) red (if sugar is present) • Benedict's (reagent / solution) remains unchanged / blue (if no sugar is present) For **Level 2**, the response must give details of the tests for starch and sugar.		

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.2	amylase sugar	must be in this order	1 1	AO1 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.3	the type of bread		1	AO2 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.4	any **two** from: • white bread tastes sweet in the least time • wholemeal bread takes most time to taste sweet • brown bread takes more time than white bread to taste sweet	allow answers in terms of rate, such as fastest / slowest to taste sweet allow to break down for to taste sweet, throughout allow a correct comparison of time to taste sweet for two types of bread, for **1** mark allow any two correct comparisons of time to taste sweet for two types of bread, for **2** marks ignore use of figures, unqualified	2	AO3 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.5	repeated (each type of bread) calculated a mean		1 1	AO3 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.6	$\frac{58 + 55 + 61}{3}$ 58 (seconds)	allow $\frac{174}{3}$ allow student's total correctly divided by 3 if no answer given in answer space allow answer written in **Table 3**	1 1	AO2 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.7	each person's sense of taste is different		1	AO3 4.2.2.1

Total Question 4	**14**

Question 5

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.1	ionising radiation viruses		1 1	AO1 4.2.2.5 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.2	mitosis		1	AO1 4.2.2.7 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.3	grow replicate	must be in this order	1 1	AO1 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.4	40%		1	AO2 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.5	chromosomes are pulled to each end of the cell		1	AO2 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.6	(cell) membrane		1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.7	$\frac{50}{800}$	allow conversion to µm at any stage in the calculation	1	AO2 4.1.1.5
	0.0625 (mm)		1	
	62.5 (µm)	allow correct conversion from student's incorrect calculation	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.8	cells	must be in this order	1	AO1 4.3.1.9
	people		1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.9	placebo	allow placebo effect ignore examples and descriptions of placebos	1	AO1 4.3.1.9

Total Question 5	**14**

Question 6

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.1	any **two** from: • size of piece of potato • the (type of) potato • volume / 100 cm^3 of salt solution • time (pieces of potato are kept) in the solution / beaker • the potato was uncooked	ignore size of potato allow amount of salt solution allow 20 minutes (the pieces of potato are kept) in the solution / beaker ignore time unqualified	2	AO1 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.2	blot **or** dry (the surface)	allow descriptions of blotting allow descriptions of drying (the surface)	1	AO3 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.3	balance **or** weighing scale		1	AO1 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.4	0.1 g		1	AO2 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.5	D		1	AO3 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.6	$\frac{1.1}{6.0} \times 100$	ignore minus sign throughout	1	AO2 4.1.3.2 RPA3
	18.333…		1	
	18.3(%)	allow correct conversion to 1 decimal place from student's incorrect calculation using figures from potato piece **D**	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.7	line graph		1	AO2 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.8		must be in this order		
	water		1	AO2
	osmosis	allow diffusion	1	AO1
	permeable (membrane)		1	AO2
				4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.9	answer in the range 0.15 to 0.25 (mol/dm^3)		1	AO3 4.1.3.2 RPA3

Total Question 6	**14**

Question 7

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.1	arteries		1	AO1 4.2.2.2 4.2.2.4

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.2	pushes / moves blood to get <u>oxygen</u> around the body	 allow description of getting <u>oxygen</u> around the body, such as through blood vessels **or** to get <u>oxygen</u> to a named organ do **not** accept to get oxygen to the lungs ignore reference to restarting the heart ignore reference to the pacemaker	1 1	AO2 4.2.2.2 4.4.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.3	provides oxygen (for respiration)	allow idea of carbon dioxide triggering breathing to restart	1	AO2 4.2.2.2 4.4.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.4	statin(s)	allow named statin	1	AO1 4.2.2.4

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.5	(stent) opens / widens (blocked blood) vessel	allow (stent) keeps (blocked blood) vessel open allow a description of the blood vessel being opened ignore type of blood vessel ignore unblocks (blood) vessel	1	AO1 4.2.2.4
	to allow (more) blood to flow **or** to allow (more) glucose / oxygen to the heart (cells / tissue / muscle)		1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.6	any **two** from: • smoking increases the (%) risk of **all** types of (cardiovascular) disease • smoking increases the (%) risk of having (disease) **H** more than any other type of (cardiovascular) disease • smoking increases the (%) risk of having (disease) **E** less than any other type of (cardiovascular) disease	ignore smoking causes (cardiovascular) disease allow not smoking decreases the risk of **all** types of (cardiovascular) disease allow if you smoke, you are **most** likely to get (disease) **H** allow if you smoke, you are **least** likely to get (disease) **E** allow a comparison of the effect of smoking on the risk of two (cardiovascular) diseases allow two comparisons of the effect of smoking on the risk of two (cardiovascular) diseases for **2** marks	2	AO3 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.7	*y*-axis labelled **'**Percentage / % increase in risk (compared to people who have never smoked)**'**		1	AO2 4.2.2.6
	correct scale of 1 cm = 5% on *y*-axis		1	
	all bars plotted correctly	allow a tolerance of ±½ small square ignore bars touching ignore width of bars	1	
	all bars correctly labelled		1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.8	any **one** from: • poor diet	ignore obesity allow descriptions of poor diet eg diet high in (saturated) fat / cholesterol ignore diet unqualified	1	AO1 4.2.2.6
	• lack of exercise	allow descriptions of lack of exercise allow high alcohol intake allow other correct lifestyle factors such as having a stressful job		

Total Question 7	**14**

Question 8

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.1	nucleus	allow chromosome ignore in the DNA	1	AO1 4.1.1.2 4.1.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.2	**A**, **D** and **E**		1	AO1 4.2.2.1 4.2.2.2

Question	Answers	Mark	AO / Spec Ref.
08.3	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO2
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	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	AO1
	No relevant content.	0	4.2.2.1 4.4.2.1 4.4.2.3

	Indicative content:
	
	Difficulty digesting food
	• less / no lipase
	• (so) less / no fat broken down
	  ○ into fatty acids
	  ○ into glycerol
	
	• less / no carbohydrase / amylase
	• (so) less / no carbohydrate / starch broken down
	  ○ into glucose / sugar
	
	• less / no protease
	• (so) less / no protein broken down
	  ○ into amino acids
	
	Difficulty gaining body mass
	• less / no absorption
	  ○ of small / soluble molecules
	  ○ of fatty acids
	  ○ of glycerol
	  ○ of glucose / sugar
	  ○ of amino acids
	
	• fewer molecules **or** fewer amino acids available for building protein / muscle / cells / tissues
	• less fat stored
	• less respiration
	• less energy
	• (so less energy) for building new molecules / cells / tissues
	
	For **Level 3** details of difficulty digesting food **and** difficulty gaining body mass are needed.		

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.4	large surface / area	allow large surface / area to volume (ratio)	1	AO1 4.1.3.1 4.2.2.2
	(large) capillary network **or** good / efficient blood supply	allow many capillaries	1	
	walls are thin **or** walls are one cell thick	ignore references to membranes ignore alveoli are thin ignore alveoli are one cell thick do **not** accept thin cell walls ignore references to alveoli being moist ignore steep concentration gradient	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.5	less (aerobic) respiration	allow (more) anaerobic respiration	1	AO2 4.4.2.1 4.4.2.2
	(so) less energy (released)	do **not** accept less energy produced / made / created	1	4.4.2.3
	(results in) less muscle contraction **or** (results in) reduced metabolism **or** (results in) increased breathing rate / depth **or** (results in) increased heart rate	allow relevant named metabolic processes allow (results in) person getting out of breath	1	
	OR (more) anaerobic respiration (1) (so) lactic acid produced (1)			
	(results in) <u>muscle</u> fatigue **or** (results in) less <u>muscle</u> contraction **or** (results in) increased breathing rate / depth **or** (results in) increased heart rate (1)	allow <u>muscle</u> ache / cramp / tiredness / pain allow (results in) person getting out of breath		

Total Question 8	**14**