GCSE
BIOLOGY
8461/1F

Paper 1 Foundation Tier

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 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 confuse 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 each 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 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 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	a leaf		1	AO2 4.2.1 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.2	$\frac{1.1 + 1.1 + 1.4}{3}$ **or** $\frac{3.6}{3}$ 1.2 (grams)	if no answer given on answer lines, allow an answer in **Table 1**	1 1	AO2 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.3	ring around −32.4 (grams)	table takes precedence allow (–)32.4 (grams) written by question	1	AO3 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.4	did not include it	allow ignored it	1	AO2 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.5	control variable		1	AO1 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.6	time in the salt solution		1	AO3 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.7	osmosis		1	AO2 4.1.3.2 RPA3

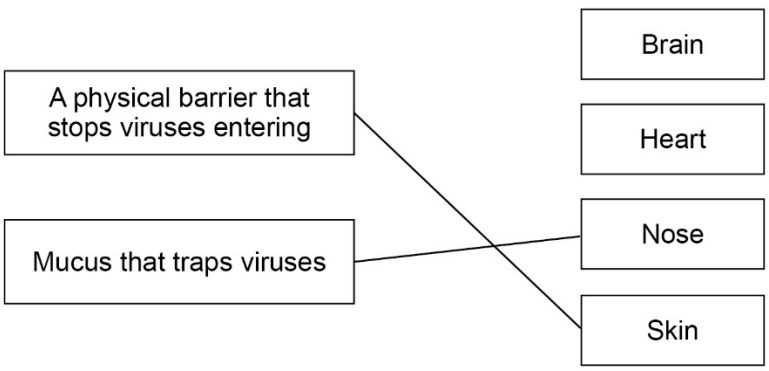
Question	Answers	Extra information	Mark	AO / Spec Ref.
01.8	some particles		1	AO1 4.1.3.2 RPA3

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.9	use more concentrations of salt solution		1	AO3 4.1.3.2 RPA3

Total Question 1	**10**

Question 2

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.1	pathogens		1	AO1 4.3.1.1

Question	Answers	Mark	AO / Spec Ref.
02.2	**Defence** / **Part of the body that provides the defence**  do **not** accept more than one line from a box on the left	1 1	AO1 4.3.1.6

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.3	division		1	AO1 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.4	malignant tumours have cells that can spread to other parts of the body malignant tumours may form secondary tumours		1 1	AO1 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.5	(percentage) decreases		1	AO3 4.2.2.7 4.2.2.5

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.6	more females were vaccinated (over time)	allow males may also be vaccinated allow more people were vaccinated allow increased use of (named) barrier methods of contraception allow more awareness / education (about HPV)	1	AO3 4.2.2.7 4.2.2.5

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.7	white blood cells		1	AO1 4.3.1.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.8	antibodies		1	AO1 4.3.1.7 4.3.1.6

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.9	any **one** from: • people are afraid of side / unknown effects • religious / cultural objections • (some people) believe they don't work • some people think (HPV) vaccine encourages sexual activity	ignore pain of injection allow there are side effects allow people think they cause (named) disease ignore religion unqualified ignore moral / ethical objections	1	AO3 4.3.1.7

Total Question 2	**11**

Question 3

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.1	*(lhs)* carbon dioxide water *(rhs)* glucose	allow word(s) take precedence over formulae } in either order	 1 1 1	AO1 4.4.1.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.2	(used in aerobic) respiration to release / transfer energy	do **not** accept anaerobic allow for energy allow (respiration) by mitochondria do **not** accept energy created / made / produced	1 1	AO1 4.4.1.2 4.4.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.3	any **one** pair from: • bulb / lamp is hot (so) may burn you / skin • glassware is breakable (1) (so) may cut skin (1) • electricity in close proximity to water (1) (so) may get electric shock (1) • scissors / scalpel (to cut pondweed) are sharp (1) may cut skin (1)	mark in pairs allow named example of electrical item in close proximity to water	 1 1	AO2 4.4.1.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.4	(use a) water bath	allow put beaker into (another) beaker of water allow other correct methods eg heat shield allow use an LED	1	AO2 4.4.1.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.5	(change in) temperature affects / changes (the rate of) photosynthesis	allow temperature is a limiting factor (of photosynthesis) allow temperature affects enzyme (activity) allow temperature affects rate of reaction	1	AO2
	(so) will affect / change the number of bubbles (produced)	allow (so) will affect results allow (so) will affect validity ignore to make it fair ignore so the results will be the same	1	AO3 4.4.1.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.6	blue		1	AO3 4.4.1.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.7	bar graph		1	AO3 4.4.1.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.8	any **one** from: • measuring cylinder • (gas) syringe • burette		1	AO3 4.4.1.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.9	as light (intensity) increases, rate / photosynthesis increases	allow positive correlation	1	AO3 4.4.1.2
	(rate / photosynthesis increases) at the same rate as light (intensity)	allow rate / photosynthesis increases linearly / evenly allow description of shape of line eg straight / linear allow rate is (directly) proportional to light (intensity) for **2** marks	1	

Total Question 3	**15**

Question 4

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.1	vector		1	AO1 4.3.1.5

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.2	any **two** from: • (it has) mitochondria • (it has a) nucleus • (it has) no plasmids	if neither mark awarded, allow **1** mark for protist has membrane-bound structures allow it does not have a loop of DNA allow other appropriate features do **not** accept (it has) cytoplasm do **not** accept (it has) a (cell) membrane do **not** accept it has no cell wall	2	AO2 4.3.1.5 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.3	Salmonella		1	AO2 4.1.1.1 4.3.1.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.4	only one parent is involved		1	AO1 4.3.1.5 4.6.1.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.5	14		1	AO2 4.3.1.5 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.6	decreased haemoglobin		1	AO2 4.3.1.5 4.2.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.7		allow alternative route allow correct conversion to standard form at any stage		AO2 4.3.1.5
	$\frac{210\ 000\ 000}{2}$	allow $\frac{210 \text{ million}}{2}$	1	
	or	**or**		
	105 000 000	105 million		
	105 000 000 × 3	allow 105 million × 3	1	
	315 000 000	allow 315 million	1	
	3.15×10^8		1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.8		ignore vaccination / anti-malarial drugs		AO2 4.3.1.5
	any **two** from:		2	
	• wear long(er) sleeves / clothes	allow reduce bare skin exposure		
	• use insect repellent or insecticides	allow insect repellent methods such as citronella candles		
	• don't go out in the evening	allow close doors / windows in the evening		
	• avoid going to countries / places with malaria / mosquitos			
	• destroy breeding grounds	allow methods of destroying breeding grounds such as drain water holes		
	• release sterile male mosquitos			
		allow other correct suggestions		

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.9	percentage / chance (of getting malaria) decreases (with age)	do **not** accept percentage / chance of having disorder **S** decreases with age	1	AO3 4.2.2.5 4.3.1.5
	correct use of data such as two pairs of data from **Table 4**		1	
		allow use of processed data		

Total Question 4	**15**

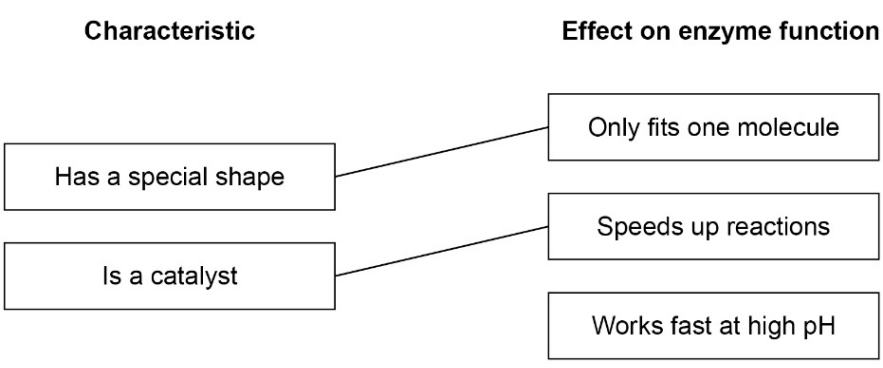
Question 5

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.1	any **one** from: • growth • development	allow replacement (of old cells) allow for repair allow to heal wounds	1	AO1 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.2	amino acids		1	AO1 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.3	Biuret reagent		1	AO1 4.2.2.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.4	purple		1	AO1 4.2.2.1 RPA4

Question	Answers	Mark	AO / Spec Ref.
05.5	 do **not** accept more than one line from a box on the left	1 1	AO1 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.6	9	allow answer in the range 8.5 to 9.5	1	AO3 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.7	fastest breakdown is at pH 2	allow acid **or** low pH for pH 2 throughout allow maximum / most breakdown is at pH2 allow works best at pH 2 allow (it / pH2) is the optimum pH allow a tolerance of ± 0.5 pH units	1	AO2
	stomach has (hydrochloric) acid		1	AO1 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.8	active site		1	AO2 4.2.2.1
	substrate		1	

Question	Answers	Mark	AO / Spec Ref.
05.9	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5-6	AO2 4.2.2.1 RPA4 RPA5
	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: • add iodine solution to spotting tile • use measuring cylinder • (to) add amylase (solution), pH solution and starch (solution) together • start the timer • use pipette • (to) remove a drop of mixture at regular intervals (e.g. every 30 seconds) • add drop of mixture to iodine (solution) • if starch is present, mixture and iodine (solution) turns blue / black • continue until the iodine (solution) and the mixture remain yellow / orange / brown • record the time taken for the mixture to remain orange • repeat at different pH • compare times at each pH (control variables): • volume of starch (solution) / amylase (solution) / pH solution / iodine (solution) • concentration of starch (solution) / amylase (solution) / pH solution / iodine (solution) • temperature for Level **3** reference to control variables in an investigation involving different pHs is required for Level **2** students must describe the mixing of amylase, starch and a buffer at different pH values		

Total Question 5	**17**

Question 6

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.1	a group of the same / similar cells **or** a group of cells with a (similar / specific) function	ignore a group of cells unqualified ignore examples of tissue functions	1	AO1 4.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.2	meristem (tissue)		1	AO1 4.1.1.4 4.1.2.3 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.3	willow	ignore named parts of willow	1	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.4	any **one** from: • (berries are) easy to access / pick • easier to extract chemical • taking berries will not harm the plant	ignore berries are not underground allow taking leaves / roots might damage / kill the plant (so it cannot produce more chemical) allow idea that the lower mass / amount (of chemical) will be less toxic / harmful allow greater mass of berries than of leaves / roots	1	AO3 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.5		allow conversion to mg at any point in calculation		AO2 4.3.3.1
	(0.6 × 1.2 =) 0.72		1	
	(0.72 × 2 =) 1.44		1	
	1.44 × 1000	allow conversion of a correct mass calculated for berries / roots	1	
	1440 (mg)	allow a correct answer using an incorrect conversion factor of a multiple of 10	1	
	alternative route (2 × 1.2 =) 2.4 (1) (2.4 × 0.6 =) 1.44 (1) 1.44 × 1000 (1) 1440 (mg) (1)			

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.6	any **one** from: • lack of chlorophyll • lack of magnesium (ions)	allow lack of chloroplasts allow lack of mineral (ions) **or** named example such as iron / nitrate / potassium / zinc (ions) ignore lack of nutrients / nitrogen allow lack of water allow incorrect pH of soil allow acidic / alkaline soil allow (named) infection allow lack of light allow other correct suggestions	1	AO1 4.3.3.1 4.3.1.2 4.3.1.4

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.7	any **two** from: • to check toxicity • to check dosage • to check its efficacy	 allow to check it is safe allow to check for side effects allow to check it is not poisonous / dangerous / harmful allow to check how much is needed allow to check it works allow to check it does not interact with other drugs	2	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.8	(writers / companies may get) financial gain **or** (competitor may suffer) financial loss	 ignore because the report has not been peer reviewed ignore have not used a double-blind trial	1	AO3 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.9	have the claims peer reviewed		1	AO1 4.3.1.9

Total Question 1	**13**

Question 7

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

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.2	C		1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.3	right atrium		1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.4	any **two** from: • (artery) has a thick**er** muscle (tissue) • (artery) has a thick**er** elastic (tissue) • (artery) has a narrow**er** lumen • (artery) does not contain valves	allow converse if clearly referring to a vein if neither mark awarded allow **1** mark for artery has a thick**er** wall allow description of lumen	2	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.5	as the percentage of the (coronary) artery that is blocked increases, blood flow decreases	allow converse allow the greater the blockage, the less blood flows allow negative correlation **or** inversely proportional allow as one increases, the other decreases	1	AO2 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.6	scale on y-axis	must take up at least 50% of axis	1	AO2 4.2.2.2
	all points plotted	allow 3 or 4 correct plots for **1** mark allow a tolerance of ± ½ small square	2	
	correct curved line of best fit	ignore line joined point to point with straight lines ignore extrapolation	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.7	correct answer from student's line in **Figure 7**	allow a tolerance of ± ½ small square if no line drawn on **Figure 7**, allow a value from 18 to 24 (cm^3/minute)	1	AO3 4.2.2.2

Question	Answers	Mark	AO / Spec Ref.
07.8	**Level 3**: Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5-6	AO1 AO2 4.2.2.2 4.2.2.4 4.4.2.1 4.4.2.2
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3-4	
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1-2	
	No relevant content.	0	
	Indicative content: • reduced blood flow to heart (muscle / tissue / cells) • (so) less oxygen to heart (muscle / tissue / cells) • (so) less glucose to heart (muscle / tissue / cells) • (so) less (aerobic) respiration (in heart / body cells) • (more) anaerobic respiration • (so) less energy (released) • (so) less muscle contraction • (so) less blood / oxygen / glucose around the body (from heart) **or** slower flow of blood / oxygen / glucose to body (from heart) • less carbon dioxide removed from body (muscle / tissue / cells) • (resulting in) breathlessness • (resulting in) tiredness • (anaerobic respiration causes) production of lactic acid • (build-up of lactic acid) causes muscle fatigue / pain **or** chest pain For **Level 3**, students must explain the effect of reduced oxygen / glucose on respiration **or** energy release and its consequence		

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.9	any **one** pair from:	mark as a pair		AO1 4.2.2.4
	• (insert) stent(s)	allow description	1	
	(to) open (coronary) artery	ignore unblock (coronary) artery	1	
	• (prescribe) statins (1)			
	(to) reduce (blood) cholesterol (1)	allow to slow down the rate of fatty material deposit		
	• heart (and lung) transplant (1)			
	(to) replace the diseased heart with a healthy heart (1)			
	• use an artificial heart (1)			
	(to) keep the patient alive while waiting for a transplant (1)	allow (artificial heart) pumps blood around the body in place of the heart		
	• (artery / heart) bypass (1)	allow description		
	(to) divert blood around the blockage (1)			

Total Question 7	**19**