GCSE
BIOLOGY
8461/1H

Paper 1 Higher Tier

Mark scheme

June 2025

Version: 1.0 Final

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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.

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 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 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 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	virus		1	AO1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.2	any **one** from: • (transfer of) droplets / saliva / mucus • sneezes • coughs	ignore other methods of transferring pathogens, unqualified such as touch or direct contact do **not** accept transfer through sexual intercourse	1	AO1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.3	willow	ignore parts of willow such as bark / leaves	1	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.4	fever **or** (red skin) rash	allow high temperature allow (increased) sweating allow (red) spots / lumps / boils allow red / itchy skin allow cough / sneeze allow runny / blocked nose allow sore throat allow red / watery / sore eyes allow headache ignore flu-like symptoms, unqualified ignore pain unqualified do **not** accept nausea / diarrhoea	1	AO1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.5		allow named types of pathogen		AO2 4.3.1.2 4.3.1.7
	few(er) people (in population) with pathogen / measles / disease (due to vaccination)	allow (provides) herd immunity	1	
	(so) **less likely** for pathogen / measles / disease to be passed on **or** (so) **less likely** for pathogen / measles / disease to be spread / caught	allow **less likely** to come into contact with a person with pathogen / measles / disease ignore (so) spread of disease is reduced allow **2** marks for fewer people with measles, so **less likely** to spread	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.6	(graph reading) = 45		1	AO2 4.3.1.2
	$\frac{45}{100}$ × 240	allow 0.45 × 240	1	
	108	allow for **1** mark an answer of 7 / 7.2 with evidence of having used 3(%) from **Figure 1** **or** allow for **1** mark an answer of 88 / 88.8 / 89 with evidence of having used 37(%) from **Figure 1**	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.7		allow answers in terms of numbers of children or likelihood of getting disease		AO3 4.3.1.2
	a lower percentage of vaccinated children have severe measles / infection / disease **or** a higher percentage of unvaccinated children have severe measles / infection / disease **or** vaccination reduces severity of measles / infection / disease	allow converse	1	
	correct use of supporting comparative data from **Figure 9**	allow examples such as (severe disease is) 42% higher (in unvaccinated) **or** 15 times higher (than in vaccinated) **or** allow correct use of raw data used in a comparative way	1	

Total Question 1	**11**

Question 2

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.1	type 2 diabetes	ignore diabetes unqualified do **not** accept type 1 diabetes allow high blood pressure allow (coronary) heart disease **or** CHD allow cardiovascular disease **or** CVD allow stroke allow heart attack allow (osteo)arthritis allow cancer allow sleep apnoea allow liver disease allow other correct diseases ignore high cholesterol ignore heart failure	1	AO1 4.2.2.6 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.2	correct scale **and** *y*-axis labelled 'mean obesity rate in arbitrary units'		1	AO2 4.2.2.6
	all points plotted correctly	allow a tolerance of ± ½ small square allow 3 or 4 correct plots for **1** mark ignore letters	2	
	line of best fit drawn	ignore line extended beyond plotted points ignore line joined point to point with straight lines	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.3	scatter (diagram / graph)	allow scattergram	1	AO2 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.4	positive correlation		1	AO2 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.5	(30 °C) (iodine solution remains yellow-brown because) starch is not present	allow (iodine solution remains yellow-brown because) all / the starch had been broken down	1	AO3
	(because) amylase / enzyme broke starch down	allow (because) the amylase / enzyme is active / working allow (because this is close to) the optimum / best temperature for amylase / enzyme	1	AO2
	(90 °C) (iodine solution blue-black because) starch was (still) present	allow (iodine solution blue-black because) starch was not broken down allow (because) the amylase / enzyme had no effect on starch	1	AO3
	(because) the amylase / enzyme has denatured	allow description of denaturation allow amylase / enzyme is destroyed / damaged do **not** accept amylase / enzyme has been killed	1	AO2 4.2.2.1 RPA5

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.6	test more temperatures between 10 °C and 60 °C		1	AO3 4.2.2.1 RPA5

<table>
<tr><th>Question</th><th>Answers</th><th>Mark</th><th>AO / Spec Ref.</th></tr>
<tr><td>02.7</td><td>
<table>
<tr><th>Protease enzyme</th><th>Optimum pH</th><th>Organ where enzyme is active</th></tr>
<tr><td></td><td></td><td>stomach</td></tr>
<tr><td></td><td></td><td><u>small</u> intestine
allow ileum / duodenum</td></tr>
</table>
</td><td>1

1</td><td>AO2
4.2.2.1</td></tr>
</table>

Total Question 2	14

Question 3

Question	Answers	Mark	AO / Spec Ref.
03.1	**Level 3**: A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	AO3
	Level 1: Relevant points are made. They are not logically linked.	1–2	AO3
	No relevant content.	0	4.1.3.2 RPA3

	Indicative content:
	
	(strengths)
	• same / a / one plant / potato used
	• all potato pieces used were cubes
	• mass was recorded before and after
	• change in mass was calculated
	• different concentrations of salt solution were used
	
	(improvement and reason)
	• use the same / a / one potato for all pieces
	  ○ (because the student) may have used different potatoes
	• remove skin **or** peel the potato
	  ○ (because) skin (may still be) present
	• blot / dry cube before measuring mass
	  ○ (because) cube will have excess water on surface
	• use same / set size / surface area of potato piece each time
	  ○ (because) size / surface area of cubes not controlled / specified
	• repeat (whole investigation **or** at each concentration)
	  ○ (because there were) no repeats
	  ○ to spot anomalies
	• calculate mean (from repeats)
	  ○ (because there was) no mean calculated
	• same time for each piece to be in solution
	  ○ (because) length of time in solution not specified
	• control temperature of solution using water bath
	  ○ (because) temperature (of solution) not controlled / specified
	• use same volume of solution for each piece of potato **or** ensure all pieces are completely submerged
	  ○ (because) volume of solution not specified / controlled
	• calculate percentage change in mass
	  ○ (because) percentage change in mass not calculated **or** (because) each potato piece had a different starting mass
	• include control experiment with boiled cube
	  ○ (because) no control experiment included
	• increase the number of concentrations (salt solution) used
	  ○ (because) only 3 different concentrations (salt solution) used
	
	For **Level 3**, a strength and improvements / reasons must be included.		

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.2	the solution in the potato cells was more concentrated than the distilled water		1	AO2 4.1.3.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
03.3	any **one** from: • requires energy	ignore it is active allow it is not passive	1	AO2 4.1.3.2 4.1.3.3
	• (transports substances) against / up a concentration gradient	allow (transports substances) from low concentration to high concentration ignore (transports substances) along / across the concentration gradient do **not** accept (transports substances) down a concentration gradient		
	• transports minerals / ions (and not water)	allow transports other named substances such as glucose allow does not transport water		

Total Question 3	**8**

Question 4

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.1	temperature		1	AO2 4.4.1.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.2		allow correct calculation in other units eg bubbles per minute / hour		AO1 4.4.1.2 RPA6
	$\frac{10}{43}$ **or** $\frac{1}{43} \times 10$		1	
	0.23255…		1	
	0.233	allow student's incorrectly calculated value to 3 significant figures allow use of other values for time from **Table 4**	1	
	(unit) bubbles per second	unit must be consistent with student's answer for MP3	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.3		allow converse for 10 °C if clearly stated		
	rate / photosynthesis is faster / higher (at 40 °C)	allow as the temperature increases, the rate (of photosynthesis) increases	1	AO3
	reactants / particles / molecules / enzymes have greater (kinetic) energy	allow reactants / particles / molecules / enzymes move faster	1	AO2
	(so) collide more frequently	allow (so) more collisions in a given time allow more <u>successful</u> collisions	1	AO2 4.4.1.2 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.4	any **two** from: • light intensity / level • colour / wavelength of light • carbon dioxide (concentration) • (mass of) chlorophyll	if neither point awarded allow **1** mark for light unqualified allow number of chloroplasts ignore water / humidity do **not** accept wind	2	AO1 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.5	collect gas / oxygen in a (gas) syringe **or** collect gas / oxygen in an inverted measuring cylinder	allow bubbles for gas / oxygen do **not** accept incorrect gas allow measure the <u>volume</u> of gas / oxygen in a (gas) syringe ignore use a gas syringe allow measure the <u>volume</u> of gas / oxygen in an inverted measuring cylinder ignore collect gas / oxygen in a measuring cylinder ignore use an inverted measuring cylinder allow other correct methods	1	AO3 4.4.1.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.6	any **two** from: • reference to a gardening manual / website / app • take (infected plants) to a laboratory / scientist / expert • use testing kits that contain monoclonal antibodies	ignore use / search the internet unqualified	2	AO1 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.7	(rose) black spot	allow other correct diseases such as rust do **not** accept nitrate / magnesium deficiency do **not** accept tobacco mosaic virus **or** TMV	1	AO1 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.8	a shortage of magnesium (ions)	allow a shortage of nitrate / iron (ions)	1	AO1 4.3.1.4 4.3.3.1
	which causes chlorosis **or** (so) less chlorophyll **or** (magnesium is needed) to make chlorophyll **OR** lack of light (1) causes chlorosis **or** causes chlorophyll to break down (1)	ignore chlorosis unqualified ignore fewer chloroplasts allow (nitrate / iron is needed) to make chlorophyll	1	

Total Question 4	**16**

Question 5

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.1	(to) transport / carry hormones / antibodies / proteins / ions / enzymes / urea / glucose / carbon dioxide	allow (to) transport / carry other correctly named substances allow (to) transport / carry platelets ignore nutrients / waste / oxygen	1	AO1 4.2.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.2	*recall of equation* magnification = $\frac{\text{size of image}}{\text{size of real object}}$	allow magnification = $\frac{\text{diameter of image}}{\text{diameter of real object}}$ ignore use of equation triangle	1	AO1
	rearrangement of equation size of real object = $\frac{\text{size of image}}{\text{magnification}}$	allow diameter of real object = $\frac{\text{diameter of image}}{\text{magnification}}$	1	AO2
	substitution $\frac{6.3}{7200}$	allow substitution of incorrectly converted value	1	AO2
	0.000875 (cm)	allow answer using incorrectly converted value	1	AO2
	conversion 8.75 (µm)	allow 8.8 (µm) allow conversion to µm at any stage ignore further rounding	1	AO2 4.1.1.5

<table>
<tr><th>Question</th><th>Answers</th><th>Mark</th><th>AO / Spec Ref.</th></tr>
<tr><td>05.3</td><td>
<table>
<tr><th>Pressure of blood travelling through vessel in arbitrary units</th><th>Blood vessel in Figure X</th></tr>
<tr><td></td><td></td></tr>
<tr><td>5</td><td>A</td></tr>
<tr><td>18</td><td>B</td></tr>
<tr><td>120</td><td>C</td></tr>
</table>
allow 1 mark for 1 or 2 correct answers

ignore names of blood vessels</td><td>2</td><td>AO3
4.2.2.2</td></tr>
</table>

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.4	pulmonary vein		1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.5	thick elastic / muscle (layer)	ignore thick wall unqualified do **not** accept reference to cell walls ignore has no valves	1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.6	less energy released / transferred (per molecule of glucose)	allow more molecules of glucose need to be broken down to release / transfer equivalent energy do **not** accept less energy produced / made / created do **not** accept no energy released do **not** accept less energy released for respiration	1	AO1 4.4.2.1
	(due to) incomplete breakdown / oxidation of glucose	allow glucose **only** broken down to lactic acid	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.7	(the athlete has an) <u>oxygen debt</u>	allow the lactic acid concentration is high	1	AO2 4.4.2.1 4.4.2.2
	(so more) oxygen is required to oxidise lactic acid	allow (so more) oxygen is required to remove lactic acid allow (so more) oxygen is required to break down lactic acid ignore reference to oxygen being used to convert lactic acid back to glucose (in the liver) ignore reference to liver as the site of lactic acid oxidation	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.8	(there is) more haemoglobin so more oxygen (carried **/** bound)	allow more oxyhaemoglobin (is formed)	1	AO2 4.4.2.1 4.2.2.3
	(athlete can do) more <u>aerobic</u> respiration to transfer / release (more) energy **or** (athlete can do) more <u>aerobic</u> respiration so less muscle fatigue / cramp	allow (athlete will do) less <u>anaerobic</u> respiration which transfers / releases less energy allow (athlete will do) less <u>anaerobic</u> respiration which would (otherwise) result in muscle fatigue / cramp do **not** accept (athlete can do) more anaerobic respiration do **not** accept energy produced / made / created do **not** accept energy released for respiration	1	

Total Question 5	**16**

Question 6

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.1	movement / spreading of particles from (an area of) high(er) concentration to low(er) concentration	allow movement / spreading of substances / chemicals / gases / liquids from (an area of) high(er) concentration to low(er) concentration allow movement / spreading of substances / chemicals / gases / liquids down a concentration gradient ignore reference to membrane do **not** accept reference to against the concentration gradient	1	AO1 4.1.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.2		allow blood vessels for capillaries do **not** accept arteries / veins for capillaries		AO1 4.1.3.1
	(gills / filaments) provide a large surface area for (maximum) diffusion / absorption		1	
	good blood supply to maintain concentration gradient **or** has a capillary network to maintain concentration gradient		1	
	filaments / capillaries have thin walls for a short diffusion distance / time **or** filaments / capillaries have walls that are one cell thick for a short diffusion distance / time	ignore membranes / filaments / capillaries are one cell thick do **not** accept reference to cell walls	1	
	water in close proximity to blood supply for a short diffusion distance / time	allow blood supply is close to gill surface for a short diffusion distance / time allow a counter-current flow to maintain a concentration gradient	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.3		allow converse if clearly describing resting fish		AO2 4.4.2.3 4.4.2.1
	(increased) movement	ignore swimming	1	
	(which) needs (more) energy **or** (more) energy provided (by respiration)	do **not** accept energy produced / made / created do **not** accept energy for respiration	1	
	(so) more respiration needs to take place		1	
	(for increased) muscle <u>contract</u>ion		1	

Total Question 6	**9**

Question 7

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.1	(stem cells) can <u>differentiate</u> into any type of cell	allow (stem cells) can <u>differentiate</u> into liver cells ignore specialisation	1	AO1 4.1.3.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.2	any **one** from: • (it is) destroying a (potential) life / embryo • embryo cannot give consent • (against) religious / cultural / personal beliefs	 allow the embryo does not have a choice allow against (someone's) faith ignore against God's will ignore religion unqualified	1	AO2 4.1.3.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.3	**A** = lymphocyte (specific to the antigen) **B** = tumour (cell) **C** = hybridoma	ignore white blood cell allow myeloma allow other specific types of tumour (cell) ignore cancer (cell)	1 1 1	AO2 4.3.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.4	(the mouse is) injected with (liver) antigens	allow (by) injecting (the mouse) with <u>liver</u> cells do **not** accept (by) injecting (the mouse) with a pathogen	1	AO2 4.3.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.5	monoclonal antibodies bind to (liver) antigens / cells	allow drug sticks to (liver) antigens / cells	1	AO2 4.2.2.3 4.3.1.6
	(because) monoclonal antibodies are complementary (in shape) to (liver) antigen	allow description of complementarity ignore reference to specificity do **not** accept (because) monoclonal antibodies are the same shape as (liver) antigen	1	4.3.2.1 4.3.3.2
	(so) antibodies released by white blood cells cannot bind to (liver) antigens / cells	allow (so) antibodies released by lymphocytes cannot bind to (liver) antigens / cells allow (so) phagocytes are unable to identify / detect cells to engulf do **not** accept (so) antibodies released by phagocytes cannot bind to liver antigens / cells	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.6	any **one** from: • tests to detect pathogens	allow COVID tests **or** lateral flow tests **or** LFTs	1	AO1 4.3.2.2
	• tests to detect hormones / chemicals / drugs • to locate / identify (specific) molecules in a cell / tissue • to locate / detect cancer (cells)			
	• to deliver (toxic) chemicals / drugs to cells	allow chemotherapy / immunotherapy allow to treat named disease ignore to diagnose / treat disease unqualified		

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.7	gall bladder		1	AO1 4.2.2.1

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	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	AO1
	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
	Indicative content • less / no bile produced (by liver) so less / no emulsification of fats o (so) fats not made into small(er) droplets o (so) surface area (of fat) not increased o (so) lipase cannot digest fat as quickly / much (due to smaller surface area) • less / no bile produced (by liver) so acid not neutralised o (because) bile is alkaline o (so) lipase **or** small intestine not at optimum pH o (so) lipase denatures o (so) lipase cannot digest fat as quickly / much (due to reduced / incorrect pH) For **Level 3**, there must be consideration of the effect on lipase activity and on both emulsification **and** the effects of pH.		

Total Question 7	**17**

Question 8

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.1	bacterial cells are prokaryotic and yeast cells are eukaryotic		1	AO1 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.2	any **two** from: • nucleus • vacuole • mitochondria	allow chromosomes allow large ribosomes if no other mark awarded allow **1** mark for membrane bound sub-cellular structures	2	AO3 4.1.1.1 4.1.1.2

Question	Answers	Mark	AO / Spec Ref.
08.3	**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.	3-4	AO3 4.1.1.6
	Level 1: Relevant features are identified and differences noted.	1-2	
	No relevant content.	0	
	Indicative content: • all three antibiotics have similar / no effect in the first 4 / 5 hours *antibiotic **A*** • **A** is least / less effective ○ because **A** starts to reduce the number of bacteria latest ○ because **A** reduces the number of bacteria the slowest ○ because the (maximum) number of bacteria using **A** is the highest ○ because **A** does not reduce the number of bacteria as much as **C** and / or **B** ○ because with **A** there is still a (much) larger number of bacteria left at 16 hours *antibiotic **B*** • **B** is more effective than **A** • **B** is less effective than **C** ○ because **B** starts to reduce the number of bacteria after **C** ○ because **B** starts to reduce the number of bacteria before **A** ○ because **B** reduces the number of bacteria more than **A** ○ because **B** reduces the number of bacteria quicker than **A** ○ because **B** reduces the number of bacteria slower than **C** *antibiotic **C*** • **C** is most / more effective ○ because **C** starts to reduce the number of bacteria soonest ○ because **C** reduces the number of bacteria the fastest ○ because the (maximum) number of bacteria with **C** is the lowest ○ because **C** is the (only) antibiotic to reduce the number of bacteria to zero For **Level 2**, all three antibiotics must be compared.		

Question	Answers	Extra information	Mark	AO / Spec Ref.
08.4	dilute each sample and count the number of bacteria (using a microscope)		1	AO1 4.1.1.6 4.2.2.5
	find the mean number of bacteria and scale / multiply up	allow find the mean number of bacteria and multiply by 50 allow find the total number of bacteria and multiply by 5	1	

Total Question 8	**9**