



GCSE

BIOLOGY

8461/1F

Paper 1F

Mark scheme

Specimen (set 2)

Version: 1.0

Keep secure

Please be aware that not all schools and colleges will be using these tests at the same time.

Help us to maintain the security of these papers by ensuring they are not distributed on social media or other platforms.

Important – please note

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers.

It must be stressed that a mark scheme is a working document. This mark scheme has **not** been through the full standardisation process. 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.

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.

The Information to Examiners is included as a guide to how the mark scheme will function as an operational document.

The layout has been kept consistent so that future operational mark schemes do not appear different from these test materials.

If the printing process in your school alters the scale of a diagram, measure the values on your printed papers and mark the scripts accordingly.

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 not 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.

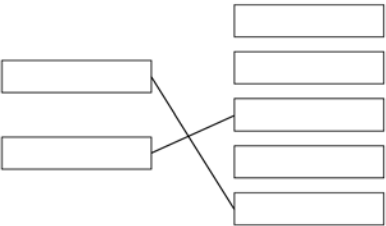
You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

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. / Demand
01.1	(A) bronchus	allow bronchi allow bronchiole	1	AO1.1 4.2.2.2 Low
	(B) trachea	allow windpipe	1	
	(C) alveolus	allow alveoli ignore air sac	1	
01.2	circulatory system		1	AO1.1 4.2.1 Low
01.3	Q		1	AO1.1 4.2.3.1 Low
01.4	guard cell		1	AO1.1i 4.2.3.1 Low
01.5	a group of cells with a similar structure / function		1	AO1.1 4.2.1 Low
01.6		1 mark for each correct line extra line from a tissue negates the mark for that tissue	3	AO1.1 4.2.3.1 Low
Total			10	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
02.1	bacteria		1	AO1.1i 4.3.1.8 Low
02.2		extra line from a drug negates the mark for that drug	2	AO1.1i 4.3.1.9 Low
02.3	any one from: <ul style="list-style-type: none"> • to check they are safe • to check they are effective • to check for side effects 	allow to check they work or to check for the (right) dose allow to check for toxicity	1	AO1.1 4.3.1.9 Low
02.4	testing on healthy volunteers		1	AO1.2 4.3.1.9 Low

02.5	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking.	3–4	AO1.1 4.3.1.7 Low Standard
	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 <ul style="list-style-type: none"> • dead / inactive pathogen • introduced to the body • white blood cells respond • produce antibodies • antibodies are specific to pathogen • antibodies produced quickly (on reinfection) / rapid response • in larger quantities • killing the pathogen 		

Total			9
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Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
03.1	rate of photosynthesis increases or number of bubbles produced (in one minute) increases or volume of gas / oxygen produced (in one minute) increases	allow decreases / stays the same throughout	1	AO2.2 4.4.1.2 8.2.6 Low
03.2	light intensity		1	AO2.2 4.4.1.2 8.2.6 Low
03.3	reduces the effect of heat from the lamp or prevents temperature affecting photosynthesis		1	AO3.3b 4.4.1.2 8.2.6 Low
03.4	52		1	AO2.2 4.4.1.2 8.2.6 Low
03.5	should be 62 or is to 3 s.f. / not rounded	allow inconsistent number of significant figures / decimal places	1	AO2.2 4.4.1.2 8.2.6 WS 3.3 M1a Low
03.6	the numbers of bubbles at each distance are similar		1	AO2.2 4.4.1.2 8.2.6 Low

03.7	x-axis correctly labelled (colour of light) and bars identified as correct colour	bars can be identified by labels beneath the x-axis or with a key	1	AO2.2 4.4.1.2 Low
	bars plotted correctly	all 4 correct = 2 marks 3 correct = 1 mark if wrong type of graph drawn, max 2 marks	2	
03.8	blue light gives highest (rate of) photosynthesis	allow ecf from candidate's graph allow blue light is best	1	AO3.2b 4.4.1.2 Low
	green light gives the lowest (rate of) photosynthesis	allow green light is worst	1	
03.9	energy	in this order only	1	AO1.1i 4.4.1.3 Low
	cell wall(s)	allow cell	1	
	starch / fat / oil / lipid	do not accept (cell) membrane	1	
Total			14	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand						
04.1	<table border="1"> <tr> <td>x</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>✓</td> <td>x</td> <td>✓</td> </tr> </table>	x	✓	✓	✓	x	✓	1 mark for each correct row if no other marks awarded allow a mark for one correct column	2	AO1.1i 4.1.1.1 Low
x	✓	✓								
✓	x	✓								
04.2	a bacterial cell		1	AO1.1 4.1.1.1 Low						
04.3	make / synthesise / produce protein	allow produce enzymes	1	AO1.1i 4.1.1.2 Standard						
04.4	0.0015 (mm)	allow 1.5×10^{-3} (mm)	1	AO1.2 4.1.1.1 Low						
04.5	mitochondria are longer / bigger (than the cell)	allow too big	1	AO3.2b 4.1.1.2 Low						
04.6	2 ⁴ 16	an answer of 16 scores 2 marks allow $2 \times 2 \times 2 \times 2$ or a correct list showing doubling at each time interval allow 90 mins = 8 for 1 mark	1 1	AO2.2 4.1.1.6 Low						

04.7	<p>(number of live cells / bacteria) stays level / the same <u>until 11 hours</u></p> <p>then (number of live cells / bacteria) increases rapidly to 2.5×10^8 or from 11 hours to 14.5 hours</p> <p>then (number of live cells / bacteria) stays at 2.5×10^8 or stays the same from 15 to 20.5 hours</p>	<p>answer must refer to number of live cells / bacteria (not the shape of the graph)</p> <p>allow (number of cells / bacteria) is very low until 11 hours allow number in the range 10-11 hours</p> <p>allow (then) increases exponentially</p> <p>allow (number of live cells / bacteria) stays the same for the next 5 hours</p> <p>if no other mark awarded allow for 1 mark the idea that the graph is level, then increases, then levels off again</p>	1 1 1	AO3.1a 4.1.1.6 Low
04.8	<p>any one from:</p> <ul style="list-style-type: none"> • lack of food / nutrients / oxygen / space <p>or</p> <ul style="list-style-type: none"> • competition for space • build-up of toxins • temperature too high 	allow ethanol	1	AO2.1 4.1.1.6 Low
Total			12	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
05.1	(surface area =) 24 (cm ²)		1	AO2.2 4.1.3.1 Standard
05.2	(volume =) 8 (cm ³)		1	AO2.2 4.1.3.1 Low
05.3	3 (:1)	allow ecf from 05.1 and 05.2	1	AO2.2 4.1.3.1 Low
05.4	to keep the volume (of the cubes) the same in both sets or so both sets of cubes are 8 cm ³	allow to compare with the 2 × 2 × 2 cube ignore to keep it fair	1	AO2.2 4.1.3.2 Standard
05.5	so that excess water does not contribute to the mass of the cubes		1	AO2.2 4.1.3.2 Low
05.6	0.8 (g)	if no answer given, check for answer in Table 5	1	AO2.2 4.1.3.2 Low
05.7	(because) water moved into the cubes (by osmosis) because the solution outside the cubes was more dilute than inside the cells	allow water moves in by diffusion allow converse allow because the concentration of water was higher outside the cubes / in the beaker / solution than inside the cells	1 1	AO3.2b 4.1.3.2 Low Standard

05.8	because the samples of cubes were different masses at the start of the investigation		1	AO2.2 4.1.3.1 Standard
05.9	more water was taken in	allow ecf for answer to 05.4	1	AO3.2b 4.1.3.1 Low Standard
	because they had a larger surface area to volume ratio	allow more / faster osmosis happened	1	
Total			11	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
06.1	movement of particles from (an area of) high concentration to (an area of) low concentration	allow movement of particles down a concentration gradient do not accept along / across a concentration gradient	1	AO1.1i 4.1.3.1 Low
06.2	oxygen carbon dioxide	in this order only both needed for 1 mark allow O ₂ allow CO ₂	1	AO1.1i 4.1.3.1 Low
06.3	less diffusion (because of the) reduced / smaller surface area	allow less gas will enter / leave the blood allow ecf from 06.2	1 1	AO2.1 4.2.2.2 4.2.2.6 Low
06.4	(B) very low birth mass (C) extremely low birth mass		1 1	AO3.2b 4.2.2.6 Low
06.5	any one from: <ul style="list-style-type: none"> • men would be included in the study (can't be pregnant) • children / older (post-menopausal) women would be included in the study 	ignore reference to cost	1	AO2.2 4.2.2.6 Low

06.6	any three from: <ul style="list-style-type: none"> • higher percentage of pregnant women have never smoked (compared with non-pregnant women) • higher percentage of pregnant women are ex-smokers (compared with non-pregnant women) • lower percentage of pregnant women currently smoke (compared with non-pregnant women) • in both pregnant and non-pregnant women, the highest percentage of women have never smoked 	allow converse throughout allow appropriate use of correct figures throughout	3	AO3.2.b 4.2.2.6 Standard
06.7	scatter graph		1	AO2.2 4.2.2.6 Low
06.8	B		1	AO3.1a 4.2.2.6 Low
06.9	there is no correlation (between the variables)	allow (all) the points are widely scattered allow idea that the person with the longest birth time does not have the highest risk	1	AO3.1a 4.2.2.6 Low
Total			13	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
07.1	$C_6H_{12}O_6$		1	AO1.1 4.4.2.1 Standard
07.2	atmospheric air contains less carbon dioxide than exhaled air (flask B goes more cloudy because) carbon dioxide is produced in (aerobic) respiration (by woodlice)	allow converse do not accept anaerobic respiration	1 1	AO2.2 4.4.2.1 Standard
07.3	for comparison / to compare or to check that no other factor / variable is influencing the results	allow answers in the context of the investigation eg to prove that the results obtained were due to the woodlice respiring and nothing else or to prove that the woodlice produced the carbon dioxide and nothing else	1	AO2.2 4.4.2.1 Standard
07.4	(flask A) would remain colourless (flask B) would remain colourless	ignore references to clear allow not cloudy	1 1	AO3.2b 4.4.2.1 Standard
07.5	lactic acid		1	AO1.1i 4.4.2.1 Standard
07.6	alcohol / ethanol		1	AO1.1i 4.4.2.1 Standard
Total			8	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
08.1	electron (microscope)		1	AO2.2 4.1.1.5 Standard
08.2	$\frac{30\,000}{200}$ 150 (µm)	an answer of 150 (µm) scores 2 marks if answer is incorrect allow for 1 mark sight of 0.015 / 0.15 / 1.5 / 15 allow ecf for incorrect measurement of line X for max 1 mark	 1 1	AO2.2 4.1.1.5 Standard
08.3	either large surface area for more / faster osmosis or allow thin (cell) walls for short(er) diffusion distance	allow (vacuole contains) cell sap that is more concentrated than soil water (1) create / maintain concentration / water potential gradient (1)	 1 1	AO1.1 4.1.1.3 4.2.3.2 Standard
08.4	(on hot day) more water lost more transpiration or more evaporation so more water taken up (by roots) to replace (water) loss (from leaves)	allow converse for a cold day if clearly indicated	 1 1 1	AO2.1 4.2.3.2 Standard

08.5	(aerobic) respiration occurs in mitochondria	do not accept anaerobic respiration	1	AO2.1 4.1.3.3 4.4.2.1 Standard
	(mitochondria / respiration) release energy	do not accept energy produced / made / created	1	
	(energy used for) active transport		1	
	to transport ions, against the concentration gradient or from a low concentration to a high concentration		1	

Total			12
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Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand																									
09.1	a fungus		1	AO1.1i 4.3.3.1 4.3.1.4 Standard																									
09.2	<p>Level 3: Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.</p> <p>Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.</p> <p>Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.</p> <p>No relevant content</p> <p>Indicative content</p> <table border="1" data-bbox="256 1032 1153 2054"> <thead> <tr> <th></th> <th>defence</th> <th>description of defence</th> </tr> </thead> <tbody> <tr> <td rowspan="5">animals</td> <td>skin</td> <td>sebum / oils to kill microbes dead layer difficult to penetrate</td> </tr> <tr> <td>nose</td> <td>hairs keep out dust and microbes</td> </tr> <tr> <td>trachea / bronchi</td> <td>mucus traps microbes cilia moves mucus</td> </tr> <tr> <td>stomach</td> <td>(hydrochloric) acid kills bacteria</td> </tr> <tr> <td>white blood cells</td> <td>produce antibodies produce antitoxins engulf microbes / phagocytosis</td> </tr> <tr> <td rowspan="4">plants</td> <td>cell wall</td> <td>tough / difficult to penetrate</td> </tr> <tr> <td>waxy cuticle</td> <td>tough / difficult to penetrate</td> </tr> <tr> <td>dead cells / bark</td> <td>fall off, taking pathogens with them</td> </tr> <tr> <td>production of antibacterial chemicals</td> <td>kill bacteria</td> </tr> <tr> <td>fungi</td> <td>antibiotic production</td> <td>kill bacteria</td> </tr> </tbody> </table>		defence	description of defence	animals	skin	sebum / oils to kill microbes dead layer difficult to penetrate	nose	hairs keep out dust and microbes	trachea / bronchi	mucus traps microbes cilia moves mucus	stomach	(hydrochloric) acid kills bacteria	white blood cells	produce antibodies produce antitoxins engulf microbes / phagocytosis	plants	cell wall	tough / difficult to penetrate	waxy cuticle	tough / difficult to penetrate	dead cells / bark	fall off, taking pathogens with them	production of antibacterial chemicals	kill bacteria	fungi	antibiotic production	kill bacteria	5-6 3-4 1-2 0	AO1.1 4.3.1.6 4.3.3.2 Standard
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09.3	<p>any three from:</p> <ul style="list-style-type: none"> • sterilise agar (before use) • sterilise (Petri) dish before use • disinfect bench (before use) • pass inoculating loop (through flame) • secure lid with (adhesive) tape • minimise exposure of agar / culture to air / lift and replace lid as quickly as possible 	<p>allow:</p> <ul style="list-style-type: none"> • dip loop into ethanol (after flaming) • keep the lid on the plate for as long as possible or minimise exposure of agar to air or only tilt the lid off (rather than remove it) • flame the neck of the bottle 	3	AO3.3b 4.1.1.6 Standard
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09.4	to prevent the growth of a harmful pathogen		1	AO1.1 4.1.1.6 Standard
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Total			11	
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