GCSE
BIOLOGY
8461/1H

Paper 1H

Mark scheme
Specimen (set 2)

Version: 1.0

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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 <u>not</u> accept

Do **not** accept means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1: Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

Step 2: Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this.

The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

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

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

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

An answer which contains nothing of relevance to the question must be awarded no marks.

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
01.1	$C_6H_{12}O_6$		1	AO1.1 4.4.2.1 Standard
01.2	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
01.3	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
01.4	(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
01.5	lactic acid		1	AO1.1i 4.4.2.1 Standard
01.6	alcohol / ethanol		1	AO1.1i 4.4.2.1 Standard
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
02.1	electron (microscope)		1	AO2.2 4.1.1.5 Standard
02.2	$\frac{30\,000}{200}$ 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
02.3	**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
02.4	(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	1 1 1	AO2.1 4.2.3.2 Standard

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

Total			**12**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
03.1	a fungus		1	AO1.1i 4.3.3.1 4.3.1.4 Standard

03.2	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5-6	AO1.1 4.3.1.6 4.3.3.2 Standard
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logically 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

	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

03.3	any **three** from: • 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	allow: • 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

03.4	to prevent the growth of a harmful pathogen		1	AO1.1 4.1.1.6 Standard

Total			**11**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
04.1	an undifferentiated / unspecialised cell that can differentiate / become / change into (many) other cell types		1 1	AO1.1i 4.1.2.3 Standard
04.2	(malignant tumours) invade / spread to other tissues via the blood (benign don't) **or** (malignant tumours) form secondary tumours in other organs	ignore cancer unqualified allow converse allow metastasises	1	AO1.1i 4.2.2.7 Std./High
04.3	mitosis	correct spelling only	1	AO1.1 4.1.2.2 Standard
04.4	glucose protein / amino acids	answers in any order ignore sugar	1 1	AO1.1 4.4.2.1 4.4.2.3 Standard Std./High
04.5	no need to wait for a donor **or** can be done immediately (so) no risk of rejection **or** no need for immunosuppressant drugs	if no other marks awarded, allow for **1** mark idea of ethics surrounding the use of tissue from another / dead person	1 1	AO3.1b AO3.1b 4.1.2.3 4.2.2.4 Standard Std./High
04.6	stent opens up the trachea allowing air to flow through **or** allowing patient to breathe		1 1	AO2.1 4.2.2.4 4.2.2.2 Std./High

<table>
<tr><td rowspan="6">04.7</td><td colspan="2">Level 3: A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.</td><td>5-6</td><td rowspan="6">AO3.1b
4.1.2.3
Std./High</td></tr>
<tr><td colspan="2">Level 2: Some logically linked reasons are given. There may also be a simple judgement.</td><td>3-4</td></tr>
<tr><td colspan="2">Level 1: Relevant points are made. They are not logically linked.</td><td>1-2</td></tr>
<tr><td colspan="2">No relevant content</td><td>0</td></tr>
<tr><td colspan="2">Indicative content

embryos advantages
• can create many embryos in a lab
• painless technique
• can treat many diseases / stem cells are pluripotent / can become any type of cell (whereas bone marrow can treat a limited number)

bone marrow advantages
• no ethical issues / patient can give permission
• can treat some diseases
• procedure is (relatively) safe / doesn’t kill donor
• tried and tested / reliable technique
• patients recover quickly from procedure

both procedures advantage
can treat the disease / problem</td><td>

embryos disadvantages
• harm / death to embryo
• embryo rights / embryo cannot consent
• unreliable technique / may not work

bone marrow disadvantages
• risk of infection from procedure
• can only treat a few diseases
• procedure can be painful

both procedures disadvantages
• risk of transfer of viral infection
• some stem cells can grow out of control / become cancerous</td><td></td></tr>
</table>

Total			**16**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
05.1	86	allow this answer only do **not** accept 85.7 if no answer given, check for answer in **Table 2**	1	AO2.2 4.1.3.2 Standard
05.2	as salt concentration increases, percentage of open stomata (in field of view) decreases (above 0.1 mol/dm^3) **or** allow percentage of open stomata stays the same between 0.0 and 0.1 (mol/dm^3 then decreases as salt concentration increases)	ignore references to number of open stomata allow converse allow idea that mean concentration (of salt) in guard cells is between 0.3 and 0.4 mol per dm^3	1	AO3.2b 4.1.3.2 Standard
05.3	use concentrations between 0.3 (mol / dm^3) and 0.4 (mol / dm^3) **or** draw a graph of the data and read off the value at 50 % (open stomata)	allow a list of appropriate concentrations i.e. 0.32 mol / dm^3), 0.34 (mol / dm^3), 0.36 (mol / dm^3) etc.	1	AO3.3a 4.1.3.2 Std./High

05.4		an answer of 36 scores **3** marks		AO2.2 4.1.1.6 4.1.3.2 4.2.3.2 High
	$(\pi \times 0.1875^2) = 0.11$ (mm^2)		1	
	$\frac{4}{0.11}$		1	
	36 (per mm^2)	allow 36.22 / 36.23 **or** 36.2 if answer is incorrect allow for **2** marks for sight of number of open stomata = 9 per mm^2 (diameter used instead of radius) if no other marks awarded allow for **1** mark any **one** from: • sight of area = 0.44(mm^2) (diameter used instead of radius) • sight of number of open stomata = 9.1 / 9.05 / 9.06 per mm^2 (diameter used instead of radius and no rounding)	1	

05.5	(potassium) ions increase the concentration of the solution (inside guard cells) **or** (potassium) ions make cell more concentrated / less dilute	allow (potassium) ions decrease concentration of water / water potential (of guard cells)	1	AO2.1 4.1.3.2 High
	water moves into the (guard) cell by osmosis		1	
	cell swells unevenly (so stoma opens)		1	
	as inner wall is less flexible than outer wall **or** thick part of the wall is less flexible than the thin part (of the wall)		1	

Total			**10**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
06.1	any **two** from: • regular hand washing **or** use hand sanitiser / alcohol gel • cover nose / mouth when coughing / sneezing • put used tissues (straight) in the bin • don't kiss uninfected people **or** don't share cutlery / cups / drinks with uninfected people • clean / disinfect / sterilise surfaces regularly	allow wear a face mask allow isolate patient from others ignore responses referring to infected people	2	AO2.1 4.3.1.1 Standard Std./High
06.2	any **three** from: • stimulate (mouse) lymphocytes to produce antibody • combine (mouse) lymphocyte with tumour cell **or** (create a) hybridoma • clone (hybridoma) cell • (hybridoma) divides rapidly **and** produces the antibody	for marking points 1 and 2 lymphocyte must be used at least once	3	AO1.2 4.3.2.1 High
06.3	any **two** from: • (monoclonal) antibody binds to virus **or** antibody binds to antigen on surface of virus • (monoclonal) antibody is complementary (in shape) / specific to antigen (on surface of virus) • white blood cells / phagocytes kill / engulf the virus(es)		2	AO2.1 4.3.1.6 4.3.2.1 High

06.4	as a control **or** to see / compare the effects of the treatment (vs. no treatment)		1	AO1.2 4.3.1.9 Std./High

06.5	 (4.8 + 10.4) ÷ 2 ÷ 100 × 1500 **or** (4.8 ÷ 100 × 750) + (10.4 ÷ 100 × 750) 114	an answer of 114 scores **2** marks allow 228 for **1** mark	 1 1	AO2.2 4.3.1.9 Std./High

06.6	**(supports the conclusion because)** over double the number / % of patients (in the trial) were hospitalised with the placebo (compared to MAB) **(does not support the conclusion because)** no information on patients not hospitalised / still unwell at home **or** other factors may have affected those admitted to hospital **or** don't know if it was a double blind trial	 allow correct named factor eg age / gender / other illness	1 1	AO3.1b 4.3.1.9 Std./High High

Total			**12**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
07.1	vena cava		1	AO1.1 4.2.2.2 Standard
07.2		an answer of 25 (s) scores **4** marks		AO2.2 4.2.2.2 Std./High
	0.5 mm = 0.05 cm		1	
	time = $\frac{10.00 - 0.05}{0.4}$	allow alternative correct substitution	1	
	24.875		1	
	25 (s)		1	
		allow 24 for **3** marks (no conversion of mm to cm) allow 23.8 / 23.75 for **2** marks (no conversion of mm to cm and incorrect sf)		
07.3		ignore ref to valves / systole / diastole throughout		AO1.1 4.2.2.2 Std./High
	(blood) travels through (the) pulmonary vein		1	
	(blood) enters left atrium		1	
	(blood) enters (the) left ventricle		1	
	(blood) leaves the heart via / through (the) aorta	allow blood travels through arterioles allow blood (travels round the body and) reaches the cells / tissues via / in capillaries	1	

07.4	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5-6	AO1.1 4.2.2.2 4.1.3.1 4.1.3.2 4.1.3.3 4.2.2.1 Std./High High
	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 **S = structural F = functional** • (S) both have a large surface area • (S) villi have many microvilli • (S) alveolar walls are not flat / are folded • (F) to maximise diffusion (of gases) / absorption of (food) molecules • (S) both have many capillaries / good blood supply / capillaries near the surface • (F) to maintain concentration / diffusion gradient • (S) both have thin walls / walls that are one cell thick / one cell thick surface • (F) to provide a short diffusion distance (for molecules to travel) • (S) villi have many mitochondria • (F) to provide energy for active transport (of food molecules) • (S) cells of the villi have microvilli / more projections • (F) to further increase the surface area/ increase the number of proteins in the membrane / to allow more active transport to take place		

Total			**15**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
08.1	salivary glands and pancreas		1	AO1.1 4.2.2.1 Standard
08.2	starch / substrate fits into active site (of enzyme)		1	AO1.1 4.2.2.1 Std./High
	shape of active site is unique / complementary to substrate **or** substrate is specific to active site / enzyme	allow converse allow enzyme has a high specificity for substrate	1	
	bonds (within starch **/** substrate **or** between sugar molecules) are broken		1	
08.3	converted to new carbohydrates / glycogen / named organic compound (eg protein / fat)		1	AO1.1i 4.2.2.1 4.4.2.1 Std./High
08.4	to allow (the starch and amylase / solutions) to equilibrate (to the temperature of the water bath) **or** to get the starch and amylase / solutions to the same temperature / 20 °C **or** to get the starch and amylase / solutions to the (same) temperature of the water bath		1	AO1.2 4.2.2.1 Standard

08.5	**40 °C** all wells contain a symbol **and** must contain at least two crossed (×) wells at the end **60 °C** all wells contain a symbol **and** must have fewer crossed (×) wells at the end than at 40 °C	allow final three wells crossed (×) allow all wells ticked (✓) for either mp do **not** allow a crossed well followed by a ticked well	1 1	AO3.2b 4.2.2.1 Std./High

08.6	more accurate (because) it is a quantitative measure **or** less / not subjective	allow (so) closer to (the) true value allow (it's) an actual value as opposed to an opinion allow colour is only qualitative	1 1	AO3.3b 4.2.2.1 Standard High

08.7	0.07 (%)		1	AO2.2 4.2.2.1 Std./High

08.8	starch is broken down less quickly (at 20 °C) because, at 20 °C, substrates / enzymes / molecules have less (kinetic) energy	allow converse	1 1	AO3.1a 4.2.2.1 Std./High High

08.9	1.08 (arbitrary units)		1	AO2.2 AO3.2a 4.2.2.1
	at 80 °C, enzyme / amylase has denatured	allow description of denaturation do **not** allow enzyme is killed	1	Std./High High
	so starch is not broken down (at all)	allow the concentration of starch is still 0.5%	1	

Total			**16**