



GCSE

BIOLOGY

8461/2H

Paper 2H

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	times are very short / in milliseconds or milliseconds cannot be measured with a stopwatch		1	AO3 4.5.2.1 Standard
01.2	to increase validity / repeatability or to get representative results	allow to give a more reliable mean value	1	AO2 4.5.2.1 Standard
	because of variation in results	allow to identify any anomalies	1	
01.3	(they have included) 468 / the 7th result	allow identification of anomaly in the table	1	AO3 4.5.2.1 Standard
	(which) is anomalous / is a much higher value (than the others)		1	
01.4	$\frac{275}{259}$	an answer of 1.06 (: 1) scores 2 marks	1	AO2 4.5.2.1 Standard
	1.06 (: 1)	allow max 1 mark if wrong number of sig. figs.	1	
01.5	2.59×10^{-1} seconds		1	AO2 4.5.2.1 Standard

01.6	<p>any two from:</p> <ul style="list-style-type: none"> • cannot compare mean to B as it has been incorrectly calculated • C's mean reaction time is the longest, not the shortest • only measured one type of reaction <p>or</p> <ul style="list-style-type: none"> • cannot generalise to all reaction types • other factors can influence reaction time 	allow examples	2	AO3/ 4.5.2.1 Standard
01.7	involves (the conscious part of) the brain	allow voluntary (re)action	1	AO2 4.5.2.1 Standard
Total			11	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
02.1	(molecules are) (too) large cannot pass through (filtration) membrane / (holes in) filter	allow 'is not filtered out of the blood'	1 1	AO1 4.5.3.3 Standard
02.2	glucose is reabsorbed <u>all</u> of it	ignore 'is absorbed' unless qualified by 'into blood'	1 1	AO1 4.5.3.3 Standard
02.3	(molecules / ions) small so pass through filter or not all is reabsorbed more water reabsorbed on a hot day due to more water lost in sweat	allow the body needs to maintain the right balance of ions and urea in the blood ignore 'are filtered' unqualified } 'more' needed at least once to gain both marks	1 1 1	AO1 AO2 4.5.3.3 Standard

02.4	Level 3: A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3 AO2 4.5.3.3 Standard
	Level 2: A judgement, supported by some relevant reasons is given.	3–4	
	Level 1: Relevant points are made. If there is a judgement, this is asserted, but not logically linked to the points made.	1–2	
	No relevant content	0	
	Indicative content pro transplant: <ul style="list-style-type: none"> • (dialysis requires repeated treatments to prevent) build-up of toxins or to prevent raised blood pressure between sessions • inconvenience of dialysis, eg long sessions of immobility or repeated hospital visits • (dialysis requires restricted diet) to prevent build-up of urea / ions • there is a greater risk of infection with dialysis eg repeated puncturing of skin or use of non-sterile equipment allows entry of microorganisms • there is a risk of blood clots with dialysis • dialysis more expensive in the long term / 2+ years or examples given eg 2 yrs dialysis = £60 000 compared with 2 yrs after transplant = (£51 000 + £5 000) = £56 000 • transplant is a long term treatment or may remain healthy for many years con transplant: <ul style="list-style-type: none"> • shortage of kidney donors leading to long waiting time • requires death of another person or live donation leaving a person with just one kidney • exploitation of poor people for donor kidneys (paying for organs) • need to match tissue type • rejection – role of wbc's / lymphocytes • need immunosuppressant drugs – susceptibility to infection • dangers of surgery – physical damage / infection / brain damage from anaesthetic • high initial cost – limited funding (either personal or NHS / CCG) 		
Total		13	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
03.1	any two from: <ul style="list-style-type: none"> • sprinkled through air • air spaces between stones • thin layer over stones (for efficient diffusion) • slow flow (for efficient diffusion) 		2	AO2 4.7.3.1 4.7.3.2 4.4.2.1 Standard
03.2	green algae		1	AO1 4.7.2.1 4.7.4.1 Standard
03.3	(large / small) protist		1	AO1 4.7.4.1 Standard

03.4	Level 2: Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3–4	AO1 4.7.2.2 4.7.2.3 4.7.4.1 4.2.2.1 4.4.2.1 Standard
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–2	
	No relevant content	0	
	Indicative content digestion: <ul style="list-style-type: none"> • (external) enzymes released • role of enzymes – eg amylase / protease / lipase • substrates & products – eg starch→sugar / protein→amino acids / fat→fatty acids absorption: <ul style="list-style-type: none"> • by diffusion / active transport deamination: <ul style="list-style-type: none"> • amino acids→ammonia / ammonium ions release of other ions: <ul style="list-style-type: none"> • eg phosphate / nitrate / magnesium respiration: <ul style="list-style-type: none"> • produces carbon dioxide (+ water) or equation is given • release of energy allows other processes to take place eg active transport 		
Total		8	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
04.1	$0.03 = \frac{\text{output}}{5950 + 50} \times 100$ $\text{output} = \frac{0.03 \times (590 + 50)}{100}$ 1.8	an answer of 1.8 scores 3 marks	1 1 1	AO2 4.7.5.2 Standard
04.2	indoor % efficiency = $\frac{40}{10\,000 + 6\,000} \times 100$ or $\frac{40}{16\,000} \times 100$ 0.25(%) $\left(\frac{0.25}{0.03} =\right) 8.33 \text{ (times)}$	an answer of 8.33 scores 3 marks allow 8 / 8.3 / 8.333...	1 1 1	AO2 4.7.4.3 4.7.5.2 Std./High
04.3	any two from: <ul style="list-style-type: none"> • in faeces / egestion or not all food is absorbed • not all food is ingested • in urine / excretion • in respiration • keeping warm • movement 	do not accept 'for respiration' allow as 'heat'	2	AO1 4.7.4.3 Std./High

04.4	warmer indoors so less energy wasted in keeping warm	allow less energy lost as 'heat'	1	AO1 4.7.5.2 Std./High
	less movement indoors so less energy wasted		1	
		if no other mark awarded, allow it is warmer and there is less movement indoors for 1 mark		

Total			10	
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Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
05.1	any three from: <ul style="list-style-type: none"> a (chemical) messenger or an organic substance made by the endocrine system / an endocrine gland / endocrine organ affects (a) specific / target organ(s) / tissue(s) released into the blood 	allow correct named example – eg protein / modified amino acid / catecholamine / steroid allow made by / released from a (ductless) gland allow carried by the blood	3	AO1 4.5.3.1 Std./High
05.2	insulin and glucagon	both required for 1 mark correct spelling only for glucagon	1	AO1 4.5.3.2 Std./High
05.3	<p>Level 2: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.</p> <p>Level 1: Relevant points (reasons/causes) are identified, and there are attempts at logically linking. The resulting account is not fully clear.</p> <p>No relevant content</p> <p>Indicative content</p> <ul style="list-style-type: none"> (0–0.5 h:) glucose from meal enters blood or increase in blood glucose (to 6.5 mmol/dm³) glucose detected by pancreas pancreas secretes insulin (insulin causes) glucose to move (out of blood) into cells / liver liver converts glucose to glycogen causing a fall in blood glucose (after 0.5h) low blood glucose (< 5.0 mmol/dm³) detected by pancreas pancreas releases glucagon liver converts glycogen to glucose (which enters blood) blood glucose rises (after 1 h or to 5.2 mmol/dm³ (at 1.5 h)) 	3–4 1–2 0	AO1 AO3 AO1 AO2 4.5.3.2 Std./High	
Total			8	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
06.1	red blood cell		1	AO1 S4.2.2.3 Std./High
06.2	44		1	AO1 4.6.1.8 Standard
06.3	retina		1	AO2 4.5.2.3 4.6.1.6 Std./High
06.4	<p>7 and 8 / the parents do not have A (allele) or only have a (allele) or are aa</p> <p>so children cannot inherit A or can only inherit a</p> <p>or</p> <p>the parents show the recessive characteristic</p> <p>so must be homozygous (recessive) or must be aa or parents cannot have A</p>	<p>allow converse – if parents had an A (allele) they would have Stickler syndrome</p>	<p>1</p> <p>1</p>	<p>AO2 4.6.1.6 Std./High</p>

06.5	<p>parental genotypes: 12 = Aa and 18 = aa or parental gametes: 12 = A + a and 18 = a + a</p> <p>derivation of offspring genotypes</p> <p>identification of Aa offspring as Stickler</p> <p>probability = 0.25 / ¼ / 1 in 4 / 25% / 1:3</p>	<p>allow ecf</p> <p>allow ecf – eg 0.5 if 12 = AA do not accept 3:1 do not accept 1:4</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>AO2 AO3 4.6.1.6 Std./High</p>
Total			9	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
07.1	large number – more representative and so more valid (mean can be calculated) random – avoid bias	allow more reliable	1 1	AO1 4.7.2.1 Standard
07.2	correct figures in table: (3) (8) (16) 19 9 4 1		1	AO2 4.7.2.1 Standard
07.3	all bars plotted correctly	± 1 mm allow ecf from Table 3	1	AO2 4.7.2.1 Std./High
07.4	any three from: <ul style="list-style-type: none"> much overlap of values between the 2 shores sheltered shore: <ul style="list-style-type: none"> wider range or use of figures - eg approx 0.26 to 0.70 cf 0.21 to 0.55 higher mode or use of figures – eg 0.41 to 0.45 cf 0.36 to 0.40 there are no limpets at 0.21 to 0.25 	accept converse for exposed shore } allow ecf for figures from 07.2 allow there are no limpets on exposed shore at 0.56 to 0.70	3	AO3 4.7.2.1 Std./High
07.5	sheltered – 0.47 or 0.466 exposed – 0.35 or 0.354		1 1	AO2 4.7.2.1 Std./High

07.6	radius = 2.48 cm (area = $3.14 \times (2.48)^2 =$) 19.3 cm ² (force = $19.3 \times 2 =$) 38.6 (newtons) or (force = $[3.14 \times (2.48)^2] \times 2 =$ 38.62 (newtons) or (force = $[\pi \times (2.48)^2] \times 2 =$ 38.64 (newtons)	an answer of 38.6 / 38.62 / 38.64 scores 3 marks allow area calculated from incorrect radius allow force calculated from 1 previous error	1 1 1	AO2 4.7.1.2 Std./High
07.7	any two from: <ul style="list-style-type: none"> • foot may not be circular • foot may be larger / smaller than outside of shell • scientists' value is approximate • variation between limpets / described • variation in rock surface texture 	eg re muscle development or greater 'awareness' of some limpets	2	AO3 4.7.1.2 Std./High
07.8	any three from: <ul style="list-style-type: none"> • more force of waves to dislodge limpets • lower height lowers exposure to waves • wider foot gives greater grip • those with this / these feature(s) pass on alleles / genes to offspring leading to population of broad squat limpets 	allow converse for sheltered shore throughout, if clearly stated	3	AO3 4.7.1.1 4.7.1.2 4.7.1.4 Std./High
Total			17	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
08.1	less sweating so less water loss (as) no / little water available in desert		1 1	AO1 AO2 4.5.1 4.5.2.4 4.5.3.3 Standard Std./High
08.2	(fat store) can be metabolised / respired to water (little urine...) conserve water (hard mouth) not damaged by spines on plants / on food or not damaged by hard / dry food		1 1 1	AO3 4.5.3.3 4.7.1.1 4.7.1.2 4.7.1.4 Standard Std./High High
08.3	dromedary / <i>C.dromedarius</i> and bactrian / <i>C. bactrianus</i> because same genus	no mark for the names, but must be identified ignore 'both are <i>Camelus</i> '	1	AO2 4.6.4 Std./High
08.4	any two from: • the fossil record • oldest fossils in N. America or newer fossils in S. America / in Asia / in Africa • chemical / DNA analysis of living species	allow numbers for ages (45 Mya and 3 Mya / 6 Mya) allow radioactive dating of fossils	2	AO1 4.6.3.4 4.6.3.5 4.6.4 Std./High

08.5	isolation of separate camel populations by sea or by mountains		1	AO1 4.6.2.1 4.6.2.2 4.6.3.1 4.6.3.2 4.7.1.4
	habitat variation / described between populations	allow examples – biotic (eg food / predators) or abiotic	1	Std./High High
	genetic variation / mutation in each population		1	
	45 million years is sufficient time to accumulate enough mutations		1	
	natural selection or better adapted survive to reproduce		1	
	pass on favourable allele(s)	allow gene(s)	1	

Total			14
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Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand								
09.1	white blood cells have the same DNA / genes / chromosomes or have the gene for GH	allow have all the genes allow all body cells (except RBCs) have all of the genes	1	AO2 4.6.2.4 4.1.2.2 Std./High								
09.2	enzyme has specifically-shaped <u>active site</u>		1	AO1								
	the 2 antibiotic resistance genes have different (sequence of) <u>bases</u>		1	AO2								
	only Tetracycline-resistance gene fits (active site of) enzyme or only Tetracycline-resistance gene is complementary to (active site of) enzyme		1	AO1 4.6.1.5 4.6.2.4 4.2.2.1 High								
09.3	<table border="1"> <thead> <tr> <th>Ampicillin</th> <th>Tetracycline</th> </tr> </thead> <tbody> <tr> <td>✓</td> <td>✗</td> </tr> <tr> <td>✗</td> <td>✗</td> </tr> <tr> <td>✓</td> <td>✓</td> </tr> </tbody> </table>	Ampicillin	Tetracycline	✓	✗	✗	✗	✓	✓	1 mark for each correct row if no other mark, allow 1 mark for one correct column	1 1 1	AO2 4.6.2.4 High
Ampicillin	Tetracycline											
✓	✗											
✗	✗											
✓	✓											
09.4	clone produced by asexual reproduction	allow by 'mitosis'	1	AO2								
	all DNA / all genes are copied	allow GH gene copied allow plasmid copied	1	AO1								
	every cell receives a copy or receives every gene or receives GH gene or receives plasmid or genetically-identical cells		1	AO1 4.6 4.6.1.1 4.6.1.3 4.6.2.4 4.6.2.5 Std./High High								
Total			10									