

Cambridge O Level

BIOLOGY

5090/21

Paper 2 Theory

May/June 2024

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

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This document consists of **12** printed pages.

PUBLISHED**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Science-Specific Marking Principles

1 Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.

2 The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.

3 Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).

4 The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.

5 'List rule' guidance

For questions that require *n* responses (e.g. State **two** reasons ...):

- The response should be read as continuous prose, even when numbered answer spaces are provided.
- Any response marked *ignore* in the mark scheme should not count towards *n*.
- Incorrect responses should not be awarded credit but will still count towards *n*.
- Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response.
- Non-contradictory responses after the first *n* responses may be ignored even if they include incorrect science.

6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

Mark schemes will use these abbreviations:

; separates marking points

/ alternatives

() contents of brackets are not required but should be implied

R reject

A accept (for answers correctly cued by the question, or guidance for examiners)

lg ignore (for incorrect but irrelevant responses)

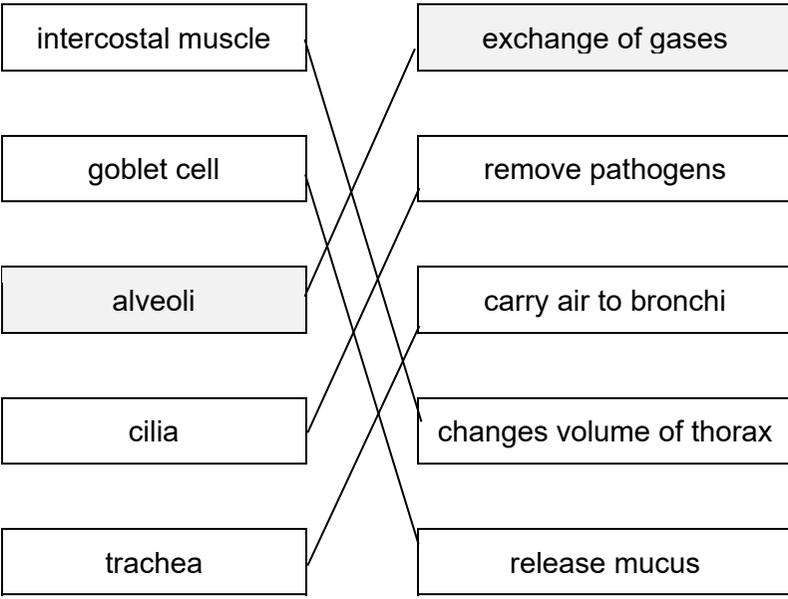
AW alternative wording (where responses vary more than usual)

AVP alternative valid point (where a greater than usual variety of responses is expected)

ORA or reverse argument

underline actual word underlined must be used by candidate

+ statements on both sides of the **+** are needed for that mark

Question	Answer	Marks	Guidance
1(a)(i)	 <p>four correct = 4 marks three correct = 3 marks two correct = 2 marks one correct = 1 mark</p>	4	
1(a)(ii)	<p>large surface area ; thin/flattened + cells / walls ; layer of water AW ; close to capillaries ;</p> <p>Max 2</p>	2	

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Question	Answer	Marks	Guidance
1(b)	inspired/inhaled air + expired/exhaled air in correct order ; nitrogen ; oxygen ; carbon dioxide ;	4	

Question	Answer	Marks	Guidance
2(a)(i)	amylase acts on starch / amylase produces maltose ; amylase + in the mouth / small intestine / duodenum/ileum ; maltase acts on maltose / maltase produces glucose ; maltase + in the small intestine / duodenum / ileum ;	4	
2(a)(ii)	not digested / not broken down ; is egested / passes out of anus / in faeces ;	2	
2(b)	(active transport / it) requires energy / ATP ; (active transport / it) moves molecules against / up a concentration gradient ; (active transport / it) requires carrier proteins ; Max 2	2	
2(c)(i)	the graph line does not start at the origin / the graph line starts part-way up the y-axis ;	1	
2(c)(ii)	glucose being converted to glycogen / insulin released ; glucose being used in respiration / glucose is used for energy ;	2	

Question	Answer	Marks	Guidance
2(c)(iii)	<i>slowly-digested starch</i> less variation in blood glucose concentration ORA ; pancreas not having to produce so much insulin ORA ; less likely to develop diabetes ORA ; Max 2	2	
2(d)	artificial selection / selective breeding ; select / breed + plants with greatest fibre content; genetic modification ; transfer / insert / alter + gene / allele + so plant produces high fibre ;	4	

Question	Answer	Marks	Guidance
3(a)(i)	10 / 1250 or correct equation ; 0.008 (mm) or 8×10^{-3} ; 8 (μm) ; (3 marks for correct answer)	3	
3(a)(ii)	both same shape AW ; W side view / X is a view from above / seen from different angles ;	2	
3(a)(iii)	Y = plasma + Z = tissue fluid ; plasma / Y / blood + under pressure / squeezed ; plasma / Y passes out of capillaries to form tissue fluid ;	3	

Question	Answer	Marks	Guidance
3(b)(i)	any three from: mosquito ; vector ; sucks up blood from infected woman / sucks up blood containing pathogen ; injects pathogen + into different person ; Max 3	3	
3(b)(ii)	<u>mitosis</u> ;	1	
3(b)(iii)	red blood cells destroyed / reduces the number of red blood cells ;	1	
3(b)(iv)	iron deficiency / lack of iron / heavy loss of blood through injury / menstruation ;	1	

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Question	Answer	Marks	Guidance
4(a)(i)	Chlorophyll/chloroplasts ; larger surface area (after rainfall) ; photosynthesis ; carbohydrates / glucose / starch produced ; absorption / trap + light (energy) ; Max 4	4	
4(a)(ii)	loss of water molecules + osmosis / diffusion / evaporation ; cytoplasm shrinks ; sap vacuole shrinks ; cell membrane pulls away from cell wall ; lack of turgor pressure ; plasmolysis ; Max 4 accept marks from a labelled diagram	4	
4(b)(i)	(a group of organisms that) can reproduce / breed / mate ; produce offspring that are fertile ;	2	

Question	Answer	Marks	Guidance
4(b)(ii)	<p><i>name:</i> <u>binomial</u> ;</p> <p><i>advantage: relevant advantage given</i> same name in all parts of the world / international name /</p> <p>common names can differ in different parts of the world /</p> <p>genus name helps identify closely related species ;</p>	2	

Question	Answer	Marks	Guidance
5(a)(i)	<p>A + DNA / genetic material ;</p> <p>D + <u>ribosome</u> ;</p> <p>Part A: contains the gene for the protein / lipase / codes for the production of the protein / lipase / mRNA / codes for sequence of amino acids in protein / lipase ;</p> <p>Part D: adds amino acids together to build protein ;</p>	4	
5(a)(ii)	motile / can move ;	1	
5(a)(iii)	<p>genes / DNA can be inserted into them ;</p> <p>can pass into a (bacterial) cell / vector / can carry a gene into a (bacterial) cell ;</p>	2	
5(b)(i)	<u>fermenter</u> ;	1	
5(b)(ii)	M indicated between 3rd and 4th plots ;	1	
5(b)(iii)	<p>0.4 / 0.1 × 100 ;</p> <p>400 (%) ;</p> <p>(2 marks for correct answer)</p>	2	

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Question	Answer	Marks	Guidance
5(b)(iv)	<p>E has higher final biomass / greater increase in biomass (than F)ORA ;</p> <p>E reaches max biomass quicker (than F) ORA ;</p> <p>E starts at a higher biomass (than F) ORA ;</p> <p>E rate of increase of biomass is faster (than F) ORA ;</p> <p>Max 2 Accept answers that quote figures</p>	2	
5(b)(v)	pH / oxygen / food supply / nutrients / temperature ;	1	
5(c)	<p>lipase digests / hydrolyses / breaks down + lipids / fats ;</p> <p>fatty acids and glycerol produced ;</p> <p>bile emulsifies / increases surface area of lipids ;</p> <p>bile neutralises acidic food / provides the optimum pH for digestion ;</p> <p>Max 3</p>	3	

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Question	Answer	Marks	Guidance
6(a)	<p><i>Human:</i> detected by retina / light receptors; involves neurones / nervous system / electrical impulses; response is muscular contractions (in iris) ; causing constriction / reduction in size of the pupil ;</p> <p><i>Plants:</i> detected by stem tip ; involves hormones / auxin ; more moves / diffuses to the side away from light ; causing more growth / elongation + on the shaded side ; positive phototropism / plant stem grows/bends + towards the light ;</p> <p>Max 6</p>	6	
6(b)	<p>transmission of impulse between neurones ; in one direction ; neurotransmitter ; released (from vesicles) into (synaptic) gap ; <u>diffusion</u> + across gap ; binds with receptor (proteins) ;</p> <p>Max 4</p>	4	