CAMBRIDGE
International Education

Cambridge IGCSE™

BIOLOGY **0610/43**

Paper 4 Theory (Extended) **May/June 2025**

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.

Cambridge International is publishing the mark schemes for the May/June 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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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.

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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	<u>'List rule' guidance</u> 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.

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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.

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Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
	correct point or mark awarded
	incorrect point or mark not awarded
	information missing or insufficient for credit
	allow or accept
	incorrect or insufficient point ignored while marking the rest of the response
	contradiction in response, mark not awarded
	benefit of the doubt given
	error carried forward applied
	benefit of doubt was considered, but the response was decided to not be sufficiently close for benefit of doubt to be applied.
	point has been noted, but no credit has been given or blank page seen

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Annotation	Meaning
	correct awarding one mark from marking point or marking group 1. similar numbered ticks are used for marking point or marking groups 2, 3, 4 etc.
	pages are linked together
	used to highlight part of the response
	used to highlight parts of an extended response
	used to highlight parts of an extended response
	Point already given
	Maximum mark reached
	Key point attempted / working towards marking point / incomplete answer / response seen but not credited / blank page seen
	Maximum number of marks for a marking point has been awarded.

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Mark Scheme Abbreviations:	
;	separates marking points
/	alternative responses for the same marking point
R	reject the response
A	accept the response
I	ignore the response
ecf	error carried forward
AVP	any valid point
ora	or reverse argument
AW	alternative wording
underline	actual word given must be used by candidate (grammatical variants excepted)
( )	the word / phrase in brackets is not required but sets the context
max	indicates the maximum number of marks that can be given
MP	marking point

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Question	Answer	Marks	Guidance
1(a)	<table><tr><th>name of structure</th><th>function</th><th>letter in Fig. 1.1</th></tr><tr><td>anus</td><td>egestion / removal of, undigested food / faeces</td><td>**G**</td></tr><tr><td>salivary glands / pancreas</td><td>produce amylase</td><td>**M / D**</td></tr><tr><td>gall bladder</td><td>stores bile</td><td>**L**</td></tr><tr><td>oesophagus</td><td>transports food to the stomach</td><td>**B**</td></tr></table> **;;;;**	**4**	one mark per correct row
1(b)(i)	(the breakdown) of large molecules into small molecules **;** idea of (only) small molecules can be absorbed **;** idea of insoluble (molecules) to soluble (molecules) **;**	**3**	
1(b)(ii)	glucose **;**	**1**	
1(b)(iii)	(the membranes of the) epithelium lining, epithelial cells (of, small intestine / villi) **;**	**1**	
1(b)(iv)	*any six from:* 1 stomach produces, gastric juice / hydrochloric acid / HC*l* **;** 2 acidic / low pH, in stomach **;** 3 (acid) denatures, amylase / enzyme **;** 4 changes shape of the active site **;** 5 (active site) no longer complementary (shape) to, substrate / starch **;** 6 cannot form enzyme-substrate complexes **;** 7 bile is released into the, small intestine / duodenum **;** 8 bile is an alkaline mixture **;** 9 neutralises the acidic mixture **;** 10 *idea of* suitable pH for amylase to work in small intestine **;**	**6**	MP1 **A** stomach contains gastric juice / HC*l* MP7 **A** pancreatic juice instead of bile

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Question	Answer	Marks	Guidance
2(a)	*any three from:* large surface area ; thin, (wall / surface,) / short diffusion distance / one cell thick ; good blood supply / network of capillaries ; good ventilation (with air) ;	**3**	
2(b)(i)	**P** and **S** ;	**1**	
2(b)(ii)	keeps the trachea / bronchi / airway open **OR** prevents collapse of trachea / bronchi / airway ;	**1**	
2(c)(i)	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$;;	**2**	MP1 correct molecules MP2 balancing of correct equation
2(c)(ii)	*any three from:* 1 increased carbon dioxide in blood ; 2 (high) carbon dioxide (in blood) detected by the brain ; 3 increases impulses to (named) muscles used in breathing / AW ; 4 increases contraction of (named) muscles used in breathing ; 5 adrenaline is released ; 6 to increase rate and depth of breathing ;	**3**	

Question	Answer	Marks	Guidance
3(a)	pancreas ; liver ; glycogen ; negative feedback / homeostasis ;	**4**	

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Question	Answer	Marks	Guidance
3(b)	*any two from:* 1 monitoring blood glucose ; 2 insulin, injections / pump ; 3 artificial pancreas ; 4 counting carbohydrates (in diet) ; 5 matching, food / carbohydrate, intake to activity ; 6 keeping a healthy weight ; 7 pancreas / islet cell, transplant ; 8 AVP ;	**2**	e.g. consuming, sugar / glucose, if blood, glucose is low / AW
3(c)	(–)43(%) ;;;	**3**	MP1 correct readings from graph 210 and 120 mg per 100 cm^3 MP2 correct calculation to any number of significant figures e.g. (–)42.857(%) MP3 correct rounding to two significant figures **ecf** from previous step
3(d)	*any three from:* 1 (adrenaline) causes the, breakdown / conversion, of, glycogen / stored carbohydrate ; 2 increasing (blood) glucose concentration ; 3 glucose used in respiration releasing energy ; 4 energy used for muscle contraction ; 5 AVP ;	**3**	e.g. increased glucose uptake by cells

Question	Answer	Marks	Guidance
4(a)(i)	**B** – palisade mesophyll ; **C** – (lower) epidermis ;	**2**	

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Question	Answer	Marks	Guidance
4(a)(ii)	*any two from:* diffusion of (named) gases for photosynthesis / respiration ; diffusion of <u>water vapour</u> for transpiration ; idea of buoyancy / to make the leaf float (to get more light) ;	**2**	
4(a)(iii)	*any two from:* traps light energy ; transfers energy from light into energy in chemicals ; (energy) for the synthesis of (named) carbohydrates ;	**2**	
4(a)(iv)	*any two from:* 1 water lilies do not need to prevent water loss ; 2 carbon dioxide uptake is less restricted / AW ; 3 use less resources to produce a cuticle ; 4 allows more light to penetrate ; 5 to the palisade (mesophyll) layer ; 6 AVP ;	**2**	e.g. leaf does not need to be rigid / AW
4(b)(i)	57 300 (stomata per cm^2) ;	**1**	
4(b)(ii)	*any four from:* 1 pondweed is submerged in water so no need for stomata to let air into a leaf ; 2 oxygen and carbon dioxide can diffuse into, leaf / cells, from water ; 3 water lily has stomata only on upper surface ; 4 because lower surface is, on the surface of the water / under the water ; 5 constant water supply to water lily / no risk of wilting ;	**4**	
4(c)(i)	*any one from:* 1 thin / strap-shaped, leaves ; 2 parallel veins ;	**1**	

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Question	Answer	Marks	Guidance
4(c)(ii)	*any three from:* 1 reduced aerobic respiration can occur ; 2 less energy released for active transport ; 3 less nitrate ions absorbed ; 4 less amino acids (to make protein) ; 5 less energy released for protein synthesis ; 6 more denitrifying (bacteria) ; 7 less nitrogen fixing (bacteria) ; 8 fewer nitrate ions in the soil ;	3	

Question	Answer	Marks	Guidance
5(a)(i)	bacteria / prokaryote(s) ;	1	
5(a)(ii)	*any two from:* only use for bacterial infections / when essential / when necessary ; use appropriate antibiotic ; AVP ;	2	e.g. complete the course / shorter course / reduce use in livestock / take the full dose / do not share antibiotic
5(b)(i)	genus ;	1	
5(b)(ii)	fungus / fungi ;	1	
5(c)(i)	insulin / mycoprotein / ethanol / (named) alcohol / carbon dioxide / amino acids / hormones / proteins / factor VIII / AVP ;	1	
5(c)(ii)	oxygen ;	1	

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Question	Answer	Marks	Guidance
5(c)(iii)	*any five from:* 1 monitoring ; 2 temperature ; 3 water jacket / described / water bath ; 4 pH ; 5 carbon dioxide might reduce pH ; 6 buffer / described ; 7 keep, pH / temperature, at suitable value for enzyme activity ; 8 (named) nutrient supply ; 9 carbon dioxide / waste products, removal ; 10 stirrer to equally (distributed), temperature / pH / nutrient concentration / oxygen concentration / microorganisms ; 11 idea of regulating (gas) pressure ; 12 vent or exhaust ; 13 sealed to prevent contamination / AW ;	**5**	
5(d)	yeast ;	**1**	

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Question	Answer	Marks	Guidance
6(a)(i)	*any two from:* less (land) covered by forest ; more fragmented forest ; less forest around the coast / AW ;	**2**	
6(a)(ii)	*any two from:* 1 housing / AW ; 2 agriculture / AW ; 3 (logging), for timber / fuel / paper ; 4 extraction of natural resources ; 5 wildfires ; 6 climate change ; 7 disease / invasive species ;	**2**	MP1 **A** urbanisation / industrialisation MP6 **A** global warming **A** drought
6(b)	**T** photosynthesis ; **U** (aerobic) respiration ; **V** combustion ;	**3**	
6(c)(i)	*any three from:* 1 decrease in photosynthesis leads to less carbon dioxide removed from atmosphere ; 2 increase in decomposition of felled trees leads to more carbon dioxide added to the atmosphere ; 3 increase in combustion of felled trees leads to more carbon dioxide added to the atmosphere ; 4 carbon dioxide traps, infrared / long wavelength, radiation (from the ground) ; 5 increase / enhanced, greenhouse effect ;	**3**	

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Question	Answer	Marks	Guidance
6(c)(ii)	*any three from:* 1 loss of habitat ; 2 extinction of species ; 3 reducing biodiversity ; 4 disrupt cycling of nutrients ; 5 disrupt, energy flow / food web / food chain ; 6 loss of possible, fuels / crop plants / drugs / genes ; 7 soil erosion / infertile land ; 8 (more run off) flooding ; 9 (fewer trees means) less transpiration / less water vapour in the atmosphere ; 10 so less rainfall / droughts / desertification ; 11 AVP ;	**3**	e.g. loss of, tourism / areas of natural beauty

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