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CAMBRIDGE
International Education

Cambridge IGCSE™

BIOLOGY **0610/42**

Paper 4 Theory (Extended) **February/March 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.

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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.

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

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Question	Answer	Marks	Guidance
1(a)(i)	net movement / AW, of particles ; from a region of higher concentration to a region of their lower concentration (as a result of their random movement) ;	**2**	
1(a)(ii)	kinetic (energy) ;	**1**	
1(b)(i)	aerobic respiration ;	**1**	
1(b)(ii)	arrow drawn from inside to outside of epithelial cell ;	**1**	
1(c)	*type:* active transport ; *explanation:* (particles move from) low(er) concentration to high(er) concentration ; uses energy ;	**3**	
1(d)	*any two from:* starch is insoluble ; starch is (too) large ; starch has already been broken down / AW ;	**2**	

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Question	Answer	Marks	Guidance
1(e)	*any six from:* 1 *idea of* before immersion cells are turgid / *idea of* after immersion cells are flaccid **or** plasmolysed ; 2 *idea of* before immersion cell membrane **or** cytoplasm pushes against cell wall / *idea of* after immersion cell membrane **or** cytoplasm pulls away from cell wall ; 3 *idea of* before immersion increased turgor <u>pressure</u> / *idea of* after immersion decreased turgor <u>pressure</u> ; 4 ref to osmosis ; 5 salt solution is concentrated **or** has a lower water potential / cytoplasm is dilute **or** has a higher water potential ; 6 water moves from high water potential to low water potential ; 7 through a partially permeable membrane ; 8 cytoplasm / vacuole / cell contents, is darker (after immersion) / ora ; 9 cytoplasm / vacuole / cell contents, are more concentrated (after immersion) / ora ;	**6**	

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Question	Answer	Marks	Guidance
2(a)(i)	2 **and** °C ;	**1**	
2(a)(ii)	horizontal line drawn at 37 °C ;	**1**	
2(a)(iii)	negative feedback ;	**1**	
2(a)(iv)	*any five from:* 1 brain / receptors, detect(s), low temperature / change in temperature ; 2 constriction of arterioles / vasoconstriction ; 3 less blood flow to, skin-surface / capillaries ; 4 ref to shivering / increased **or** rapid (skeletal) muscle contraction ; 5 increase in rate of respiration ; 6 hair erector muscles contract / hair stands on end ; 7 hair traps (insulating layer of) air ; 8 AVP ;	**5**	
2(b)(i)	**A** ;	**1**	
2(b)(ii)	**C** – (hair) erector muscle ; **D** – sensory neurone ;	**2**	

Question	Answer	Marks	
3(a)(i)	27 ;;	**2**	MP1: $28 \times 0.95 = 26.6$ **or** $\frac{28 \times 95}{100} = 26.6$ MP2: correct rounding to 2 significant figures

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Question	Answer	Marks	Guidance
3(a)(ii)	*any three from:* 1 ref to solvent / described ; 2 for digestion / named example ; 3 for excretion / named example ; 4 for transport / named example ; 5 temperature regulation ; 6 support, cells / tissues ; 7 AVP ;	**3**	
3(b)(i)	**L** cell membrane ; **M** ribosome ;	**2**	
3(b)(ii)	*any two from:* cell wall ; circular DNA ; plasmid(s) ; AVP ;;	**2**	
3(b)(iii)	bacterium ;	**1**	
3(b)(iv)	*Vibrio* ;	**1**	
3(b)(v)	*any three from:* cholera produces a toxin that causes secretion of chloride ions, into, (small) intestine / gut **or** out of the small intestine cells ; causing osmotic movement of water into the, gut / (small) intestine **or** out of the (small intestine) cells ; causing diarrhoea / described ;	**3**	
3(b)(vi)	sticky ends ; (DNA) ligase ; recombinant ;	**3**	

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Question	Answer	Marks	Guidance
4(a)(i)	1 maternal and fetal blood are kept separate / AW ; *plus any three from:* 2 umbilical cord / placenta, transfers named substance, from mother / to fetus ; 3 umbilical cord / placenta, transfers named substance, from fetus / to mother ; 4 umbilical cord / placenta, transfers, antibodies / passive immunity, from mother / to fetus ; 5 placenta forms barrier to, toxins / pathogens ; 6 placenta secretes, progesterone / oestrogen ; 7 AVP ;	**4**	
4(a)(ii)	*any three from:* 1 protects, (fetus) against (mechanical) damage ; 2 regulation of temperature ; 3 allows fetus to move / allows muscle **or** bone development ; 4 protects fetus from infection / provides antibodies ; 5 allows lung development ; 6 sac produces amniotic fluid ; 7 AVP ;	**3**	
4(b)(i)	HIV / named STI ;	**1**	
4(b)(ii)	*any two from:* (named) barrier method of contraception / condom / femidom ; abstinence ; (regular) testing / screening ; education ; tracing sexual partners ; use of antibiotics ; vaccination ; AVP ;;	**2**	

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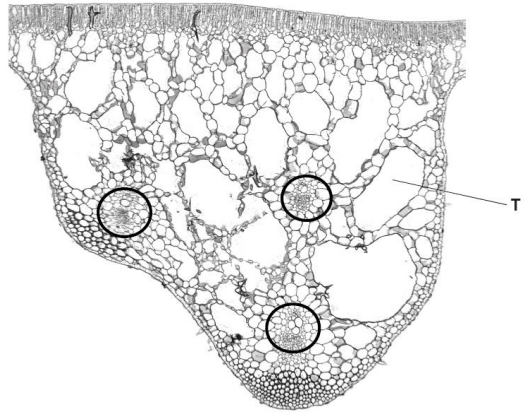
Question	Answer	Marks	Guidance
5(a)(i)	circle drawn around one vascular bundle ;	**1**	
5(a)(ii)	**X** drawn to identify palisade mesophyll tissue ;	**1**	
5(a)(iii)	chloroplasts ;	**1**	
5(a)(iv)	ref to xylem **and** phloem ; phloem responsible for, translocation / transport of sucrose **or** amino acids ; xylem transports, water / mineral ions ; xylem provides support ;	**4**	
5(b)(i)	hydrophyte ;	**1**	
5(b)(ii)	***T**:* air space ; *explanation:* creates buoyancy / decreases density, (of leaf) ;	**2**	

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Question	Answer	Marks	Guidance
5(b)(iii)	stomata on, upper epidermis / upper side of leaf ; allows gas exchange / AW ; **or** thin / no, cuticle ; no need to prevent water loss ; **or** AVP ;;	**2**	Explanation must be linked to correct description

Question	Answer	Marks	
6(a)(i)	*any two from:* *idea that* not all microplastics are able to be, collected / measured / weighed ; because the area is, (too) large / inaccessible / deep / undiscovered ; because some microplastics were eaten ; only samples were taken / described ;	**2**	
6(a)(ii)	750 (%) ;;	**2**	MP1: both figures identified from graph e.g. 1.7 **and** 0.2 (million tonnes) **or** difference found e.g. 1.5 (million tonnes) MP2: correct calculation e.g. 1.5 ÷ 0.2 x 100 = 750
6(b)(i)	(organism) makes its own (named organic) nutrients ; using energy from sunlight / through photosynthesis ;	**2**	

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Question	Answer	Marks	Guidance
6(b)(ii)	*any two from:* microplastics, can't breakdown / are non-biodegradable / can't be excreted ; (microplastic-containing) producers / phytoplankton, are eaten by fish (which are eaten by birds) ; AVP ;	**2**	
6(b)(iii)	*any three from:* monitoring species ; *idea of* protecting, habitat / nest sites ; education / awareness ; captive breeding programmes ; ban, hunting / poaching ;	**3**	
6(b)(iv)	*any three from:* 1 reduction in genetic variation ; 2 inbreeding ; 3 less chance of population adapting to a (named) change in the environment ; 4 increased chance of harmful recessive alleles being expressed / increase in genetic disease ; 5 extinction ; 6 *idea that* more difficult to find a mate ; 7 AVP ;	**3**	

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