Cambridge Assessment International Education

Cambridge O Level

BIOLOGY **5090/21**

Paper 2 Theory **October/November 2023**

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 October/November 2023 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 descriptors 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	‘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.

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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.

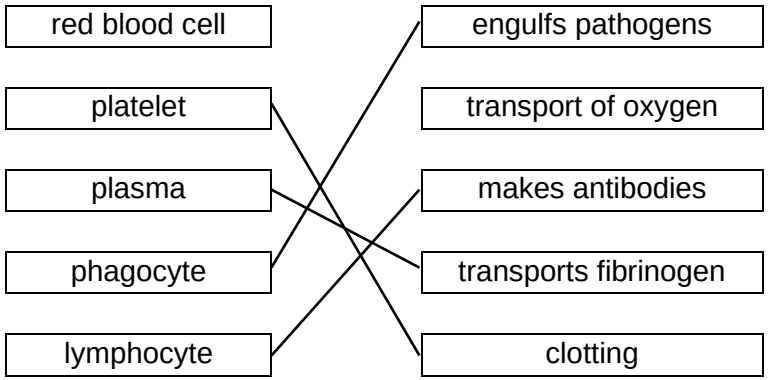
State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

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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)
Ig 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

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Question	Answer	Marks	Guidance
1(a)		**3**	all four correct = 3 marks three correct = 2 marks two correct = 1 mark
1(b)(i)	any **three** from: haemoglobin to bind with / carry / transport oxygen ; no nucleus so more room for haemoglobin ; small / flexible / elastic so can squeeze / fit along capillaries ; biconcave shape / large surface area for faster / rapid / more uptake / diffusion (of oxygen) ;	**3**	
1(b)(ii)	any **two** from: iron (in diet) ; anaemia / sickle cell anaemia ; pregnancy ; menstruation; accidental loss ; altitude ;	**2**	

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Question	Answer	Marks	Guidance
2(a)(i)	B = a fruit ; germination ;	**2**	
2(a)(ii)	*position:* at base / inside flower / at the base of the petals / near / at the ovary / anther / stigma ; *how it assists:* idea that the position of the insect allows pollen to be collected from anther / pollen to be deposited on stigma ;	**2**	
2(a)(iii)	any **three** from: male nucleus / nucleus of pollen grain / male gamete **+** fuses with female nucleus / egg (cell) / female gamete ; zygote forms / embryo develops ; ovule becomes a seed ; ovary becomes a fruit ;	**3**	
2(b)(i)	it stops insects from eating the plant **AW** ;	**1**	
2(b)(ii)	some areas / leaves / buds / seeds are more likely to be eaten / attacked; so that pollinators are not killed ;	**2**	
2(c)(i)	caffeine is a drug **+** adrenaline a hormone ; a drug / caffeine is taken in to body **+** affects chemical reactions / body functions / body actions ; a hormone / adrenaline is made in the body / by glands ;	**3**	**A** coffee for caffeine

Question	Answer	Marks	Guidance
2(c)(ii)	any **two** from: increased heart rate ; increased blood pressure ; increased sugar / glucose in bloodstream ; more blood to muscles ; dilates pupils ; dilation of bronchioles ; increased breathing rate ; (mental) alertness **AW** ;	**2**	

Question	Answer	Marks	Guidance
3(a)(i)	93.0 ; ;	**2**	**A** 65, 18.5 & 9.5 for 1 mark
3(a)(ii)	carbohydrates ; fats / lipids ;	**2**	
3(b)(i)	any **three** from: solvent ; named dissolved substance ; cytoplasm is mostly water ; in blood / plasma **+** transport ; in urine **+** excretion ; in sweat **or** evaporation cools body ;	**3**	

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Question	Answer	Marks	Guidance
3(b)(ii)	any **three** from: water enters **+** osmosis ; higher water potential in water / lower water potential in tissue / cells ; across selectively / partially / differentially / semi permeable membrane ; cell swells up / expands / cytoplasm volume increases ; bursts due to lack of a cell wall ;	**3**	
3(c)	muscle ; protein ;	**2**	

Question	Answer	Marks	Guidance
4(a)(i)	any **four** from: impulse in sensory neurone ; passes to CNS / brain ; relay neurone ; motor neurone to effector / muscle ; contraction of muscle closes eyelid ;	**4**	
4(a)(ii)	expelled air contains pathogen / bacteria / viruses ; breathed in by another person / lands on another person / taken in from contaminated surfaces ;	**2**	
4(b)(i)	discontinuous ; only two phenotypes / sneeze or don't sneeze / no intermediates / caused by genes only ;	**2**	

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Question	Answer	Marks	Guidance
4(b)(ii)	dominant: always expressed **AW** ; allele: alternative form of a gene / variation of a gene **AW** ;	**2**	

Question	Answer	Marks	Guidance
5(a)(i)	molar / premolar ;	**1**	
5(a)(ii)	enamel ;	**1**	**Ig** crown
5(a)(iii)	any **two** from: tooth: physical digestion ; grinds / breaks up food into smaller pieces / larger surface area ridged surface / hard-wearing surface ; any **two** from: salivary gland: chemical digestion ; produces amylase / enzyme ; starch broken down to maltose ;	**4**	
5(b)(i)	hydrochloric acid ; optimum / best acidity / correct pH **+** enzyme action ; pepsin / protease ; protein broken down to polypeptides / peptides / amino acids;	**4**	**Ig** references to killing bacteria
5(b)(ii)	in the blood / bloodstream / plasma ;	**1**	

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Question	Answer	Marks	Guidance
6(a)(i)	DNA / deoxyribonucleic acid ;	**1**	
6(a)(ii)	any three from: two / double strands ; double helix ; made of nucleotides ; strands held together by bonds between the bases ; complementary bases / A – T and C – G ; made from elements C, H, O, N, P ;	**3**	**A** sugar phosphate backbone
6(b)	in nucleus in animal cells **+** in cytoplasm in bacterial cells ; linear / straight / ribbon / strand / AW in animal cells + circular in bacterial cells ;	**2**	
6(c)	any **three** from: contains genes ; codes / controls for proteins / polypeptides ; by the order of bases / nucleotides ; example of protein e.g. enzyme / haemoglobin / antibody ;	**3**	

Question	Answer	Marks	Guidance
7(a)(i)	mitochondria / mitochondrion ;	**1**	
7(a)(ii)	$C_6H_{12}O_6 + 6O_2$; $6H_2O + 6CO_2$;	**2**	**A** correct word equation for max 1 mark **Ig** any reference to energy or ATP
7(b)	heavy rain ; soil waterlogged / **AW +** no air spaces / oxygen available ;	**2**	

Question	Answer	Marks	Guidance
8(a)	any **six** from: 1 tiger population declining and human population increasing ; 2 correct reference to birth / reproduction rate and death rate for either humans or tigers ; 3 reference to less disease / medical advances for humans; 4 reference to tigers killed / hunted / poached by humans ; 5 reference to less habitat available for tigers ; reasons for link 6 reason for less tiger habitat e.g. destruction of habitat due to human demand for food / building roads / houses / agriculture 7 reason for humans killing tigers e.g. medicines, trophies, predation of farm animals, fur, protection ;	**6**	
8(b)	1 conservation / prevent extinction AW ; 2 biodiversity / number of different species that live in an area plus maximum of three from: 3 protecting areas / habitats / reducing habitat destruction / production of reserves / game parks ; 4 legal restrictions / laws on hunting / poaching ; 5 education / increasing awareness AW ; 6 reference to breeding programmes ;	**4**	

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