Cambridge Assessment International Education

Cambridge O Level

BIOLOGY **5090/21**

Paper 2 Theory **May/June 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.

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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.

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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.

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)	a chemical / substance produced / released by a gland ;	**1**	
	carried by blood ;	**1**	
	alters activity of an organ ;	**1**	**A** affects target organs
1(b)	B ;	**1**	
	D and E ;	**1**	
	A and F ;	**1**	
	E ;	**1**	**Ig** D

Question	Answer	Marks	Guidance
2(a)(i)	*first column:* arthropod, vertebrate, vertebrate ;	**1**	
	second column: scorpion = arachnid ;	**1**	
	snake = reptile ;	**1**	
	third column: scorpion: 8 legs / 4 pairs of legs ;	**1**	**A** two parts to the body
	meerkat = hair / fur ;	**1**	
	snake = scales ;	**1**	

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Question	Answer	Marks	Guidance
2(a)(ii)	any **four** from: numbers of snakes decreases ; less food available for them ; eagles consuming more of them as fewer meerkats available ; number of beetles increases ; reduced predation **AW** ; **Max 4**	**4**	
2(a)(iii)	any **two** from: dry / high temperature / harsh environmental conditions ; low numbers / small mass / low cover **+** plant/producers ; plants / animals find it difficult to gain sufficient water / difficult not to lose too much water ; **Max 2**	**2**	**Ig** reference to nutrient level of the soil
2(b)	any **three** from: keep warm at night ; shelter from high midday temperatures / sunlight / provide shade ; can hide from predators ; safe place to give birth / shelter young ; **Max 3**	**3**	**A** shelter from sandstorms **Ig** references to location of their food

Question	Answer	Marks	Guidance
3(a)	any **two** from: cell at Y has chloroplasts / cell at X has no chloroplasts ; cell at Y has a (sap) vacuole / cell at X has no vacuole ; cell at Y has more cytoplasm / cell at X has less cytoplasm ; **Max 2**	**2**	

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Question	Answer	Marks	Guidance
3(b)	any **three** from: osmosis ; (movement of water molecules) from high to low water potential ; water source, e.g. soil / surrounding cells across a partially / selectively permeable (cell) membrane ; increases volume of sap / cytoplasm ; until equilibrium reached / no net movement / pressure from cell wall prevents further expansion ; **Max 3**	**3**	 **A** down a water potential gradient References to concentration must specify solute or water **A** xylem
3(c)	phototropism ;	**1**	
	any **four** from: auxin produced in shoot tip / cells at X ; diffuses down stem / shoot ; more on shaded side / less on side exposed to light ; promotes / stimulates **AW** + cell elongation ; cells on shaded side elongate more than those on light side ; bends/grows towards light ; **Max 4**	**4**	 **R** auxin destroyed on light side **Ig** uneven distribution unless qualified **Ig** moves towards the light

Question	Answer	Marks	Guidance
3(d)	24 ;	**1**	
	cells at X dividing by <u>mitosis</u> ;	**1**	**A** references to the production of genetically identical cells / cells at Y are not gametes

Question	Answer	Marks	Guidance
4(a)(i)	any **four** from: protein to build muscles ; iron for haemoglobin / red blood cells ; transport of oxygen ; fats / sugars for energy ; respiration ; enhanced performance of muscles **AW** ; **Max 4**	**4**	
4(a)(ii)	25 (g) ;;	**2**	100 ÷ 12 = 1 mark (suitable working)
4(b)	any **five** from: pepsin / protease ; in stomach ; trypsin ; in duodenum / small intestine ; breaks down / digests to peptides / amino acids ; amino acids absorbed ; **Max 5**	**5**	

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Question	Answer	Marks	Guidance
5(a)(i)	any **four** from: light is refracted / bent by cornea ; ciliary muscles / body contract ; suspensory ligaments become slack ; lens becomes fatter **AW** ; light refracted / bent (more) by lens ; light / image focused / formed on retina; **Max 4**	**4**	
5(a)(ii)	lens bends / refracts light rays too much so they meet before retina / drawn on diagram ;	**1**	Mark written answer first On the diagram light rays must clearly cross before the retina
5(b)(i)	any **three** from: prevalence of myopia has increased ; in both males and females / in all age groups; increased most in 25–34 age group / older people / females ; correct quote of comparative data ; **Max 3**	**3**	
5(b)(ii)	less time spent outdoors / reference to more time spent on activities looking at near objects/computers/mobile phones ;	**1**	
	eyes not trained / not enough practice at looking at far away objects ;	**1**	
5(c)	blue-eyed person has two recessive alleles / would be bb ; blue-eyed person is homozygous / both alleles are the same ; heterozygous means the alleles are different / heterozygous would be Bb; B is dominant / Bb would have brown eyes ; **Max 3**	**3**	

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Question	Answer	Marks	Guidance
6(a)(i)	left ventricle ;	**1**	
6(a)(ii)	closing of valves ;	**1**	**A** opening and closing of valves
6(a)(iii)	hepatic artery ;	**1**	
6(a)(iv)	named substance transported ;	**1**	**A** blood clotting
6(b)	any **three** from: antibodies produced by white blood cells / internally / by the body ; antibiotics are drugs / medicines (that are administered) ; antibodies produced in response to an antigen / bind with an antigen ; antibodies are more specific than antibiotics ; antibodies affect viruses, antibiotics do not ; **Max 3**	**3**	 **A** produced externally/in a lab/in a fermenter **A** antibodies are proteins, antibiotics are not
6(c)	any **five** from: variation within a population ; mutation produces resistant bacteria ; antibiotic kills many bacteria / some survive antibiotic ; survivors reproduce ; pass on alleles to next generation ; repeated over many generations ; higher proportion of bacteria in population can resist antibiotics; misuse / over-prescription increases chances ; **AVP** ; **Max 5**	**5**	 e.g. short-generation time of bacteria

Question	Answer	Marks	Guidance
7(a)	any **five** from: carbon dioxide in atmosphere absorbed by producers / plants / chloroplasts / chlorophyll ; photosynthesis ; production of carbohydrates / glucose ; used to make other organic substances / named example ; eaten by / transferred to animals ; respiration ; releases carbon dioxide ; **Max 5**	**5**	
7(b)	*burning* max **two** from: releases carbon dioxide ; greenhouse gas / global warming / greenhouse effect ; climate change / example of change ; *made into objects* max **two** from: object acts as a carbon store / locks up carbon ; tree removed from ecosystem so nutrients removed **AW** ; *left in ecosystem* max **two** from: fed on by decomposers / fungi / bacteria / decomposed; nutrients returned to soil ; respiration of decomposers releases carbon dioxide gradually ; dead trees / logs act as a habitat ; **Max 5**	**5**	

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