CAMBRIDGE
International Education

Cambridge O Level

BIOLOGY **5090/21**

Paper 2 Theory **October/November 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.

Cambridge International is publishing the mark schemes for the October/November 2024 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.

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)
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

Question	Answer	Marks	Guidance
1(a)(i)	transpiration ;	**1**	
1(a)(ii)	prevent water loss / evaporation of water;	**1**	
1(a)(iii)	measure mass / volume at start **+** at end / after 24 hours ; subtract end value from start value / calculate difference ;	**2**	
1(b)	any **three** in correct sequence from: root hair (cell) ; (root) cortex (cell) ; xylem (vessel element) ; palisade / spongy / mesophyll (cell) ;	**3**	
1(c)(i)	line that is at its highest at a low humidity and at its lowest at a high humidity ;	**1**	
1(c)(ii)	the lower the humidity, the higher the rate of water loss **AW** ; water is lost by diffusion ; when humidity is low, the concentration of water outside will be lower than inside the leaf / atmosphere would not be saturated with water ;	**3**	

Question	Answer	Marks	Guidance
2(a)	maltose ; product / what is produced when maltose is broken down ; active site ; *idea that* maltase only acts on maltose ;	**4**	
2(b)	any **two** from: not much / no maltose in blood / blood contains glucose / blood does not contain starch **AW** ; maltase not released / produced ; do not waste energy producing an unnecessary enzyme ; mutation / evolution ; does not have a functional gene for maltase ;	**2**	

Question	Answer	Marks	Guidance
3(a)	**A** = brain ; **B** = spinal cord ;	**2**	
3(b)(i)	**R** pointing to the hand ; **E** pointing to muscle ;	**2**	

Question	Answer	Marks	Guidance
3(b)(ii)	*sensory neurone* *idea that* a sensory neurone receives impulses / is stimulated by the receptor ; carries impulses to spinal cord / CNS ; *relay neurone* carries impulses from sensory neurone ; to motor neurone ; *motor neurone* carries impulses from relay neurone / spinal cord / CNS ; to the effector / muscle ;	**4**	no neurones named = no marks if more than **two** neurones described, mark best **two** named neurones
3(c)(i)	adrenal (gland) ;	**1**	
3(c)(ii)	any **two** from: produces a hormone / adrenaline ; travels in blood ; prepares the body for action / prepares body for increased activity ;	**2**	

Question	Answer	Marks	Guidance
4(a)(i)	any **two** from: removal **+** waste products / **AW** ; removal **+** toxic materials ; removal **+** substances made by the body / metabolism ;	**2**	
4(a)(ii)	<u>respiration</u> ; breathed out / exhaled / removed at the lungs / alveoli ;	**2**	

Question	Answer	Marks	Guidance
4(b)	*animals* activities vary / example given ; so more respiration at some times ; *plants* respiration **+** constant / ongoing ; daylight **+** photosynthesis **AW** ; carbon dioxide used for photosynthesis ;	**4**	max **two** marks for plants
4(c)	any **two** from: acts as a greenhouse gas ; traps thermal / heat energy / global warming ; climate change / specific effect on land or organisms ;	**2**	

Question	Answer	Marks	Guidance
5(a)(i)	any **four** from: cotyledons ; food / energy / starch **+** storage / for germination ; embryo **+** grows into new plant ; radicle **+** grows into root / absorbs water ; plumule **+** grows into shoot / stem / for photosynthesis ;	**4**	
5(a)(ii)	add ethanol ; then add to water **+** white emulsion forms / turns white/cloudy/milky ;	**2**	

Question	Answer	Marks	Guidance
5(b)(i)	*advantage* increases seed dispersal ; *disadvantage* requires more photosynthesis / lipid synthesis / energy / nutrients (to make lipid body) ;	**2**	
5(b)(ii)	any **three** from: *idea that* ant species A / A & C / C (most) useful ; data quoted ; ant species B / D / E is not useful ; as dispersal relies on whole seed being removed, not just oil body ;	**3**	
5(b)(iii)	fatty acids **+** glycerol ;	**1**	
5(c)(i)	insect ;	**1**	
5(c)(ii)	any **two** from: three pairs / 6 legs ; legs attached to thorax ; three sections to body / head, thorax and abdomen ; one pair / 2 antennae ;	**2**	

Question	Answer	Marks	Guidance
6(a)	*primary consumer:* Nile tilapia / prawns / zooplankton ; *secondary + tertiary consumer:* young Nile perch / Nile perch / humans ;	**2**	

Question	Answer	Marks	Guidance
6(b)	Nile perch ; highest number of links in food chain / quaternary / tertiary consumer / fifth / fourth trophic level **+** more / lots of energy is lost to the environment / energy is lost in respiration / heat / excretion / egestion / uneaten parts ;	**2**	
6(c)(i)	decrease / death of **+** (African fish) eagles ; increase **+** photosynthesising organisms ; more **+** any other organisms in web ;	**3**	
6(c)(ii)	education ; explanation ; closed seasons ; explanation ; protected areas ; explanation ; controlled net types / mesh size ; explanation ; monitoring / enforcement ; explanation ; quotas / limiting the amount of fish taken ; explanation ;	**5**	max. **three** marks for methods without explanations

Question	Answer	Marks	Guidance
6(d)	max **three** from: *similarities* both have a heart to act as a pump ; one way flow of blood / valves in heart ; large surface area for gas exchange ; respiratory surfaces have rich blood supply ; max **three** from: *differences* humans 4 chambers **+** fish have 2 chambers to heart ; humans have a double circulation **+** fish a single circulation ; human blood passes through heart twice **+** during a single circulation but fish only once ; lungs / alveoli in humans but gills in fish ;	**5**	

Question	Answer	Marks	Guidance
7(a)	any **seven** from: 1 pathogens **+** specific **+** chemicals / proteins ; 2 antigens ; 3 lymphocytes ; 4 production of antibodies ; 5 antibodies complementary to antigens **AW** ; 6 bind ; 7 *idea of* direct destruction of pathogen ; 8 mark / clump together for destruction / engulfing by phagocytes ; 9 memory cells produced / made ; 10 rapid / increased antibody production / action on next infection ;	**7**	
7(b)	any **three** from: numbers of lymphocytes / ability to produce antibodies ; HIV infection ; age ; sex ; genetics ; diet ; previous exposure to pathogen / immunity / vaccination / immunisation ;	**3**	