Cambridge Assessment International Education

Cambridge O Level

BIOLOGY **5090/21**

Paper 2 Theory **October/November 2021**

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 2021 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.

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	<u>Calculation specific guidance</u> 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	<u>Guidance for chemical equations</u> 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)	*clockwise from right hand side:* trachea / windpipe ;	**1**	**Allow** cartilage
	bronchiole ;	**1**	
	larynx / voice box ;	**1**	
1(b)	*any **three** from:* gaseous / gas exchange ; oxygen in **+** carbon dioxide out **AW** ; oxygen for respiration / carbon dioxide from respiration ; energy from respiration used for movement / relevant activity ; needs a large surface area / moist surface / blood capillaries close to air / thin membrane ;	**3**	

Question	Answer	Marks	Guidance
2(a)	*any **three** from:* light (energy) absorbed / captured **AW** ; chlorophyll / chloroplasts ; water **+** carbon dioxide are needed **AW** ; glucose / carbohydrate / sugar / starch produced ; oxygen produced ;	**3**	
2(b)(i)	*any **three** from:* more / optimum **+** growth / tomatoes / yield / photosynthesis ; higher / optimum temperature / glass traps heat ; for enzymes ; protects from bad weather / example ; protects from insect / pests / plant pathogens ; carbon dioxide / light intensity / wavelength **+** controlled ;	**3**	

Question	Answer	Marks	Guidance
2(b)(ii)	*any **one** from:* have to water / no rain ; increase **+** pathogens / disease ; pollination may be difficult ;	**1**	
2(c)(i)	at P increase light intensity **+** up (photosynthesis / rate / gradient) ; at Q increase in light intensity **+** no change (photosynthesis / rate / gradient);	**2**	
2(c)(ii)	*any **one** from:* carbon dioxide ; temperature ; water / precipitation ;	**1**	

Question	Answer	Marks	Guidance
3(a)(i)	*any **two** from:* (homeostasis is) the maintenance of a constant ; internal environment / temperature ; return to norm / return to set-point / negative feedback ; evaporation of sweat removes heat / thermal energy / cools / decreases temperature ;	**2**	
3(a)(ii)	*any **four** from:* receptors **+** detection of temperature ; impulse to brain / CNS ; vasodilation ; arterioles / blood vessels widen ; increase in blood **+** near skin surface ; greater **+** loss of heat / thermal energy ; by radiation ;	**4**	
3(b)	liver ;	**1**	

Question	Answer	Marks	Guidance
3(c)(i)	*any **four** from:* less urea in blood plasma ; more sodium in blood plasma ; less chloride in blood plasma ; comparative data quote with units ; data manipulation, e.g. 50 × higher urea in urine than blood plasma ;	**4**	
3(c)(ii)	high(er) / over 22 (in patient) ; reduced filtration / reduced removal of urea (from kidney) ; reference to blood plasma ;	**3**	

Question	Answer	Marks	Guidance
4(a)(i)	kapok / tree **+** insect **+** frog / bird ; arrow in correct direction from kapok / tree / leaves / plant at start ;	**2**	
4(a)(ii)	*any **three** from:* gets light / reduced **+** competition for light ; photosynthesis ; exposed to wind ; for seed dispersal ; easier for bats to find flowers ;	**3**	
4(a)(iii)	*any **three** from:* decomposition / decay / decomposers / break down (organic matter) ; use of enzymes ; carbon / nitrogen / nutrients **+** recycled / returned to soil ; carbon / nitrogen / named nutrient used by plants ;	**3**	
4(b)(i)	starch / cellulose / chlorophyll / sucrose ;	**1**	

Question	Answer	Marks	Guidance
4(b)(ii)	*any **two** from:* releases carbon dioxide / carbon dioxide into the atmosphere ; greenhouse gas ; traps thermal energy / causes temperature to increase ; removal of carbon sink **AW** ;	**2**	

Question	Answer	Marks	Guidance
5(a)	*any **four** from:* increases / in first hour **+** absorption / enters blood ; in stomach/small intestine / duodenum /ileum ; hepatic portal vein ; liver ; decrease in alcohol **+** break down / excretion / sweat / urine ; using an enzyme ;	**4**	
5(b)	*any **two** differences:* gender ; weight / mass / size ; how much eaten/different rate of absorption ; age ; different **+** ability to break down alcohol / health of liver / metabolism kidney efficiency ;	**2**	
5(c)	*any **three** from:* negative effect on reaction time / responses ; depressant ; blurred vision ; slurred speech ; reduced coordination / balance / dizziness ; description of cognitive ability impairment ;	**3**	e.g. loss of judgement, false courage, antisocial behaviour, increased aggression, drowsiness

Question	Answer	Marks	Guidance
6(a)	*any **five** from:* enzyme **+** name, e.g. amylase ; substrate **+** name, e.g. amylose/starch ; enzyme **+** has an active site ; specificity of enzyme **AW** ; substrate fits into active site / enzyme-substrate complex formed ; named product formed ; enzyme unchanged at end of reaction ;	**5**	
6(b)	*any **five** from:* growth / new cells ; repair ; energy in absence of carbohydrates/fats ; muscle ; hair / nails / skin ; hormones ; enzymes ; antibodies ; named protein, e.g. haemoglobin, fibrinogen ; cell membrane / carrier protein ; blood clotting ;	**5**	

Question	Answer	Marks	Guidance
7(a)	*any **six** from:* chromosomes ; DNA / genetic material ; genes / alleles ; code **AW +** for proteins ; proteins determine characteristics ; meiosis / meiotic division ; reduction division / produces haploid cells / produces gametes **AW** ; fertilisation / fertilisation described ; combination/mix **+** of genetic material / genes / chromosomes / DNA / characteristics ;	**6**	
7(b)	*any **four** from:* increases the chance / probability of; mutation ; change in chromosome number ; change in gene structure / sequence ; codes for new/different/incorrect protein ; may result in new beneficial variation ; may result in genetic disease / example of genetic condition ;	**4**	

Question	Answer	Marks	Guidance
8(a)	*any **six** from:* *similarities* both carried in tubes ; one way movement ; both travel between cells by osmosis ; *differences* <u>plants</u> from soil / root ; in xylem ; detail of xylem vessel, e.g. no end-walls, lignin ; Transpiration ; detail of mechanism, e.g. cohesion / adhesion / continuous water column ; lost through evaporation ; <u>human</u> by ingestion / alimentary canal part; in blood vessels ; detail of blood vessel, e.g. muscular walls elastic walls of artery ; heart pumps ; detail of mechanism, e.g. heart muscles contract, elastic tissue allows pulsing of blood ; lost through sweating / urination **AW** ;	**6**	
8(b)	*any **four** from:* magnesium **+** for chlorophyll ; iron **+** haemoglobin / blood ; calcium **+** bones ; calcium **+** cell walls ; deficiency in plants, e.g. yellow leaves ; deficiency in animals, e.g. rickets, anaemia ; idea that have different cell types / structures / physiology in organism ; produce **+** different chemicals / chemicals in different proportions ;	**4**	

Question	Answer	Marks	Guidance
9(a)	*any **six** from:* *similarities* both gametes ; haploid / half chromosome number of body cell / produced by meiosis ; fuses with egg / fertilisation / to produce zygote ; *differences* sperm cell has flagellum / tail **+** move ; enzymes / acrosome **+** to penetrate egg ; wind pollination / carried by wind / insect pollination / carried by insect ; small / light / 'sticky' / sculptured coat ; pollen tube **+** to reach egg / ovule / ovary ;	**6**	
9(b)	*any **four** from:* sexual reproduction **+** genetically different offspring ; sexual reproduction **+** variation ; asexual reproduction **+** genetically identical offspring/clones ; reference to mitosis / meiosis ; condition that affects survival, e.g. disease / temperature / water availability ; some individuals will survive changing environmental condition ; live in wider range of environments ;	**4**	