Cambridge Assessment International Education

Cambridge O Level

BIOLOGY **5090/21**

Paper 2 Theory **October/November 2020**

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 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **12** printed pages.

© UCLES 2020

PUBLISHED

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.

© UCLES 2020

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.

© UCLES 2020

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

© UCLES 2020

Question	Answer	Marks	Guidance
1(a)(i)	**A** oesophagus / gullet **;** **B** duodenum / ileum / small intestine **;** **C** colon / large intestine **;** **D** rectum **;**	**4**	
1(a)(ii)	colon / large intestine / **C ;**	**1**	
1(b)(i)	protein **;** *explanation:* pepsin / protease / acid / muscular stomach mixing contents / mechanical digestion / chemical digestion **;**	**2**	
1(b)(ii)	stomach smaller **AW ;** stomach holds less food **;** reduced appetite / not hungry / feels full **AW ;** food **+** less eaten / less digestion / less absorption / lower intake of energy **;** energy used greater than energy taken in **;**	**3**	

Question	Answer	Marks	Guidance
2(a)	photosynthesis ; green / plant **+** chlorophyll / chloroplasts ;	**2**	
2(b)	*algae benefit:* gain carbon dioxide ; protected / sheltered / habitat ; *coral benefit:* gain oxygen ; corals feed on **+** glucose / carbohydrate / protein / food **+** produced by algae ; *algae or coral:* respiration **+** gas produced or required ; photosynthesis **+** gas produced or required ;	**5**	
2(c)	coral dies / killed / decreases / extinction **AW** ; algae die / killed / decrease / extinction **AW** ; algae no longer **+** protected / cells to live in / get CO_2 ; coral / algae decompose ;	**3**	

Question	Answer	Marks	Guidance
3(a)	(CO_2) 0.03–0.04 ; (O_2) 20–21 ; (N_2) 78–80 ;	**3**	
3(b)(i)	oxides of nitrogen / of sulfur / carbon monoxide ;	**1**	

Question	Answer	Marks	Guidance
3(b)(ii)	human activity, e.g. power station / factories / manufacturing / cars / machines **;** fossil fuels / named fossil fuel **;** burnt / combustion **;**	**3**	**Ig** industries / industry (as in stem of question) **A** incomplete combustion
3(c)	air / water **+** pollution / contamination **;** less food for animals / fewer types of food for animals **;** deforestation / roads / buildings **+** reduced habitat **AW ;** disposal of wastes **;** named waste, e.g. mercury **;** acid rain **AW ;**	**4**	

Question	Answer	Marks	Guidance
4(a)	cancer **;** emphysema **OR** air sacs / alveoli **+** effect **;** chronic obstructive pulmonary disorder (COPD) **;** bronchitis / inflammation of bronchi / irritates lungs / destroy cilia / cilia stop moving **;**	**2**	
4(b)(i)	carbon monoxide **;** less O_2 **AW +** blood / red blood cells / haemoglobin / to body part **;** fetus **+** impaired growth / development / underweight **;** nicotine **;** increases the desire to smoke / addictive **;** heart disease **AW ;** stroke / increased blood pressure / constricts arteries **;**	**4**	*each harmful effect has to relate to the chemical stated*

© UCLES 2020

Question	Answer	Marks	Guidance
4(b)(ii)	inhaled / enters lungs **AW ;** diffuse **;** alveoli / alveolus **;** into blood **;** placenta **;** umbilical cord / umbilical vein **;**	**4**	

Question	Answer	Marks	Guidance
5(a)	water **;**	**1**	
5(b)	**(E)** sucrose **;** **(F)** partially permeable membrane **AW ;** **(G)** water **;**	**3**	
5(c)	movement of solvent / water / **G ;** water **+** from high to low water potential / **G** concentration **OR** water **+** from dilute to concentrated sucrose / **E** solution **OR** water **+** down its concentration gradient **AW ;** water / **G + ;** to left / from right **;** through partially permeable membrane / **F ;** sucrose / solute / **E** too large **OR** water / **G** small enough to pass through **;** diffusion **+** water **G ;** stops at equilibrium / concentration same on both sides **AW ;**	**5**	**A** selectively permeable membrane / Visking tubing / dialysis tubing

Question	Answer	Marks	Guidance
6(a)	*aorta 4 max:* oxygenated blood **;** from left ventricle **+** to rest of body **;** thick walls **;** elastic **+** muscle **;** elastic recoil **OR** lumen can stretch **AW ;** high **+** pressure **;** valve **+** prevent blood returning to heart **AW ;** *vena cava 4 max:* deoxygenated blood **;** from the body / head **+** to the right atrium **;** thin walls **;** wide lumen **;** low **+** pressure **;** valves **+** to prevent backflow / one way flow **;**	**7**	*maximum of 4 marks for either section*
6(b)	mixing / non-separation **+** oxy- and deoxygenated blood **;** more oxygen in blood sent to the lungs **;** less oxygen in blood sent to body / organs / tissues / cells **AW ;** reduced (aerobic) respiration / reduced energy / more anaerobic respiration / more lactic acid **;** heart beats faster / harder **+** to meet oxygen demand **;** (blood) pressure reduced **;**	**3**	

© UCLES 2020

Question	Answer	Marks	Guidance
7(a)	light energy **+** transferred to chemical energy **;** (in) plants / producers **;** during photosynthesis **;** produce **+** glucose / sucrose / sugar / starch / carbohydrates / fats / proteins **;** food / energy from plant to herbivore or named example **;** food / energy from herbivore to lion **AW ;** absorption **+** named solute **;** respiration **;** energy from respiration **+** contraction / for muscles **;**	**7**	
7(b)	less energy / fossil fuels **+** used in recycling (than in manufacture) **AW ;** fossil fuels / resources **+** finite / running out / need conserving **AW ;** reduce pollution / reduce waste **+** environment / landfill / being burnt **ORA ;** plastics / some materials **+** don't biodegrade / decompose **;** example of an effect **+** specified waste **;**	**3**	**A** reduces global warming caused by manufacturing **A** take a long time to break down, difficult to decompose

Question	Answer	Marks	Guidance
8(a)	mitosis ; only one parent ; all cells / organisms produced are genetically identical / clones ; artificial selection / under human control ; reproduces selected / desirable features or example ; can be done throughout year / in different seasons ; no need to rely on pollinators ; fast **+** reason, e.g. no waiting for seeds to form / germinate / grow ;	**5**	**A** no gametes required
8(b)	bees are pollinators ; reduced yields / fewer seeds ; fewer offspring / plants produced ; less plants for herbivores / first trophic level ; fewer bees **+** effect on consumers / food chains / webs / ecosystems / biodiversity ; reduced honey production ;	**5**	**A** fewer plants reproduce

Question	Answer	Marks	Guidance
9(a)	change in gene / change in DNA ; change in chromosome number ; sickle-cell anaemia **+** change in gene ; Down's syndrome **+** increase in chromosome number / 47 chromosomes ; radiation ; chemicals / example ;	**5**	maximum of 1 mark for 2 examples alone, or if incorrectly linked to mutation

Question	Answer	Marks	Guidance
9(b)	farmer does not need to keep male animals **;** promotes cross-breeding / prevents inbreeding **;** sperm transported from anywhere / far away **;** artificial selection / selective breeding **;** desirable features / characteristics **;** increased chances of successful fertilisation **AW ;** quicker / easier / more convenient **;** economic benefit **+** explanation **;**	**5**	

© UCLES 2020