Cambridge Assessment International Education

Cambridge O Level

BIOLOGY **5090/22**

Paper 2 Theory **October/November 2022**

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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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.

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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.

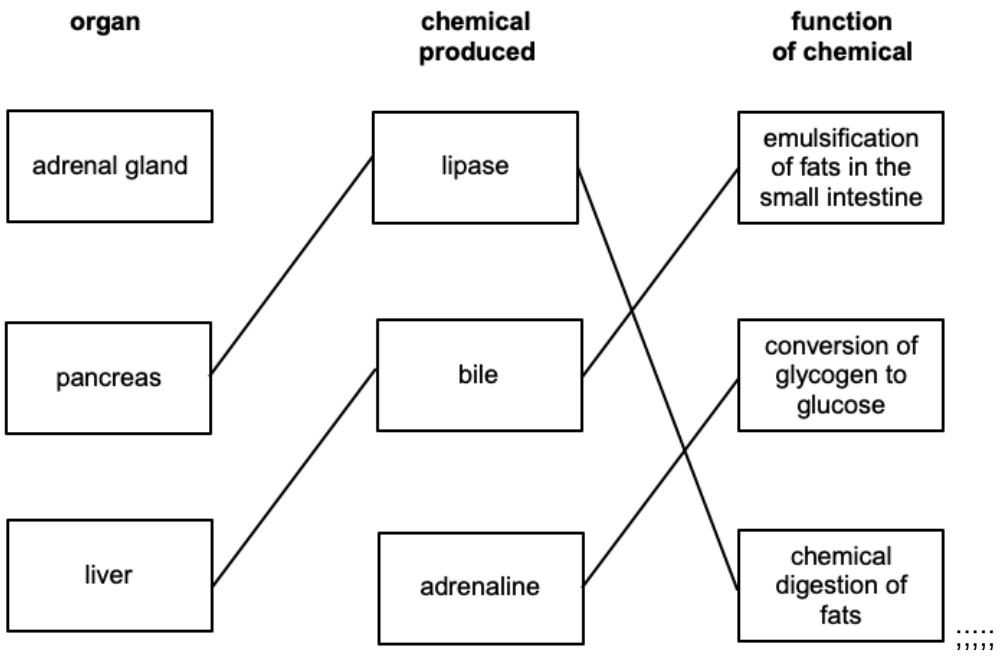
State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

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MARK SCHEME ABBREVIATIONS

;	separates marking points
/ and **OR**	indicate alternatives within a marking point
()	the contents of brackets are **not required**
Reject	guidance for examiners concerning a point to reject
Allow	guidance for examiners concerning a point to accept
Ignore	guidance for examiners concerning a point to ignore
AW	allow alternative wording to that specified on the mark scheme
ORA	or reverse argument – i.e. the reverse argument may be accepted annotation in RM = 0
underline	the word(s) underlined must be used by candidate for the award of the mark (allow grammatical variants)
ecf	allow error carried forward
max	dictates the maximum number of marks that can be awarded
+	a statement from **both** sides of the **+** is required for that mark

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Question	Answer	Marks	Guidance
1	one mark for each correct line  ;;;;;	**5**	

Question	Answer	Marks	Guidance
2(a)(i)	tissue / mesophyll ;	**1**	**Ignore** spongy / palisade / cells
2(a)(ii)	chloroplast drawn **+** labelled **+** correct position ;	**1**	
	any three drawn + labelled + correct position: nucleus **+** larger than chloroplast if present ; nucleolus / nuclear membrane ; cell membrane ; cytoplasm / protoplasm ; sap / vacuole ; tonoplast ;	**3**	
2(a)(iii)	guard cell **+** label line ends inside / touching guard cell ;	**1**	
2(b)(i)	cellulose ;	**1**	**Reject** cellulase
2(b)(ii)	**1** down water potential gradient **AW** ; **2** water into cell / vacuole ; **3** osmosis / diffusion ; **4** increase **+** size / pressure **AW** ; **5** burst / rupture ; **6** no cell wall to stop rupturing **AW** ;	**4**	

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Question	Answer	Marks	Guidance
3(a)(i)	bacterium / bacteria ;	**1**	
3(a)(ii)	binary fission / mitosis ;	**1**	**Ignore** asexual reproduction
3(a)(iii)	lactic / lactate ;	**1**	
3(a)(iv)	increasing from Y axis and increasing as crosses lactose line ; level off at 40 hours and then constant to 48 hours ;	**2**	
3(b)(i)	**1** mutation; **2** change **+** allele / gene / base sequence / DNA ; **3** genetic material **AW** **+** codes **+** for enzyme / lactase **/** protein ; **4** active site **+** doesn't fit substrate / lactose **AW** ;	**3**	
3(b)(ii)	bones / prevention of rickets ; teeth ; growth / energy ; vitamin D / calcium / protein / fat ;	**2**	

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Question	Answer	Marks	Guidance
4(a)	aorta ; pulmonary vein ;	**2**	
4(b)(i)	'**X**' used to indicate valve at base of aorta ;	**1**	
4(b)(ii)	**1** valve **+** not open / close **+** fully / properly **AW** ; **2** ventricle contracts **+** valve opens (not fully) ; **3** contracts **+** less blood through valve ; **4** ventricle relaxes **+** valve closes (not fully) ; **5** relaxes **+** backflow of blood / blood back to ventricle ;	**4**	
4(b)(iii)	**1** less ability to exercise / get tired / (muscle) fatigue **AW** ; **2** less / little **AW** + oxygen / oxygenated blood ; **3** to muscle ; **4** less / little **+** aerobic respiration ; **5** less / little **+** energy released ; **6** anaerobic respiration ; **7** lactic acid ;	**3**	
4(c)	**1** antigen / protein ; **2** (antigen / protein) **+** removed / blocked / coated **OR** cells / antigens made same as human tissue ; **3** no recognition **AW** ; **4** white blood cells / lymphocytes / phagocytes ; **5** reduced **+** immune response ; **6** less **+** antibodies / phagocytosis **AW** ;	**4**	

Question	Answer	Marks	Guidance
5(a)	**1** transport **AW** ; **2** processing **AW** ; **3** refrigeration ; **4** packaging **AW** ; **5** cooking **AW** ; **6** waste food / disposal of low-quality food / decomposition / respiration **AW** ; **7** burning / combustion ; **8** fuel ;	**3**	
5(b)(i)	95 / 94.9 **;;** minus **;**	**3**	
5(b)(ii)	**1** less **+** carbon dioxide / CO_2 ; **2** CO_2 **+** greenhouse gas / greenhouse effect / global warming ; **3** climate change ; **4** climate change effect ; **5** decrease in land for cultivation **ORA** ; **6** increase **+** biodiversity **AW** ; **7** decrease in methane from animals ;	**4**	

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Question	Answer	Marks	Guidance
6(a)	**1** producer **+** grass ; **2** photosynthesis ; **3** produces + carbohydrate / glucose / starch ; **4** herbivores / primary consumer **+** name **+** feeds on plants / grass / producer ; **5** carnivores / secondary consumer **+** name **+** feeds on animals / named animal ; **6** hawk + top predator / top carnivore / secondary and tertiary consumer ;	**5**	**1, 4–6** A**ccept** correct trophic levels if answer only given in trophic levels
6(b)	**1** from Sun / light ; **2** light **+** producer / plant / named producer ; **3** photosynthesis / light to chemical energy ; **4** non-cyclical / does not return to the Sun ; **5** energy loss **AW** ; **6** example of energy loss ; **7** biomass decreases up trophic levels **AW** ;	**5**	

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Question	Answer	Marks	Guidance
7(a)	**P** ovary (wall) ; **Q** ovule ;	**2**	
7(b)(i)	**1** colour / red **+** attracts ; **2** eaten / ingested ; **3** animal moves **AW** ; **4** jelly coat **+** protect Q / seed **OR** edible ; **5** seeds / Q **+** not digested / broken down / destroyed ; **6** egested / removed in faeces / spat out ;	**4**	
7(b)(ii)	**1** colonisation of new areas / less overcrowding **AW** ; **2** less / no **+** competition ; **3** for named factor ; **4** increased chance of germination / more plants growing ; **5** increased chance of survival **AW** ; **6** less risk of disease / pests / infection ;	**4**	

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Question	Answer	Marks	Guidance
8(a)	*day* **1** light / day **+** photosynthesis ; **2** faster than respiration / respiration uses up oxygen ; **3** day **+** CO_2 used / in **+** O_2 produced / out ; *night* **4** no light / night **+** no photosynthesis ; **5** respiration ; **6** night / evening **+** O_2 used / in **+** CO_2 produced / out ; **7** stomata + open in day / closed at night ; **8** more water vapour lost during day ; **9** compensation point(s) **AW** ;	**5**	
8(b)	**1** xylem ; **2** from xylem into mesophyll ; **3** diffusion / osmosis ; **4** down water potential gradient **AW** ; **5** layer of water **+** mesophyll **+** cell wall / outside cell ; **6** evaporation **/** water vapour ; **7** air / intercellular **+** spaces ; **8** exits leaf through stomata / stoma ;	**5**	

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Question	Answer	Marks	Guidance
9(a)	*advantages* **1** kills pests / harmful insects **AW** ; **2** increased **+** yield / growth / productivity / profit / quality **AW** ; **3** stop spread of plant diseases carried by insects ; *disadvantages* **4** harms non-pest insects **AW** ; **5** reduces pollination / reduces pollinators / reduces biodiversity ; **6** less food for predators of insects **AW** ; **7** pest resistance to insecticide ; **8** water pollution / washed into water / food contamination ; **9** bioaccumulation / concentrates up food chain **AW** ;	**5**	
9(b)	**1** mosquito / *Anopheles* ; **2** **M** drain swamps / prevent stagnation of water / cover water ; **3** **E** stops egg laying / nowhere to breed **AW** ; **4** **M** oil on water **OR** fish / bacteria in ponds ; **5** **E** kills / feeds on + eggs / larvae / pupae / mosquito / vector ; **6** **M** nets / screens / long clothes / insect repellant ; **7** **E** prevention of bites **AW** ; **8** **M** release irradiated males / sterile males ; **9** **E** infertile eggs laid / eggs don't develop into larvae **AW** ;	**5**	**M** = method **E** = effect one linked explanation per method