



Cambridge IGCSE™ (9–1)

BIOLOGY

0970/03

Paper 3 Theory (Core)

For examination from 2023

MARK SCHEME

Maximum Mark: 80

Specimen

This document has **10** pages.

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	<p><u>Calculation specific guidance</u></p> <p>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’.</p> <p>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.</p> <p>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.</p> <p>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.</p>
7	<p><u>Guidance for chemical equations</u></p> <p>Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.</p> <p>State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.</p>

Mark schemes will use these abbreviations:

;	separates making points
/	alternatives
()	the word / phrase in brackets is not required but sets the context
A	accept (for answers correctly cued by the question, or guidance for examiners)
and	both responses required for the mark
any [number] from:	accept the [number] of valid responses
AVP	alternative valid point
AW	alternative wording (where responses vary more than usual)
ecf	error carried forward
I	ignore as irrelevant
MP	mark point
note:	additional marking guidance
ora	or reverse argument
R	reject
<u>underline</u>	actual word given must be used by candidate (grammatical variants accepted)

Question	Answer	Marks	Guidance
1(a)(i)	fur / hair ;	1	
1(a)(ii)	<i>Panthera</i> ;	1	
1(b)	<i>lays soft-shelled eggs:</i> reptiles ; <i>feathers:</i> birds ; <i>smooth, moist skin:</i> amphibians ;	3	
1(c)(i)	(A) cytoplasm ; (B) cell membrane ; (C) nucleus ;	3	
1(c)(ii)	<i>any two from:</i> chloroplast ; cell wall ; (permanent) vacuole ;	2	
1(c)(iii)	cell wall ;	1	

Question	Answer	Marks	Guidance
1(d)	<p>specialised cells</p> <div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; margin: 5px;">ciliated cell</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">neurone</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">palisade mesophyll cell</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">red blood cell</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">root hair cell</div> </div> <p>functions</p> <div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; margin: 5px;">absorption of water</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">conduction and support</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">conduction of impulses</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">movement of mucus</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">photosynthesis</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">transport of oxygen</div> </div>	4	1 mark for each correct line

Question	Answer	Marks	Guidance
2(a)(i)	running ;	1	
2(a)(ii)	125 (bpm) ;	1	
2(a)(iii)	50(%) ; ;	2	MP1 correct selection of values from graph MP2 correct calculation
2(b)	ECG / listening to valves (closing) ;	1	A other correct methods
2(c)	(breathing) rate increases / AW ; (breathing) depth increases / AW ;	2	
2(d)(i)	oxygen ;	1	
2(d)(ii)	mitochondria ;	1	

Question	Answer	Marks	Guidance														
2(e)(i)	glucose → lactic acid ;	1															
2(e)(ii)	releases more energy (per molecule of glucose) ;	1															
Question	Answer	Marks	Guidance														
3(a)(i)	five / 5 ;	1															
3(a)(ii)	<u>black</u> (fur / coat) ;	1															
3(a)(iii)	homozygous circled ; dominant circled ;	2															
3(b)	discontinuous ;	1															
3(c)	(male and female gametes) A and a ; (offspring) AA , Aa , Aa and aa ; (phenotypic ratio) 3 (white) : 1 (black) ;	3	e cf from the step before <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td colspan="2" style="text-align: center;">male</td> </tr> <tr> <td></td> <td style="text-align: center;">A</td> <td style="text-align: center;">a</td> </tr> <tr> <td rowspan="2" style="text-align: center; vertical-align: middle;">female</td> <td style="text-align: center;">A</td> <td style="text-align: center;">Aa</td> </tr> <tr> <td style="text-align: center;">a</td> <td style="text-align: center;">Aa</td> </tr> <tr> <td></td> <td style="text-align: center;">Aa</td> <td style="text-align: center;">aa</td> </tr> </table>		male			A	a	female	A	Aa	a	Aa		Aa	aa
	male																
	A	a															
female	A	Aa															
	a	Aa															
	Aa	aa															
3(d)	<i>any three from:</i> breed / cross / mate, two white goats ; select offspring with white coats and breed again / do not breed the offspring with black coats ; <i>idea of</i> (breeding) over many generations ; correct ref. to homozygous dominant ;	3															
Question	Answer	Marks	Guidance														
4(a)	<i>any four from:</i> chlorophyll is required (for photosynthesis) ; chlorophyll absorbs light energy (for photosynthesis) ; only the green part contains chlorophyll ; ora production of glucose ; glucose converted to / stored as starch ;	4															

Question	Answer	Marks	Guidance
4(b)(i)	<i>any three from:</i> into the root ; (via) root hair cells ; through the cell walls ; across a partially permeable membrane ; by osmosis ;	3	
4(b)(ii)	support / transport of mineral ions / solvent / coolant ;	1	A cooling / germination
4(b)(iii)	xylem ;	1	
4(b)(iv)	stoma(ta) ;	1	

Question	Answer	Marks	Guidance
5(a)	C ; E ; B ;	3	
5(b)	<i>any three from:</i> vagina ; cervix ; uterus ; oviduct ;	3	
5(c)	<i>any three from:</i> ref. to tail / flagellum ; ref. to enzymes / acrosome ; mitochondria ; AVP ; e.g. streamlined shape	3	
5(d)(i)	X or Y ;	1	
5(d)(ii)	DNA ; protein ;	2	

Question	Answer	Marks	Guidance												
6(a)(i)	32.5 (°C) ;	1	A 32–34 (°C)												
6(a)(ii)	enzymes denature ;	1													
6(b)	pH ;	1	A enzyme / substrate, concentration												
6(c)	<table border="1"> <thead> <tr> <th>insoluble molecule</th> <th>enzyme</th> <th>soluble molecules</th> </tr> </thead> <tbody> <tr> <td>starch</td> <td>amylase</td> <td>reducing sugars</td> </tr> <tr> <td>fat</td> <td>lipase ;</td> <td>fatty acids ; glycerol ;</td> </tr> <tr> <td>protein ;</td> <td>protease</td> <td>amino acids ;</td> </tr> </tbody> </table>	insoluble molecule	enzyme	soluble molecules	starch	amylase	reducing sugars	fat	lipase ;	fatty acids ; glycerol ;	protein ;	protease	amino acids ;	5	
insoluble molecule	enzyme	soluble molecules													
starch	amylase	reducing sugars													
fat	lipase ;	fatty acids ; glycerol ;													
protein ;	protease	amino acids ;													
6(d)	carbon, hydrogen and oxygen ;	1													
6(e)	pancreas / stomach / small intestine ;	1													

Question	Answer	Marks	Guidance
7(a)	methane ;	1	A water vapour / nitrous oxide / CFCs / ozone
7(b)	<p>any <i>three from</i>:</p> <ul style="list-style-type: none"> habitat destruction ; loss of biodiversity ; extinction ; soil erosion ; flooding ; <p>AVP ;; e.g. landslides / leaching / disruption to food chains or webs or loss of food source / desertification / reduction in rainfall</p>	3	

Question	Answer				Marks	Guidance
7(c)(i)	organism	producer	herbivore	secondary consumer	3	1 mark per correct column
	corn plant	✓				
	vole		✓			
	grasshopper		✓			
	hawk			✓		
	; ; ; ;					
7(c)(ii)	4 ;				1	
7(c)(iii)	hawk ;				1	
7(c)(iv)	decomposer ;				1	
7(c)(v)	(the) Sun ;				1	