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CAMBRIDGE
International Education

Cambridge IGCSE™

BIOLOGY **0610/43**

Paper 4 Theory (Extended) **May/June 2026**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme contains the instructions and marking guidance that our examiners used to mark candidate responses for this component.

Before they start marking, examiners complete a standardisation process. They review a range of candidate responses and discuss the mark scheme in detail to agree which answers can and cannot be accepted. Examiners award marks where it is clear that candidate responses have met the requirements of the mark scheme. These requirements may vary between different components or different versions of the same component, depending on the exact requirements of the question and the candidate responses seen during the standardisation process.

Sometimes, our mark schemes may allow marks to be awarded to responses which contain elements that are factually incorrect or for content not covered by the syllabus. We do this in response to the demands of a specific question to support candidates and make sure that our assessments are fair. However, these allowances should not be used as a guide for teaching and learning.

We cannot discuss the mark scheme with schools, and we recommend that schools read the mark scheme together with the assessment material and the Principal Examiner Report for Teachers.

This document consists of **16** printed pages.

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General marking principles

All examiners must apply these marking principles when marking candidate responses.

1	Examiners must award marks for each response in line with: • the specific **content** defined in the mark scheme • the specific **skills** defined in the mark scheme or in the level descriptions • the **standard of response** required as exemplified by the standardisation scripts.
2	Examiners must award **whole marks** (not half marks, or other fractions).
3	Examiners must award marks **positively**. This means that: • marks are not deducted for errors or omissions • marks are awarded for correct/valid answers as defined in the mark scheme and also for **other valid answers** which go beyond the scope of the syllabus and mark scheme referring to your team leader as appropriate • the quality of spelling, punctuation and grammar are judged **only** when the mark scheme indicates that these features are **specifically assessed** in the question. However, the meaning of all responses must be unambiguous.
4	Examiners must **consistently** apply the requirements of the mark scheme and any rules for what to do when candidates have not followed instructions correctly.
5	Examiners must use the **full range of marks** defined in the mark scheme, unless limited by the quality of the candidate responses seen.
6	Examiners must award marks according to the mark scheme and **must not** award marks with grade thresholds or grade descriptions in mind.

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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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Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
	correct point or mark awarded
	incorrect point or mark not awarded
	information missing or insufficient for credit
	allow or accept
	incorrect or insufficient point ignored while marking the rest of the response
	contradiction in response, mark not awarded
	benefit of the doubt given
	error carried forward applied
	point has been noted, but no credit has been given or blank page seen
	correct awarding one mark from marking point or marking group 1. similar numbered ticks are used for marking point or marking groups 2, 3, 4 etc.

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Annotation	Meaning
	pages are linked together
	used to highlight part of the response
	used to highlight parts of an extended response
	used to highlight parts of an extended response
	Point already given
	Maximum mark reached
	Key point attempted / working towards marking point / incomplete answer / response seen but not credited / blank page seen
	Maximum number of marks for a marking point has been awarded.

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Mark Scheme Abbreviations:	
;	separates marking points
/	alternative responses for the same marking point
R	reject the response
A	accept the response
I	ignore the response
ecf	error carried forward
AVP	any valid point
ora	or reverse argument
AW	alternative wording
underline	actual word given must be used by candidate (grammatical variants excepted)
( )	the word / phrase in brackets is not required but sets the context
max	indicates the maximum number of marks that can be given
MP	marking point

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Question	Answer	Marks	Guidance
1(a)(i)	fungi ; prokaryotes ;	2	either order
1(a)(ii)	*any two from:* (cell) membrane ; nucleus ; mitochondria ; cytoplasm ; ribosomes ; vacuoles ;	2	**R** (large) central / permanent, vacuole
1(b)(i)	(contains) chloroplasts ;	1	**I** food vacuole
1(b)(ii)	*any two from:* 1 (when no prey are available) they can make (named) nutrients by photosynthesis / AW **AND** (when no light available) they can capture prey and use as a source of nutrients / AW ; 2 enables (*Euglena* / them) to live in a larger range of environments / AW ; 3 increases their change of survival / AW ;	2	
1(b)(iii)	aerobic respiration / release energy ;	1	**R** produce energy **A** provides, energy / ATP **I** provides energy for respiration
1(b)(iv)	(to make) chlorophyll ;	1	
1(b)(v)	(photo)sensitivity ;	1	
1(c)	*human cell:* sperm (cell) *function:* motility / allows movement / AW ;	2	

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2(a)</td><td>
<table>
<tr><th>substance</th><th>process that produces the substance</th><th>organ responsible for excretion of the substance</th></tr>
<tr><td>carbon dioxide</td><td>(aerobic) respiration</td><td>lungs
A placenta / leaf</td></tr>
<tr><td>oxygen</td><td>photosynthesis</td><td>leaf
A stem / shoot</td></tr>
</table>
;;
</td><td>2</td><td>one mark for each correct row</td></tr>
<tr><td>2(b)(i)</td><td>F: ingestion ;
G: absorption ;
H: assimilation ;
J: deamination ;</td><td>4</td><td></td></tr>
<tr><td>2(b)(ii)</td><td>urea ;</td><td>1</td><td></td></tr>
<tr><td>2(c)(i)</td><td>P ;
filtration (of, water / glucose / urea / ions, from the blood) ;</td><td>2</td><td></td></tr>
<tr><td>2(c)(ii)</td><td>1 blood at Q has a higher oxygen concentration (than L) / Q is oxygenated and L is deoxygenated / ora ;

and any three from:
2 blood at Q is from the, heart / aorta / renal artery ;
3 blood at L is going to the heart / vena cava / renal vein ;
4 oxygen is used by cells / kidney / nephron ;
5 for (aerobic) respiration ;
6 provides energy (to cells) ;</td><td>4</td><td></td></tr>
</table>

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Question	Answer	Marks	Guidance
3(a)	*any four from:* 1 (decrease in thickness is) menstruation / AW ; 2 caused by drop in, progesterone / oestrogen ; 3 increase in thickness (of uterus lining) caused by oestrogen ; 4 (oestrogen) secreted by ovary ; 5 ovulation / egg released (at day 14 / mid cycle) ; 6 maintenance of the (uterus) lining is caused by progesterone ; 7 (progesterone) secreted by ovary ; 8 prepare for implantation (of fertilised egg) ; 9 if the egg is not fertilised progesterone decreases ;	**4**	**A** days from 1 to 4–6 as time for menstruation **I** if both oestrogen **and** progesterone **A** day 11–17 as time for ovulation **I** both oestrogen **and** progesterone **A** if pregnancy does not occur progesterone decreases
3(b)	gamete ; meiosis ; adaptive ; energy stores ; haploid ;	**5**	**A** sex cell **A** nutrient stores

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Question	Answer	Marks	Guidance
3(c)	*any two from:* maternal and fetal blood are kept separate / AW ; (placenta) transfers named substance, from mother / to fetus ; (placenta) transfers named substance, from fetus / to mother ; (placenta) transfers, antibodies / passive immunity, from mother / to fetus ; placenta forms barrier to, toxins / pathogens ; placenta secretes, progesterone / oestrogen / hormone ;	**2**	**A** mother's blood and fetal blood do not mix e.g. (named) nutrients / oxygen e.g. urea / carbon dioxide / metabolic waste / excretory products / waste products
3(d)	*FSH: (any one from)* causes, follicle to develop / grow / prepare ; causes egg cell to mature / develop ; stimulates oestrogen production ; *LH: (any one from)* causes, ovulation / release of egg cell ; stimulates progesterone production / helps to maintain the corpus luteum AW ;	**2**	
3(e)	*any two from:* growth increase / muscular development ; pubic / body / facial, hair, develops ; voice deepens / change in voice ; penis / testes, enlarges ; produce sperm ; AVP ;;	**2**	**A** broaden shoulders
3(f)	plasma ;	**1**	

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Question	Answer	Marks	Guidance
4(a)(i)	codominance ;	1	**A** codominant
4(a)(ii)	<table><tr><td colspan="2"></td><td colspan="2">male speckled chicken</td></tr><tr><td colspan="2"></td><td>F^W</td><td>F^B</td></tr><tr><td rowspan="2">female speckled chicken</td><td>F^W</td><td>F^WF^W</td><td>F^WF^B</td></tr><tr><td>F^B</td><td>F^WF^B</td><td>F^BF^B</td></tr></table> ;; 1 white : 2 speckled : 1 black ;	3	MP1 for both sets of gametes correct MP2 for correct offspring genotypes MP3 for correct phenotypic ratio **ecf** from previous step max two if incorrect use of F^W and F^B **A** phenotypes in any order as long as numbers match
4(b)	*any two from:* idea of ethical concerns ; (named) pollutant / pollution ; (pollution causes) habitat destruction / deforestation / eutrophication ; increased chance of (infectious) disease affecting livestock ; (increased) use of antibiotics ; **AVP** ;;	2	e.g. methane / nitrate ions / ammonia e.g. increased use of growth hormone / smell / air quality / reduces biodiversity / increased water use

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Question	Answer	Marks	Guidance
4(c)	*any six from:* 1 a gene is a length of DNA that codes for a protein ; 2 DNA / genes / alleles / chromosomes, cannot leave the nucleus ; 3 gene / allele, is copied ; 4 to make messenger RNA / mRNA ; 5 mRNA is moved, to the cytoplasm / out of nucleus / to a ribosome ; 6 mRNA passes through ribosomes / AW ; 7 ribosomes assemble amino acids into protein (molecules) ; 8 sequence of amino acids is determined by the sequence of bases of mRNA / DNA / gene ; 9 requires energy (from respiration) ; 10 the sequence of amino acids determines the shape of the protein ;	**6**	**A** polypeptide chain for protein throughout **A** DNA / genes / alleles, are in the nucleus

Question	Answer	Marks	Guidance
5(a)	Due to an issue with **question 5(a)**, the question has been removed from the question paper.		
5(b)(i)	three horizontal bars centred in appropriate order ; each bar labelled with the trophic level ; width of bars plotted to scale ±½ a small square ;	**3**	**I** height of bars
5(b)(ii)	*any one from:* not all, species have / biomass has, the same energy content ; shows the energy, lost / transferred, at each trophic level ; more accurate for comparing species ; **AVP** ;	**1**	e.g. idea of variation of water content affecting biomass accuracy whereas energy does not vary / difficult to measure biomass in some environments

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Question	Answer	Marks	Guidance
5(c)(i)	2.5×10^6 **;;;**	**3**	MP1 correct value read from graph at 4 days i.e. 5000 MP2 conversion of dm^3 to cm^3 and correct calculation i.e. 0.5 (dm^3) = 500 (cm^3) and then MP1 × 500 = 2 500 000 MP3 correct conversion to standard form **ecf** from previous step
5(c)(ii)	1 correct identification of the four phases as lag, exponential / log, stationary and death phases **;** *any four from:* *lag phase:* *2* takes time for the population to, reproduce / acclimatise **;** *exponential (log) phase:* 3 rapid, reproduction / increase in population / AW **;** 4 no limiting factors / plenty of, resources / light / carbon dioxide / nutrients / AW **;** *stationary phase:* 5 birth rate is equal to death rate **;** 6 population reaches a maximum / no further increase in population **;** 7 carbon dioxide / nutrients / resources, are limiting (population increase) / limiting factor **;** *death phase:* 8 death rate is greater than the birth rate **/** phytoplankton die and are not replaced **;** 9 increase in concentration of toxic waste products **;** 10 carbon dioxide / nutrients / resources, are no longer available / AW **;**	**5**	

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Question	Answer	Marks	Guidance
6(a)	*left gap:* fats / oils / lipids **;** *right gap:* glycerol **;**	**2**	
6(b)(i)	*similarities: (any two from)* both, increase and then decrease / have optimum / have peak **;** both have zero activity at, pH 3 / pH 12 **;** both increase gradually at low pH **;** same (activity) at pH 7.4 **;** *differences: (any two from)* (type) **P** has higher activity / **ora ;** (type) **P** is active at pH 4 but (type) **Q** is not active **;** (type) **Q** is active at pH 10 / pH 11 but (type) **P** is not active **;** (type) **P** optimum is in the acidic range **and** (type) **Q** optimum is in the alkaline range **;** (type) **Q** is active over a greater range of pH values / **ora ;**	**4**	**A** (type) **P** optimum is pH 6 **and** (type) **Q** is pH 8
6(b)(ii)	7.1 / 7.2 **and** 9.5 **;**	**1**	either order
6(b)(iii)	*any three from:* *idea that* the enzyme is denatured at, low and high / extremes of, pH **;** active site changes shape **;** active site / enzyme, no longer complementary to substrate **;** fewer / no, substrate molecules fit to enzyme or active site / fewer or no enzyme-substrate complexes form **;** *idea of* decrease in (the rate of), effective collisions / formation of enzyme-substrate complexes, below pH 6 / ora **OR** decrease in (rate of), effective collisions / formation of enzyme-substrate complexes, above pH 6 / ora**;** *idea of* most enzyme-substrate complexes form at pH 6 **OR** most substrate binding to enzymes / active sites, at pH 6 **;**	**3**	**A** ESC for enzyme-substrate complexes throughout **A** optimum for pH 6 throughout **A** bind for fit

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Question	Answer	Marks	Guidance
6(c)(i)	emulsify, fats / lipids / oils ;	1	
6(c)(ii)	liver ;	1	

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