CAMBRIDGE
International Education

Cambridge O Level

BIOLOGY **5090/42**

Paper 4 Alternative to Practical **May/June 2026**

MARK SCHEME

Maximum Mark: 40

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.

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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
	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

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Annotation	Meaning
	correct idea but not specific enough
	used to highlight parts of an extended response
	key point attempted / working towards marking point
Ruler	allows lengths to be measured
Protractor	allows angles to be measured
Multi-line Overlay	overlays graphs
	correct, awarding one mark from marking point 1.
	correct, awarding one mark from marking point 2, similar numbered ticks are used for marking point 3, 4, 5 etc.

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Question	Answer	Marks	Guidance
1(a)(i)	percentage / % <u>concentration</u> of vitamin C (solution) | <u>number (no.)</u> of drops	**2**	**R** drops of DCPIP **R** units in either header **Ig** extra numbers in header two correct headings in reverse order = max 1
1(a)(ii)	13 **and** 19 ;	**1**	**R** thirteen and nineteen
1(a)(iii)	0.35 ; explanation must include reference to a pair of values e.g. 19 and 24 drops / 0.25% and 0.50% ;	**2**	**ECF** from **1(a)(ii)** **A** > 0.25 < 0.50 only award ecf for mp2 if the drop numbers are sequential and form a pattern that can be explained
1(b)(i)	drops of different volume (either Vit C or DCPIP) / determining when DCPIP has gone colourless ;	**1**	**A** size for vol here **A** end point not clear **Ig** amount **Ig** cross contamination / human errors e.g. miscounting number of drops
1(b)(ii)	Water instead of vitamin C / 0% concentration vitamin C;	**1**	**A** solution with no Vit C **Ig** water unqualified
1(c)(i)	percentage concentration on x-axis **+** both axes fully labelled ; linear scales **+** value(s) at origin **+** good use of grid ; 5 plots correct ; points joined with ruled lines **+** no extrapolation ;	**4**	min. labels percentage concentration **+** <u>mean</u> vol **+** <u>cm^3</u> over ½ grid in both directions plots must be crosses or <u>encircled</u> dots. **R** lines of best fit **R** mp2 if scale is reversed on % concentration of vitamin C axis, i.e. starts at 1.0 at the origin and goes down If bar chart drawn – max3 – mps 1, 2, 3

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Question	Answer	Marks	Guidance
1(c)(ii)	correct value from graph ; graph working shown ;	**2**	**A** answer within range 0.74 – 0.76 **A** correct reading (must be % not a volume) from incorrect working **R** units e.g. cm^3 minimum one line with the intersect at 14 cm^3
1(c)(iii)	test / use smaller concentration intervals ; specifically test between 0.6 and 0.8 ;	**2**	**ECF** for mp2 based on graph reading test more concentrations btw 0.6 and 0.8 = 2 marks **Ig** other routes that change investigation / make it more accurate e.g. use of burette, colorimeter
1(c)(iv)	drops can vary in <u>volume</u> or measuring <u>volume</u> is more accurate ; using a syringe (is more accurate than teat pipette) ;	**2**	**A** reference to <u>volumes</u> of DCPIP **A** you do not know the <u>volume</u> when you add drops **R** gas syringe syringe gives an accurate volume = 2 marks
1(c)(v)	**Y** is more concentrated / has greater percentage Vit C / fewer drops Vit C needed (to decolourise DCPIP)	**1**	**A** higher concentration / contains more Vit C / comparison of data 0.75 v 0.35 **R** ref to more drops meaning Y is more concentrated – CON

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Question	Answer	Marks	Guidance
1(d)(i)	1 A range of at least 3 temperatures above 20°C (of lemon juice) used ; 2 any suitable method to obtain different temperatures; 3 cooling the lemon juice before adding ; 4 same volume / concentration of DCPIP ; 5 same concentration / batch of lemon juice ; 6 same volume / 10 cm^3 of lemon juice ; 7 repeat investigation at least 2 times, i.e. 3 × in total (for reliability); 8 identify anomalies / check that the results you get on the repeat are the same / consistent; 9 AVP	**6**	**R amount once only in mps 4 and 6** **lg known / fixed volume / concentration in mps 4, 5 and 6** 1 **R** heating DCPIP / mixture of lemon juice and DCPIP 2 **A** water bath / Bunsen burner 2 **lg** refs to heating equipment that are ONLY in an equipment list and not used in the method 5 and 6. **A** ref to Vit C solution for lemon juice 5 A description of juice from the same lemon 6 A other named volumes 7 **A** several times 7 **R** ref to accuracy / precision 8 **lg** remove / exclude / rule out anomalies 9 **A** conclusion – how have you found the lowest temperature i.e. the lowest temp for which DCPIP stays blue (not decolourised) *cont'd* 9 **A** idea of further specific testing, re:**1(c)(iii**), once a rough temperature range has been identified **Note:** only 1 tube at 1 temperature used loses mps 1, 4, 5 and 6 unless repeated if no DCPIP added loses mps 4, 7, 8 and 9
1(d)(ii)	temperature	**1**	

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Question	Answer	Marks	Guidance
2(a)(i)	cell wall correctly labelled with label line and **W**	**1**	**A** in white / light grey area
2(a)(ii)	clear and clean lines drawn with a sharp pencil **+** no shading **+** not going into text **+** cells should be fully touching but not overlapping ; min 90 mm measured across A–B ; correct 3 cells drawn **+** relative proportions / position / shapes of the cells correct ; nuclei approximately central to the cells ; cell walls indicated with double lines ;	**5**	**Ig** fully touching if only one cell drawn assess cell membranes rather than outer lines middle cell longer than the top cell **+** point on lower edge of middle cell **R** if additional part cells drawn look for double line round each cell **+** three lines between touching cells to indicate cell walls
2(b)(i)	two correct lines drawn ;	**1**	**R** line on candidate's drawing in correct position without ref to **A** and **B**
2(b)(ii)	(length of **A–B** on Fig. 2.1) 54 – 56 (mm) / 5.4 – 5.6 (cm) ; appropriate unit;	**2**	**Ig** length of line on candidate's drawing **A** units once unless contradictory
2(b)(iii)	measurement in candidate's drawing ÷ measurement in fig 2.1 ; correct magnification ; answer to 1 d.p. ;	**3**	**A** mp3 if expression only is inverted **R** mp3 if units after mag

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2(c)</td><td>Differences

<table><tr><td>cells in Fig.2.1 – onion skin</td><td>cells in Fig. 2.2 – cheek</td></tr><tr><td>rectangular / elongated in shape</td><td>round / circular in shape</td></tr><tr><td>cell wall present</td><td>cell wall not present</td></tr></table>;;

similarity
both have a nucleus / cytoplasm ;</td><td>3</td><td>Differences need to be comparative

A onion nucleus round v cheek cell nucleus oval / elongated
Ig longer / oval for onion
Ig regular / irregular
Ig spherical

Ig refs to cells touching

Ig cell membrane</td></tr>
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