CAMBRIDGE
International Education

Cambridge International AS & A Level

BIOLOGY **9700/31**

Paper 3 Advanced Practical Skills 1 **May/June 2025**

MARK SCHEME

Maximum Mark: 40

Published

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1(a)(i)	1 four correct concentrations (0.2, 0.02, 0.002, 0.0002) and mol dm^{-3} at least once ; 2 shows transfer of 1 (cm^3) to each beaker from the previous beaker ; 3 shows 9 (cm^3) of water added to each beaker ;	**3**
1(a)(ii)	1 *heading for independent variable*: concentration of hydrochloric acid / mol dm^{-3} (before heading for dependent variable) and no units in body of table ; 2 *heading for dependent variable*: diffusion distance after 10 and 20 minutes / mm and no units in body of table ; 3 a measurement at 10 and 20 minutes for each concentration ; 4 (at 20 minutes) diffusion distance recorded for the highest concentration of hydrochloric acid longer than for the lowest concentration of hydrochloric acid and the diffusion distance for each concentration is equal to or longer than the diffusion distance recorded at 10 minutes ; 5 records diffusion distance in whole millimetres ; 6 diffusion distance recorded for **U** between the diffusion distance recorded for 0.2 and 0.02 mol dm^{-3} ;	**6**
1(a)(iii)	the higher the concentration the steeper the concentration gradient (so) the greater the diffusion distance ;	**1**
1(a)(iv)	difficult to judge where to measure the diffusion distance / AW ;	**1**
1(a)(v)	correct estimate for **U** based on candidate's results ;	**1**
1(a)(vi)	1 stated concentrations both sides of the estimate for **U** ; *any **one** from:* 2 more concentrations with narrower intervals ; 3 repeat and calculate a mean ; 4 do each concentration separately ;	**2**
1(a)(vii)	1 shows measurement at 20 minutes for 2.0 mol dm^{-3} divided by 20 ; 2 correct answer and units ;	**2**

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Question	Answer	Marks
1(a)(viii)	*any **one** from:* *results support:* 1 diffusion distance is greater in the first 10 minutes than in the second 10 minutes ; *results do not support:* 2 diffusion distance in the first 10 minutes is less than or equal to the diffusion distance in the second 10 minutes ;	**1**
1(b)(i)	1 *x*-axis: temperature / °C and *y*-axis: percentage transmission of light ; 2 *x*-axis: 20 °C to 2 cm and labelled at least each 2 cm and scale on *y*-axis: 20% to 2 cm and labelled at least each 2 cm ; 3 correct plotting of all five points using small dots in circles or crosses ; 4 five plots joined with a thin line passing through all points ;	**4**
1(b)(ii)	*any one from:* 1 reference to effect on proteins e.g. denatured ; 2 reference to effect on phospholipids / fatty acids e.g. increased fluidity ; 3 cell membrane e.g. increased fluidity ;	**1**

Question	Answer	Marks
2(a)(i)	1 appropriate size and no shading ; 2 draws correct section of the leaf ; 3 draws at least three vascular bundles in a line and no cells drawn ; 4 draws a circle (of tissue) around each vascular bundle ; 5 label line and label to epidermis ;	**5**

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<tr><td>2(a)(ii)</td><td>1 appropriate size <u>and</u> lines are sharp and continuous ;
2 draws only two cells from the epidermis <u>and</u> two cells from the layer beneath the epidermis <u>and</u> each cell touches at least two other cells ;
3 draws two lines around each cell <u>and</u> three lines where cells touch ;
4 draws correct shape and arrangement of cells ;
5 label line <u>and</u> label to the cell wall of one epidermal cell ;</td><td>5</td></tr>
<tr><td>2(b)(i)</td><td>any three (correct differences) from:

<table><tr><th>feature</th><th>J1</th><th>Fig. 2.2</th></tr><tr><td>shape</td><td>elongated</td><td>circular ;</td></tr><tr><td>vascular bundles</td><td>in a line</td><td>In the centre ;</td></tr><tr><td>stomata</td><td>many</td><td>fewer ;</td></tr><tr><td>air spaces</td><td>many</td><td>fewer ;</td></tr></table></td><td>3</td></tr>
<tr><td>2(b)(ii)</td><td>cuticle / thick epidermis / few stomata <u>and</u> reduces transpiration ;</td><td>1</td></tr>
<tr><td>2(c)</td><td>1 correct measurement of the width of the whole leaf section (X–Y) <u>and</u> units ;
2 correct measurement of the width of the central region (A–B) <u>and</u> units ;
3 shows the width of the central region divided by the width of the whole leaf section <u>and</u> multiplied by 100 ;
4 correct answer ;</td><td>4</td></tr>
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Question	Answer	Marks
1(a)(i)	1 correct volumes of **R** (4.0, 2.0) **;** 2 correct volumes of **W** to make 20 cm^3 **; ecf**	**2**
1(a)(ii)	1 *heading for independent variable*: percentage concentration of reducing sugar (before heading for dependent variable) and no units in body of table **;** 2 heading for dependent variable: time / seconds and no units in body of table **;** 3 a time for each concentration **;** 4 time to reach the end-point for the highest concentration of reducing sugar is shorter than for the lowest concentration of reducing sugar **;** 5 records time in whole seconds **;**	**5**
1(a)(iii)	records the time for **W** as 'more than 120' and records the time for **E** as a value less than 120 **;**	**1**
1(a)(iv)	correct estimate for **W** and **E** based on candidate's results **;**	**1**
1(a)(v)	1 sucrose is not a reducing sugar **;** 2 (for **W**) there is no invertase (so) sucrose is not broken down / hydrolysed **;** 3 (for **E**) invertase has, broken down / hydrolysed, the sucrose into reducing sugars **;**	**3**
1(a)(vi)	*any **two** from:* 1 use concentrations with narrower intervals **;** 2 use stated concentrations that are either side of the estimate stated in **1(a)(iv)** **;** 3 repeat (the procedure) and calculate a mean **;**	**2**
1(b)(i)	1 *x*-axis: percentage concentration of catalase and *y*-axis: number of bubbles of oxygen in 5 minutes **;** 2 scale on *x*-axis: 2% to 2 cm and labelled at least every 2 cm and scale on *y*-axis: 20 to 2 cm and labelled at least every 2 cm **;** 3 correct plotting of all six points using dots in circles or small crosses **;** 4 plots are joined with a thin line passing through all points **;**	**4**
1(b)(ii)	6.0 **;**	**1**
1(b)(iii)	as the concentration of catalase increases the number of bubbles of oxygen increases **;**	**1**

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Question	Answer	Marks
1(b)(iv)	hydrogen peroxide, breaks down / forms oxygen, with no enzyme ;	**1**
1(b)(v)	measuring the volume of oxygen **or** description e.g. using a gas syringe, water displacement method ;	**1**

Question	Answer	Marks
2(a)(i)	1 appropriate size and no shading ; 2 draws quarter of the stem section; 3 draws the correct pattern and size of the vascular bundles and no cells; 4 draws an enclosed area in the top of each vascular bundle ; 5 label line and label to vascular bundle ;	**5**
2(a)(ii)	1 approprate size and all lines sharp and continuous ; 2 draws one large xylem vessel element and three small xylem vessel elements ; 3 two lines around each xylem vessel element and three lines where xylem vessel elements touch ; 4 draws correct shape of xylem vessel elements ; 5 label line and label to the wall of one xylem vessel element ;	**5**
2(b)(i)	1 correct measurement of the width of the vascular bundle (**P**–**Q**) and units ; 2 shows division of the measured width of the vascular bundle by 350 ; 3 correct answer ;	**3**

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<tr><td>2(b)(ii)</td><td>records only observable features ;
records one similarity ; e.g. (both) have phloem and xylem
(both) have thickening to cell walls
(in both) xylem is larger than phloem
any two correct differences ; ;
e.g.
<table>
<tr><th>feature</th><th>K1</th><th>Fig. 2.2</th></tr>
<tr><td>shape</td><td>oval</td><td>circular</td></tr>
<tr><td>xylem</td><td>circular</td><td>star shape</td></tr>
<tr><td>endodermis</td><td>absent</td><td>present</td></tr>
<tr><td>vascular cap</td><td>present</td><td>absent</td></tr>
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<tr><td>2(b)(iii)</td><td>iodine / iodine in potassium iodide ;</td><td>1</td></tr>
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Question	Answer	Marks
1(a)(i)	diameter of the cylinder stated and the correct radius and appropriate units, mm or cm ;	**1**
1(a)(ii)	volume of **S** stated and a correct reason e.g. so that the cylinders of potato are completely submerged ;	**1**
1(a)(iii)	1 shows the surface area of one piece and the total surface area when n = 1 and h = 40 mm ; 2 shows the surface area of one piece and the total surface area when n = 16 and h = 2.5 mm ;	**2**
1(a)(iv)	(the total surface area) increases ;	**1**
1(a)(v)	1 *heading for independent variable*: number of pieces / cylinders of potato and to the left of the dependent variable ; 2 *heading for dependent variable*: total length with appropriate units (mm or cm) ; 3 length for each of the five cylinders of potato ; 4 expected trend (the higher number of pieces the shorter the total length) ; 5 results recorded in whole mm ;	**5**
1(a)(vi)	correct description of the trend according to the candidates' results ; e.g. as the surface area increases the length decreases	**1**
1(a)(vii)	(as the number of pieces of potato increases, there is an increase in the total surface area) *any **two** from:* 1 increases the (total) surface area in contact with the sodium chloride solution ; 2 increased surface area to volume ratio ; 3 (so) there is a shorter (diffusion) distance (to the cells in the middle of the potato cylinder) ;	**2**
1(a)(viii)	exactly lining up cylinders is difficult as there will be gaps between them and they are not straight / AW ;	**1**
1(a)(ix)	1 use, the same surface area / one length of plant tissue ; 2 use five different temperatures ;	**2**

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Question	Answer	Marks
1(b)(i)	1 *x*-axis: percentage concentration of sodium chloride and *y*-axis: percentage number of whole red blood cells remaining ; 2 scale on *x*-axis: 0.2 to 2 cm, labelled at least every 2 cm and scale on *y*-axis: 20 to 2 cm, labelled at least every 2 cm ; 3 correct plotting of all six points using small dots in circles or crosses ; 4 six plots joined with thin line passing through all points ;	**4**
1(b)(ii)	0.9% ;	**1**
1(b)(iii)	0.4% sodium chloride solution has a higher water potential than the red blood cells and water enters the cells and (so) they burst ;	**1**

Question	Answer	Marks
2(a)(i)	1 uses most of the available space ; 2 correct number of tissues and no cells ; 3 epidermis drawn as two lines close together ; 4 draws at least one vascular bundle divided into three areas ; 5 label line to phloem and label to identify the phloem ;	**5**
2(a)(ii)	1 lines are continuous, thin and sharp and no shading ; 2 draws a line of four xylem vessel elements and each touches at least one other xylem vessel element ; 3 cell wall drawn as two lines ; 4 at least two vessel elements drawn with more than four sides ; 5 label line and label to identify the lumen ;	**5**
2(b)(i)	1 shows division of 100 by 40 ; 2 correct answer (e.g. 2.5 μm) ;	**2**
2(b)(ii)	1 states the correct number of eyepiece graticule units along the section of vascular tissue **T** ; 2 multiplies this number of eyepiece graticule units by the answer in **(b)(i)** ;	**2**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(c)(i)</td><td>any three (differences) from :

<table>
<tr><th>feature</th><th>L1</th><th>Fig. 2.3</th></tr>
<tr><td>shape of organ</td><td>round</td><td>rectangular / irregular ;</td></tr>
<tr><td>position of vascular bundles</td><td>in a ring near the epidermis</td><td>scattered ;</td></tr>
<tr><td>sizes of the vascular bundles</td><td>all are a similar size</td><td>large and small sizes ;</td></tr>
<tr><td>arrangement of xylem vessels</td><td>in lines</td><td>scattered ;</td></tr>
</table></td><td>3</td></tr>
<tr><td>2(c)(ii)</td><td>correct identification of plant organ as a stem
<u>and</u>
correct observable feature that helped identification e.g. vascular bundles are in a ring near the epidermis on L1 ;</td><td>1</td></tr>
</table>

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CAMBRIDGE
International Education

Cambridge International AS & A Level

BIOLOGY **9700/34**

Paper 3 Advanced Practical Skills 2 **May/June 2025**

MARK SCHEME

Maximum Mark: 40

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.

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PUBLISHED

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- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

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- 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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	contradiction in response, mark not awarded
	benefit of the doubt given
	error carried forward applied

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AW	alternative wording (where responses vary more than usual)
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max	indicates the maximum number of marks that can be given
ora	or reverse argument
mp	marking point (with relevant number)
ecf	error carried forward
AVP	alternative valid point

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Question	Answer	Marks
1(a)(i)	1 concentrations labelled under correct sequence of beakers: 0.5%, 0.25%, 0.125%, 0.0625% **;** 2 shows transfer of 10 cm^3 of copper sulfate to each beaker from previous beaker **;** 3 shows 10 cm^3 of **W** added to each beaker **;**	**3**
1(a)(ii)	1 *heading for independent variable*: percent(age) / %, concentration of, copper sulfate / **C** and to the left of the dependent variable **;** 2 *heading for dependent variable*: number of drops of, **P** / potassium manganate(VII) **;** 3 records the number of drops for each of five concentrations of, copper sulfate / **C ;** 4 expected trend (the higher the concentration of copper sulfate the more drops)**;** 5 results recorded in whole drops **;**	**5**
1(a)(iii)	the higher the concentration of copper sulfate, the higher the concentration of hydrogen peroxide **;**	**1**
1(a)(iv)	*any **one** from*: 1 size of drops varies **;** 2 difficulty of releasing **P** drop by drop / AW **;** 3 difficulty of observing the pink colour / AW **;**	**1**
1(a)(v)	records number of drops as whole number **;**	**1**
1(a)(vi)	estimates the concentration **R** using the candidate's results **;**	**1**
1(b)(i)	1 label on *x*-axis: concentration of inhibitor / mg cm^{-3} and label on *y*-axis: percentage inhibition of sucrase **;** 2 scale on *x*-axis: 0.5 to 2 cm, labelled at least every 2 cm and *y*-axis: 10.0 to 2 cm, labelled at least every 2 cm **;** 3 correct plotting of all five points using small dots in circles or crosses **;** 4 five plots joined with thin line passing through all points **;**	**4**
1(b)(ii)	shows both intercepts (one line drawn from the y-axis across to the line on the graph and one line drawn down from the graph line to the *x*-axis) **;**	**1**

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Question	Answer	Marks
1(b)(iii)	*any **one** from*: 1 binds to the enzyme's active site / allosteric site ; 2 changes active site shape ; *any **one** from*: 3 prevents substrate from binding / formation of enzyme substrate complexes ; 4 reduces the number of enzyme substrate complexes ;	**2**
1(b)(iv)	1 prepare known concentrations of reducing sugars ; 2 (test known concentrations with) Benedict's solution and heat to at least 80 °C ; 3 test sample with Benedict's and compare, time taken / final colour, to, standard / known, concentrations ;	**3**

Question	Answer	Marks
2(a)(i)	1 uses most of the available space and draws the upper epidermis as 3 lines and the lower epidermis as 2 lines ; 2 correct region of leaf section and no cells ; 3 draws correct proportions of the vascular tissue ; 4 draws subdivisions of the vascular tissue ; 5 label line to lower epidermis and label to identify the lower epidermis ;	**5**
2(a)(ii)	1 lines are continuous, thin and sharp and no shading ; 2 draws a line of four xylem vessel elements and each touches at least one other xylem vessel element ; 3 cell wall drawn as two lines and drawn around each cell ; 4 correct shape of cells ; 5 label line and label to identify the wall of one xylem vessel element ;	**5**

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<table>
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<tr><td>2(b)</td><td>states differences that are (only) observable features ;

any three from :

<table>
<tr><th>feature</th><th>M1</th><th>Fig. 2.2</th></tr>
<tr><td>number of vascular bundles</td><td>more</td><td>fewer ;</td></tr>
<tr><td>sizes of the vascular bundles</td><td>larger</td><td>smaller ;</td></tr>
<tr><td>presence of trichomes</td><td>absent</td><td>present ;</td></tr>
<tr><td>shape of leaf</td><td>straight</td><td>curled ;</td></tr>
</table>
</td><td>4</td></tr>
<tr><td>2(c)</td><td>1 states the correct length of the scale bar <u>and</u> appropriate units ;
2 states the correct length of the gap between the ends of the leaf (D–E) <u>and</u> appropriate units ;
3 shows the length for D–E divided by the length of the scale bar <u>and</u> multiplied by 145 μm ;
4 states correct answer ;</td><td>4</td></tr>
</table>

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International Education

Cambridge International AS & A Level

BIOLOGY **9700/35**

Paper 3 Advanced Practical Skills 1 **May/June 2025**

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks
1(a)(i)	1 states at least three concentrations of catalase (in addition to 100.0 and 0.0) ; 2 states the correct volume of catalase and water to make 20 cm^3 of each concentration ;	**2**
1(a)(ii)	1 *heading for independent variable*: percentage concentration of catalase and to the left of dependent variable ; 2 *heading for dependent variable*: number of drops ; 3 number of drops for each of the five concentrations of catalase ; 4 expected trend (the higher the concentration of catalase the more drops) ; 5 results recorded in whole drops ;	**5**
1(a)(iii)	correct description of the trend according to the candidates' results ; e.g. the greater the concentration of catalase the more drops	**1**
1(a)(iv)	1 the higher the concentration of catalase the more active sites available ; 2 increased number of enzyme substrate complexes ;	**2**
1(a)(v)	catalase concentration ;	**1**
1(a)(vi)	*any one from*: 1 volume of catalase ; 2 volume of hydrogen peroxide ; 3 concentration of hydrogen peroxide ; 4 time ;	**1**
1(a)(vii)	*any one from*: 1 drops already started being produced before timing started ; 2 drop size varies ; 3 drops too fast to count accurately ;	**2**
1(a)(viii)	1 states five different concentrations of hydrogen peroxide ; 2 states using the same concentration of catalase ;	**2**

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Question	Answer	Marks
1(b)(i)	1 label on *x*-axis: concentration of salt / mmol dm^{-3} and label on *y*-axis: catalase activity / arbitrary units ; 2 scale on *x*-axis: 100 to 2 cm, labelled at least every 2 cm and scale on *y*-axis: 20 to 2 cm, labelled at least every 2 cm ; 3 correct plotting of all six points using small dots in circles or crosses ; 4 six plots joined with thin line passing through all points ;	**4**
1(b)(ii)	1 shows interpolation lines on graph at catalase activity of 54 arbitrary units ; 2 correct estimate of concentration of salt solution according to candidate's graph ;	**2**

Question	Answer	Marks
2(a)(i)	1 uses most of the available space and shows at least three tissues ; 2 draws correct region of leaf section and no cells ; 3 draws correct proportions of the vascular tissue ; 4 draws correct subdivision of the vascular tissue ; 5 label line to cuticle and label to identify the cuticle ;	**5**
2(a)(ii)	1 lines are continuous, thin and sharp and no shading ; 2 draws a line of four cells and each cell touches at least one other cell ; 3 cell wall drawn as two lines ; 4 correct shape of cells ; 5 label line and label to identify the cell wall ;	**5**
2(b)(i)	1 states the correct number of eyepiece graticule units in 1.0 mm ; 2 shows division of 1000 by 45 ;	**2**
2(b)(ii)	1 states the correct number of eyepiece graticule units for the width of the leaf ; 2 multiplies this number of eyepiece graticule units by the answer from **(b)(i)** and appropriate units ;	**2**

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<tr><td>palisade layer</td><td>thin</td><td>thick ;</td></tr>
<tr><td>number of chloroplasts</td><td>low</td><td>high ;</td></tr>
<tr><td>sizes of the vascular bundles</td><td>large in proportion to width of leaf</td><td>small in proportion to width of leaf ;</td></tr>
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CAMBRIDGE
International Education

Cambridge International AS & A Level

BIOLOGY **9700/37**

Paper 3 Advanced Practical Skills 1 **May/June 2025**

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Question	Answer	Marks
1(a)(i)	diameter of the cylinder stated and the correct radius and appropriate units, mm or cm ;	**1**
1(a)(ii)	volume of **S** stated and a correct reason e.g. so that the cylinders of potato are completely submerged ;	**1**
1(a)(iii)	1 shows the surface area of one piece and the total surface area when n = 1 and h = 40 mm ; 2 shows the surface area of one piece and the total surface area when n = 16 and h = 2.5 mm ;	**2**
1(a)(iv)	(the total surface area) increases ;	**1**
1(a)(v)	1 *heading for independent variable*: number of pieces / cylinders of potato and to the left of the dependent variable ; 2 *heading for dependent variable*: total length with appropriate units (mm or cm) ; 3 length for each of the five cylinders of potato ; 4 expected trend (the higher number of pieces the shorter the total length) ; 5 results recorded in whole mm ;	**5**
1(a)(vi)	correct description of the trend according to the candidates' results ; e.g. as the surface area increases the length decreases	**1**
1(a)(vii)	(as the number of pieces of potato increases, there is an increase in the total surface area) *any **two** from:* 1 increases the (total) surface area in contact with the sodium chloride solution ; 2 increased surface area to volume ratio ; 3 (so) there is a shorter (diffusion) distance (to the cells in the middle of the potato cylinder) ;	**2**
1(a)(viii)	exactly lining up cylinders is difficult as there will be gaps between them and they are not straight / AW ;	**1**
1(a)(ix)	1 use, the same surface area / one length of plant tissue ; 2 use five different temperatures ;	**2**

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Question	Answer	Marks
1(b)(i)	1 *x*-axis: percentage concentration of sodium chloride and *y*-axis: percentage number of whole red blood cells remaining ; 2 scale on *x*-axis: 0.2 to 2 cm, labelled at least every 2 cm and scale on *y*-axis: 20 to 2 cm, labelled at least every 2 cm ; 3 correct plotting of all six points using small dots in circles or crosses ; 4 six plots joined with thin line passing through all points ;	**4**
1(b)(ii)	0.9% ;	**1**
1(b)(iii)	0.4% sodium chloride solution has a higher water potential than the red blood cells and water enters the cells and (so) they burst ;	**1**

Question	Answer	Marks
2(a)(i)	1 uses most of the available space ; 2 correct number of tissues and no cells ; 3 epidermis drawn as two lines close together ; 4 draws at least one vascular bundle divided into three areas ; 5 label line to phloem and label to identify the phloem ;	**5**
2(a)(ii)	1 lines are continuous, thin and sharp and no shading ; 2 draws a line of four xylem vessel elements and each touches at least one other xylem vessel element ; 3 cell wall drawn as two lines ; 4 at least two vessel elements drawn with more than four sides ; 5 label line and label to identify the lumen ;	**5**
2(b)(i)	1 shows division of 100 by 40 ; 2 correct answer (e.g. 2.5 μm) ;	**2**
2(b)(ii)	1 states the correct number of eyepiece graticule units along the section of vascular tissue **T** ; 2 multiplies this number of eyepiece graticule units by the answer in **(b)(i)** ;	**2**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(c)(i)</td><td>any three (differences) from :

<table>
<tr><th>feature</th><th>L1</th><th>Fig. 2.3</th></tr>
<tr><td>shape of organ</td><td>round</td><td>rectangular / irregular ;</td></tr>
<tr><td>position of vascular bundles</td><td>in a ring near the epidermis</td><td>scattered ;</td></tr>
<tr><td>sizes of the vascular bundles</td><td>all are a similar size</td><td>large and small sizes ;</td></tr>
<tr><td>arrangement of xylem vessels</td><td>in lines</td><td>scattered ;</td></tr>
</table></td><td>3</td></tr>
<tr><td>2(c)(ii)</td><td>correct identification of plant organ as a stem
<u>and</u>
correct observable feature that helped identification e.g. vascular bundles are in a ring near the epidermis on L1 ;</td><td>1</td></tr>
</table>

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CAMBRIDGE
International Education

Cambridge International AS & A Level

BIOLOGY **9700/38**

Paper 3 Advanced Practical Skills 2 **May/June 2025**

MARK SCHEME

Maximum Mark: 40

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 May/June 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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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 descriptions 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.
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Question	Answer	Marks
1(a)(i)	1 concentrations labelled under correct sequence of beakers: 0.5%, 0.25%, 0.125%, 0.0625% **;** 2 shows transfer of 10 cm^3 of copper sulfate to each beaker from previous beaker **;** 3 shows 10 cm^3 of **W** added to each beaker **;**	**3**
1(a)(ii)	1 *heading for independent variable*: percent(age) / %, concentration of, copper sulfate / **C** and to the left of the dependent variable **;** 2 *heading for dependent variable*: number of drops of, **P** / potassium manganate(VII) **;** 3 records the number of drops for each of five concentrations of, copper sulfate / **C ;** 4 expected trend (the higher the concentration of copper sulfate the more drops)**;** 5 results recorded in whole drops **;**	**5**
1(a)(iii)	the higher the concentration of copper sulfate, the higher the concentration of hydrogen peroxide **;**	**1**
1(a)(iv)	*any **one** from*: 1 size of drops varies **;** 2 difficulty of releasing **P** drop by drop / AW **;** 3 difficulty of observing the pink colour / AW **;**	**1**
1(a)(v)	records number of drops as whole number **;**	**1**
1(a)(vi)	estimates the concentration **R** using the candidate's results **;**	**1**
1(b)(i)	1 label on *x*-axis: concentration of inhibitor / mg cm^{-3} and label on *y*-axis: percentage inhibition of sucrase **;** 2 scale on *x*-axis: 0.5 to 2 cm, labelled at least every 2 cm and *y*-axis: 10.0 to 2 cm, labelled at least every 2 cm **;** 3 correct plotting of all five points using small dots in circles or crosses **;** 4 five plots joined with thin line passing through all points **;**	**4**
1(b)(ii)	shows both intercepts (one line drawn from the y-axis across to the line on the graph and one line drawn down from the graph line to the *x*-axis) **;**	**1**

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Question	Answer	Marks
1(b)(iii)	*any **one** from*: 1 binds to the enzyme's active site / allosteric site **;** 2 changes active site shape **;** *any **one** from*: 3 prevents substrate from binding / formation of enzyme substrate complexes **;** 4 reduces the number of enzyme substrate complexes **;**	**2**
1(b)(iv)	1 prepare known concentrations of reducing sugars **;** 2 (test known concentrations with) Benedict's solution and heat to at least 80 °C **;** 3 test sample with Benedict's and compare, time taken / final colour, to, standard / known, concentrations **;**	**3**

Question	Answer	Marks
2(a)(i)	1 uses most of the available space and draws the upper epidermis as 3 lines and the lower epidermis as 2 lines **;** 2 correct region of leaf section and no cells **;** 3 draws correct proportions of the vascular tissue **;** 4 draws subdivisions of the vascular tissue **;** 5 label line to lower epidermis and label to identify the lower epidermis **;**	**5**
2(a)(ii)	1 lines are continuous, thin and sharp and no shading **;** 2 draws a line of four xylem vessel elements and each touches at least one other xylem vessel element **;** 3 cell wall drawn as two lines and drawn around each cell **;** 4 correct shape of cells **;** 5 label line and label to identify the wall of one xylem vessel element **;**	**5**

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<tr><td>2(c)</td><td>1 states the correct length of the scale bar <u>and</u> appropriate units ;
2 states the correct length of the gap between the ends of the leaf (D–E) <u>and</u> appropriate units ;
3 shows the length for D–E divided by the length of the scale bar <u>and</u> multiplied by 145 μm ;
4 states correct answer ;</td><td>4</td></tr>
</table>

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