Cambridge International AS & A Level

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Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/31**

Paper 31 (Advanced Practical Skills 1) **May/June 2017**

MARK SCHEME

Maximum Mark: 40

Published

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Mark scheme abbreviations

;	separates marking points
/	alternative answers for the same point
R	reject
A	accept (for answers correctly cued by the question, or by extra guidance)
AW	alternative wording (where responses vary more than usual)
underline	actual word given must be used by candidate (grammatical variants accepted)
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
I	ignore

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Question	Answer	Marks
1(a)(i)	1 correct concentrations 0.05, 0.025, 0.0125, 0.00625 **+** % at least once **;** 2 shows transfer of 10 cm^3 of 0.05 (%) to next dilution + 10 cm^3 transferred from 2nd to 3rd beaker and from 3rd to 4th and from 4th to 5th **+** cm^3 at least once **;** 3 adds 10 cm^3 of water to each beaker **;**	**3**
1(a)(ii)	1 table drawn **+** heading, percentage concentration of vitamin C / **V ;** 2 heading, volume of DCPIP **+** cm^3 **;** 3 records volumes for at least four concentrations **;** 4 correct pattern of results, the volume for the highest concentration of vitamin C recorded as the highest volume **;**	**4**
1(a)(iii)	*idea of* colour change is difficult to judge **or** difficult to read the syringe **+** reason **;**	**1**
1(a)(iv)	records volume for solution **X ;**	**1**
1(a)(v)	correct estimate according to results **;**	**1**
1(a)(vi)	1 more / wider / narrower, range of concentrations or named concentrations **;** 2 plot a graph **;** 3 read off graph **;**	**3**

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Question	Answer	Marks
1(b)(i)	1 (*x*-axis) vegetable **+** (*y*-axis) vitamin C content / mg per 100 g **;** 2 even width of bars **+** scale on *y*-axis: 20 to 2 cm, labelled at least each 2 cm **;** 3 correct plotting of bars in the order of the table **;** 4 bars drawn with thin lines **+** labelled as in table **;**	**4**
1(b)(ii)	1 correct calculation of vitamin C remaining 79–44 **;** 2 shows division by 79 **+** multiplication by 100 **;**	**2**
1(b)(iii)	1 *idea of* membrane structure destroyed by heat **;** 2 vitamin C released from cells **or** vitamin C destroyed by heat **;**	**2**
	Total:	**21**

Question	Answer	Marks
2(a)(i)	1 minimum size at least 80 mm **+** at least 3 vascular bundles drawn **;** 2 no cells **+** only three vascular bundles **+** epidermis **;** 3 outer vascular bundles smaller than inner vascular bundles **;** 4 decides to subdivide vascular bundle into at least two areas **;** 5 uses one label line **+** one label to xylem **;**	**5**

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Question	Answer	Marks
2(a)(ii)	1 measurements for both **L** and **T** ; 2 **L** at least 3 times larger than **T** ;	**2**
2(a)(iii)	1 quality of line for outer wall of cells (thin line) **+** minimum size at least 40 mm across largest cell **+** no shading ; 2 **only** four cells drawn, each cell touching at least one other cell ; 3 correct proportions of depth to length of epidermal cells using measurements in **(a)(ii)** ; 4 cells drawn with upper convex walls ; 5 uses one label line **+** one label to cell wall ;	**5**
2(a)(iv)	many stomata **or** large air spaces ;	**1**
2(b)	1 shows multiplication by 1000 to convert measurement from mm to μm ; 2 displays number divided by 1460 ; 3 correct answer ;	**3**
2(c)	any 3 correct differences annotated on Fig 2.2 ;;;	**3**
	Total:	**19**

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BIOLOGY **9700/32**

Paper 32 (Advanced Practical Skills 2) **May/June 2017**

MARK SCHEME

Maximum Mark: 40

Published

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ora	or reverse argument
mp	marking point (with relevant number)
ecf	error carried forward
I	ignore

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Question	Answer	Marks
1(a)(i)	1 correct concentrations 0.03 (3×10^{-2}), 0.003 (3×10^{-3}), 0.0003 (3×10^{-4}), 0.00003 (3×10^{-5}) **+** % at least once **;** 2 shows transfer of 1 cm^3 of 0.3% from 2nd to 3rd beaker and transfer of 1 cm^3 of 0.03% from 3rd to 4th beaker and transfer of 1 cm^3 of 0.003% from 4th to 5th beaker **+** cm^3 **;** 3 adds 9 cm^3 of water to each beaker **;**	**3**
1(a)(ii)	1 table drawn **+** heading, percentage concentration of **S** **;** 2 heading, time **+** seconds **;** 3 records time for **W +** times for at least four concentrations of molecule **S** **;** 4 correct pattern of results, the time for the highest concentration of molecule **S** recorded as the longest time compared to the other concentrations of molecule **S** **;** 5 times recorded as whole seconds **;**	**5**
1(a)(iii)	1 reference to inhibition **;** 2 reference to substrate unable to bind to active site **;** 3 fewer, enzyme-substrate complexes / ESCs, formed **;**	**3**
1(a)(iv)	records time to reach end-point for solution **X** **;**	**1**
1(a)(v)	correct estimate according to results **;**	**1**
1(a)(vi)	appropriate error with reason, e.g. colour change of litmus paper **+** difficult to judge **;**	**1**
1(a)(vii)	1 increase number of concentrations (of **S**) or examples of concentrations **;** 2 between named concentrations (of **S**) or use simple / proportional dilution to make concentrations **;** 3 reference to drawing a graph and reading off estimate of the concentration of **S** in solution **X** or replication of new procedure **;**	**3**

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Question	Answer	Marks
1(b)(i)	1 (*x*-axis) organism **+** (*y*-axis) mercury concentration in tissue samples / ppm **;** 2 even width of bars **+** scale on *y*-axis: 10 to 2 cm, labelled at least each 2 cm **;** 3 correct plotting of five bars in the order of the table **;** 4 five bars drawn with thin lines **+** labelled as named organism in table **;**	**4**
1(b)(ii)	correct calculation of mean (19.1);	**1**
	Total:	**22**

Question	Answer	Marks
2(a)(i)	1 minimum size at least 90 mm **+** at least 3 vascular bundles drawn **;** 2 no cells **+** at least one enclosed area beneath epidermis with each end of enclosed area touching epidermis **+** only 3 vascular bundles drawn **;** 3 decides to subdivide vascular bundle into at least two areas **;** 4 epidermis drawn as two lines **;** 5 uses one label line **+** one label to xylem **;**	**5**
2(a)(ii)	1 quality of line for outer wall of cells (thin line) **+** minimum size at least 40 mm across largest cell **+** no shading **;** 2 only four cells drawn, each cell touching at least two other cells **;** 3 cell walls drawn as two lines close together **;** 4 at least one cell drawn with at least five sides **;** 5 uses one label line **+** one label to cell wall **;**	**5**
2(b)(i)	1 organises comparison into three columns with one column for features, one column headed **M1** and one column headed **Fig. 2.1** **;** 2, 3, 4 any three observable differences of comparison **;;;**	**4**
2(b)(ii)	1 shows squares counted on **Fig. 2.2** **;** 2 uses correct units (cm^2) for area of xylem tissue and area of vascular bundle **;**	**2**
2(b)(iii)	1 shows value for area of xylem tissue divided by value for area of vascular bundle × 100 **;** 2 shows answer to appropriate degree of accuracy **;**	**2**
	Total:	**18**

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BIOLOGY **9700/33**

Paper 33 (Advanced Practical Skills 1) **May/June 2017**

MARK SCHEME

Maximum Mark: 40

Published

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ora	or reverse argument
mp	marking point (with relevant number)
ecf	error carried forward
I	ignore
AVP	alternative valid point

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Question	Answer	Marks
1(a)	1 line for concentration of reducing sugar increases from zero ; 2 line for concentration of reducing sugar horizontal (where line for concentration of biological molecule horizontal) ;	**2**
1(b)(i)	1 iodine solution **+** stated number of drops or stated volume ; 2 records colour **+** degree of colour (blue / black) ;	**2**
1(b)(ii)	1 states volume of sample **+** volume of Benedict's solution **+** equal volume or in excess ; 2 states temperature (80 °C or higher or boiling) ; 3 reference to shortest time to colour change ;	**3**
1(b)(iii)	1 table drawn **+** heading, colour (starch test) ; 2 heading, time **+** seconds (reducing sugar test) ; 3 records colours for at least four concentrations of samples (starch test) ; 4 records times for at least four concentrations of samples (reducing sugar test) ; 5 times recorded as whole seconds ;	**5**
1(b)(iv)	1 correct **S2 + S4** ; 2 correct **S1 + S3** ;	**2**
1(b)(v)	1 no starch as hydrolysed **or** all reducing sugar from hydrolysis ;	**1**

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Question	Answer	Marks
1(c)	1 5 or more concentrations of reducing sugar **;** 2 made by proportional dilution **or** simple dilution **or** serial dilution **;** 3 reference to comparing results of unknown concentration to results for known concentrations **or** reference to drawing graph and reading off **;**	**3**
	Total:	**18**

Question	Answer	Marks
2(a)(i)	1 states 4 measurements (**L** to **Q**, **L** to **M**, **M** to **N**, **N** to **Q**) **;** 2 **M** to **N** lowest value **;** 3 measurements of **L** to **Q** equal to sum of other measurements **;**	**3**
2(a)(ii)	1 correct sum of **L** to **M** and **N** to **Q** **;** 2 shows division by the measurement for **L** to **Q** multiplied by 100 **;** 3 answer to the appropriate degree of accuracy **;**	**3**
2(a)(iii)	1 minimum size at least 90 mm **+** at least three lines drawn **;** 2 no cells **+** draws correct half of the root **;** 3 stele drawn in correct proportion to the diameter of the root **;** 4 draws outline of xylem correctly **;** 5 uses one label line **+** label to xylem **;**	**5**

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Question	Answer	Marks
2(a)(iv)	1 quality of line for outer wall of cell (thin line) **+** minimum size at least 40 mm **;** 2 only four cells drawn **+** each cell touching at least two of the other cells **;** 3 cell wall drawn as two lines close together **;** 4 at least one cell with five sides or more **;** 5 uses one label line **+** one label to cell wall **;**	**5**
2(b)(i)	1 (*x*-axis) height / m; 2 scale on *x*-axis: 10 to 2 cm, labelled at least each 2 cm **+** origin labelled 50 **;** 3 correct plotting of five points with a small cross or dot in circle **;** 4 five plots joined point to point or as a line of best fit drawn as a ruled thin line **;**	**4**
2(b)(ii)	*max 2 of:* 1 (cohesion) water molecules joined to other water molecules **;** 2 (adhesion) water molecules joined to walls of xylem vessel elements **;** 3 water pulled up xylem or reference to supporting column of water **;**	**2**
	Total:	**22**

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BIOLOGY **9700/34**

Paper 34 (Advanced Practical Skills 2) **May/June 2017**

MARK SCHEME

Maximum Mark: 40

Published

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ecf	error carried forward
I	ignore

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Question	Answer	Marks
1(a)(i)	1 at least 4 more concentrations **;** 2 correct volumes of **10M** **;** 3 volumes of **10M** and **W** add up to 10 **;**	**3**
1(a)(ii)	1 table drawn **+** heading, percentage / % conc(entration) **+** (molecule) **M** **;** 2 heading, time **+** s **;** 3 records, times for at least 4 concentrations **;** 4 correct trend in results **;** 5 (for times) whole numbers only **;**	**5**
1(a)(iii)	records as whole number **+** correct unit **;**	**1**
1(a)(iv)	correct estimate for their results **+** % **;**	**1**
1(a)(v)	1 more / wider / narrower range of concentrations **or** named examples **;** 2 concentrations between named concentrations **or** within range they have stated in and **(a)(ii)** and **(a)(iv)** **;** 3 draw graph **+** explain how to read off graph **;**	**3**
1(b)(i)	1 (*x*-axis) concentration of solution of molecule **M** (/) μg cm^{-3} **+** (*y*-axis) inhibition area (/) mm^2 **;** 2 (scale for *x*-axis) : 20 to 2 cm, labelled each 2 cm **+** (scale for *y*-axis) 20 to 2 cm, labelled each 2 cm **;** 3 correct plotting of 6 points **;** 4 6 plots joined point to point drawn as a ruled thin line **;**	**4**

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Question	Answer	Marks
1(b)(ii)	correct estimate **+** mm^2 using candidates graph **;**	**1**
1(b)(iii)	bacteria has not, multiplied / grown **or** bacteria, killed / destroyed **;**	**1**
1(b)(iv)	*max 2* 1 correct reference to cell, wall / membrane **;** 2 cell / bacterial lysis **or** cells / bacteria burst **;** 3 *idea of* inhibition of transcription / translation / protein synthesis **;** 4 *idea of* inhibition of cell division **;** 5 acts as an enzyme inhibitor **;** 6 *idea of* inhibiting DNA replication / synthesis **;**	**2**
	Total:	**21**

Question	Answer	Marks
2(a)(i)	1 states 4 measurements (**T**, **L1**, **P**, **Q** and **L2**) **;** 2 **L1** and **L2** have to be smaller values than **P** and **Q** **;** 3 measurement of **T** = sum of other measurements **;**	**3**
2(a)(ii)	1 uses measurements of epg units **T + P** or **Q** (whichever is smaller) **;** 2 Larger number to smaller number **;** 3 To lowest common denominator **;**	**3**
2(a)(iii)	1 minimum size at least 90 mm **+** at least 3 lines **+** no shading **;** 2 No cells **+** at least one vascular bundle **+** correct section drawn **;** 3 correct proportion of palisade to whole depth of leaf **;** 4 epidermis drawn as two lines **+** one epidermis thinner than the other **;** 5 uses one label line **+** one label to the palisade layer **;**	**5**
2(a)(iv)	1 quality of line for outer wall of cells (thin line) **+** minimum size at least 40 mm across largest cell **+** no shading **;** 2 **only** four cells drawn in a line, each cell touching at least one other cell **;** 3 cell wall drawn as two lines close together **;** 4 shows inclusion in at least one cell **or** cells drawn with convex walls **;** 5 uses one label line **+** one label to cell wall **;**	**5**

Question	Answer	Marks
2(b)	*max 3* any 3 correct differences annotated on Fig 2.3 **;;;**	**3**
	Total:	**19**

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BIOLOGY **9700/35**

Paper 35 (Advanced Practical Skills 1) **May/June 2017**

MARK SCHEME

Maximum Mark: 40

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ora	or reverse argument
mp	marking point (with relevant number)
ecf	error carried forward
I	ignore
AVP	alternative valid point

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Question	Answer	Marks
1(a)(i)	appropriate volume of water used **;**	**1**
1(a)(ii)	1 correct concentrations under each beaker: 0.5, 0.25, 0.125, 0.0625 **+** % **;** 2 shows transfer of 10 cm^3 of 0.5% from 2nd to 3rd beaker and transfer of 10 cm^3 of 0.25% from 3rd to 4th beaker and transfer of 10 cm^3 of 0.125% from 4th to 5th beaker **+** cm^3 **;** 3 adds 10 cm^3 of water to each beaker **;**	**3**
1(a)(iii)	1 table drawn **+** heading, percentage concentration of **R or** reducing sugar **;** 2 heading, time **+** seconds **;** 3 records time for at least four concentrations of **R ;** 4 correct pattern of results, the time for the highest concentration of **R** is recorded as shortest time **;** 5 times recorded as whole seconds **;**	**5**
1(a)(iv)	appropriate error with reason, e.g. colour change **+** difficult to judge **;**	**1**
1(a)(v)	records time taken for the first colour change for sample **X +** seconds **;**	**1**
1(a)(vi)	1 correctly labels Fig.1.3 with glucose concentrations **;** 2 correctly places **X** on Fig.1.3 in the correct position according to results **;**	**2**
1(a)(vii)	1 increase number of concentrations (of **R**) or examples of concentrations **;** 2 uses proportional / simple dilution **or** serial dilution to make concentrations **;** 3 reference to drawing a graph and reading off estimate for the concentration of reducing sugar in sample **X** **or** comparing times for sample with times for known concentrations of **R ;**	**3**

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Question	Answer	Marks
1(b)(i)	1 (*x*-axis) temperature / °C **+** (*y*-axis) absorbance of light by the coloured solution / arbitrary units **;** 2 scale on *x*-axis: 10 to 2 cm, labelled at least each 2 cm + origin labelled 30 **+** scale on *y*-axis: 0.2 to 2 cm, labelled at least each 2 cm **;** 3 correct plotting of five points with a small cross or dot in a circle **;** 4 five plots joined with thin line **or** joined plot to plot **or** joined as a smooth curve **;**	**4**
1(b)(ii)	*max 3 of:* 1 (at 49 °C) reference to kinetic energy **;** 2 successful collisions **or** more enzyme substrate complexes **;** 3 (at 70 °C) reference to changing shape of active site or enzyme denatures **;** 4 substrate unable to bind or fewer enzyme substrate complexes **;**	**3**
	Total:	**23**

Question	Answer	Marks
2(a)(i)	records measurements of the depth of the leaf **and** the depth of the vascular bundle (in eyepiece graticule units) **;**	**1**
2(a)(ii)	1 shows measurement of the vascular bundle divided by the measurement of the width of the leaf multiplied by 100 **;** 2 shows the answer to the appropriate degree of accuracy **;**	**2**

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Question	Answer	Marks
2(a)(iii)	1 minimum size at least 90 mm **+** at least 4 lines drawn **+** no shading **;** 2 no cells **+** draws correct section of leaf **;** 3 draws correct proportion of the vascular bundle in relation to the depth of the leaf **;** 4 correct shape of the vascular bundle **;** 5 uses one label line **+** one label to the vascular bundle **;**	**5**
2(a)(iv)	1 quality of the line for the outer wall of vessel elements (thin line) **+** minimum size of at least 40 mm across the largest vessel element **;** 2 only four vessel elements drawn, each touching at least one of the other vessel elements **;** 3 walls of vessel elements drawn as two lines **;** 4 at least one vessel element drawn with more than four sides **;** 5 uses one label line **+** one label to lumen **;**	**5**
2(b)	1 organises comparison into three columns with one column for features, one column headed **L1** and one column headed **Fig. 2.3** **;** 2, 3, 4 any three observable differences of comparison **;;;**	**4**
	Total:	**17**