Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/31**

Paper 3 Paper 31 (Advanced Practical Skills 1) **May/June 2020**

MARK SCHEME

Maximum Mark: 40

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

© UCLES 2020

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.

© UCLES 2020

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.

© UCLES 2020

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.

© UCLES 2020

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.

Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same marking point
R	reject
A	accept
I	ignore
AVP	any valid point
AW	alternative wording (where responses vary more than usual)
ecf	error carried forward
underline	actual word underlined must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument

© UCLES 2020

Question	Answer	Marks
1(a)(i)	*risk:* medium **or** high and states reason with correct reference to hazard **;**	**1**
1(a)(ii)	1 *labels under correct sequence of beakers:* 0.01, 0.001, 0.0001 and % once **;** 2 shows transfer of 1 (cm^3) from second beaker to third beaker and 1(cm^3) from third beaker to fourth beaker and 1 (cm^3) from fourth beaker to fifth beaker and cm^3 once **;** 3 shows 9 (cm^3) of **W** added to each beaker and cm^3 once **;**	**3**
1(a)(iii)	time for **H** recorded **;**	**1**
1(a)(iv)	1 *heading for independent variable:* invertase / **E** and concentration and % **;** 2 *heading for dependent variable:* time taken for first colour change and seconds / s **;** 3 readings for at least four concentrations **;** 4 shortest time is for 1%**;** 5 records results to nearest second **;**	**5**
1(a)(v)	correct interpretation from table **;**	**1**
1(a)(vi)	*any three from:* 1 use concentrations of invertase solution within a narrower range either side of estimated concentration of **H** **;** 2 repeat and calculate a mean for each concentration **;** 3 *ref. to* staggered start / *ref. to* complete experiment for each concentration before moving on to next **;** 4 maintain water-bath at 30°C**;** 5 *ref. to* considering that honey extract may contain sucrose / reducing sugar / glucose **;**	**3**
1(b)(i)	1 *x*-axis: storage time / weeks and *y*-axis: percentage concentration of sucrose **;** 2 scale on *x*-axis: 5 (weeks) to 2 cm and scale on *y*-axis: 0.5(%) to 2 cm **;** 3 correct plotting of all points using small crosses or dots in circle **;** 4 points joined with a thin line passing through all points as either a line of best fit or straight lines joining each point to the next **;**	**4**

© UCLES 2020

Question	Answer	Marks
1(b)(ii)	*any two from:* 1 decrease over time ; 2 *ref. to* levelling off / reduced gradient over time ; 3 use of data to support ;	**2**
1(b)(iii)	1 glucose and fructose ; 2 invertase in honey breaks down the sucrose ;	**2**
2(a)(i)	**Slide J1 *Helianthus* stem** 1 suitable size and no shading ; 2 draws only sector and no cells ; 3 correct proportions of tissues ; 4 correct shapes and number of tissues / layers ; 5 label line and label to epidermis ;	**5**
2(a)(ii)	1 suitable size and lines continuous, thin and sharp ; 2 draws only three whole cells ; 3 draws (xylem) cells with suitable wall thickness ; 4 draws two lines around each cell and three lines where two cells touch ; 5 label line and label to lumen in one vessel element only ;	**5**
2(b)(i)	1 records measured length of line **X**–**Y** and measured length of scale bar ; **A** suitable range of measurements based on printed diagram 2 divides measured length of line **X**–**Y** by measured length of scale bar ; *ecf from mp1* 3 multiplies answer by 1.5 (length represented by scale bar) ; *ecf from mp2* 4 correct units for final answer (mm) ; *or* 1 records measured length of line **X**–**Y** and measured length of scale bar ; **A** suitable range of measurements based on printed diagram 2 divides 1.5 (length represented by scale bar) by measured length of scale bar ; *ecf from mp1* 3 multiplies answer by measured length of line **X**–**Y** ; *ecf from mp2* 4 correct units for final answer (mm) ;	**4**

© UCLES 2020

Question	Answer	Marks
2(b)(ii)	*any three from:* 1 position of vascular bundles (**J1** around the edge, Fig. 2.2 in central region) **;** 2 number of vascular bundles (more present in **J1** than in Fig. 2.2) **;** 3 size of air spaces (large / larger in Fig. 2.2) **;** 4 number of air spaces (**J1** has no / few air spaces, Fig. 2.2 has many) **;** 5 thickness of epidermis (Fig. 2.2 has a thinner epidermis compared with **J1**) **;**	**3**
2(b)(iii)	*any one from:* 1 numerous / large air spaces (for buoyancy) **;** 2 central / single vascular bundle (for flexibility) **/** minimal support needed in water **;** 3 thin / absent cuticle (for gas exchange) **;**	**1**

© UCLES 2020

Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/32**

Paper 3 Paper 32 (Advanced Practical Skills 2) **May/June 2020**

MARK SCHEME

Maximum Mark: 40

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

© UCLES 2020

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.

© UCLES 2020

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.

© UCLES 2020

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.

© UCLES 2020

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.

Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same marking point
R	reject
A	accept
I	ignore
AVP	any valid point
AW	alternative wording (where responses vary more than usual)
ecf	error carried forward
underline	actual word underlined must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument

© UCLES 2020

Question	Answer	Marks
1(a)(i)	three concentrations given between 4.0% and 0.0% **;** correct corresponding volumes of water and 4% sodium chloride solution **;**	**2**
1(a)(ii)	states at least 20 as the total number of cells in the sample **;**	**1**
1(a)(iii)	1 *heading for independent variable:* concentration of sodium chloride solution / AW and % **;** 2 *heading for dependent variable:* number of plasmolysed cells **;** 3 *expected pattern:* **W** has lower number of plasmolysed cells than 4.0% sodium chloride solution **;**	**3**
1(a)(iv)	1 lines are continuous, thin and sharp and at least two enclosed areas **;** 2 draws only three cells and each cell touching at least one of the other cells **;** 3 shows plasmolysis in at least one cell **;** 4 label line and label to the cell surface membrane **;**	**4**
1(a)(v)	1 water potential in (4.0%) sodium chloride solution is, lower / more negative, than in cells **; ora** 2 water lost from cells by osmosis / cell volume shrinks / cell surface membrane comes away from the cell wall **;**	**2**
1(a)(vi)	*any two from:* 1 count more cells for each solution tested **;** 2 count cells in more than one sample from each solution tested **;** 3 (if more than one sample per solution) calculate the mean number of plasmolysed cells per sample in each solution tested **;** 4 photograph image and count **;** 5 AVP **;** e.g. use a different piece of onion tissue use a greater, range / number, of concentrations	**2**
1(b)(i)	-2.60 **;** (*anomalous result (-1.60) not included in mean calculation)*	**1**

© UCLES 2020

Question	Answer	Marks
1(b)(ii)	1 *x*-axis: concentration of sucrose solution / mol dm^{-3} and *y*-axis : mean percentage change in length / mean % change in length ; 2 scale on *x*-axis: 0.2 mol dm^{-3} to 2 cm and scale on *y*-axis: 1% to 2 cm ; 3 correct plotting of six points using small crosses or dots in circles ; 4 points joined with a thin line passing through all points as either a smooth curve or straight lines joining each point to the next ;	**4**
1(b)(iii)	1 correct reading of sucrose concentration on Fig. 1.3 at which there is 0% change in length ; 2 correct reading of water potential value on Fig. 1.4 corresponding to the sucrose concentration from mp1 ; 3 show on graphs (Fig. 1.3 and Fig.1.4) how values were obtained for mp1 and mp2 ;	**3**

© UCLES 2020

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)(i)</td><td>shorter time for A than for B ;</td><td>1</td></tr>
<tr><td>2(a)(ii)</td><td>any one from:
1 coloured water did not reach top of slide in a uniform manner ;
2 delay in, starting / stopping, stop-watch ;</td><td>1</td></tr>
<tr><td>2(a)(iii)</td><td>narrower xylem leads to faster movement of water ;</td><td>1</td></tr>
<tr><td>2(b)(i)</td><td>1 suitable size <u>and</u> no shading ;
2 draws only outline of tissues <u>and</u> no cells ;
3 correct proportions drawn ;
4 vascular tissue subdivided ;
5 correct distribution of tissues <u>and</u> minimum three layers of tissues ;
6 label line <u>and</u> label to upper epidermis ;</td><td>6</td></tr>
<tr><td>2(b)(ii)</td><td>1 records only observable features ;

2, 3 and 4
any three from:
<table>
<tr><th>feature</th><th>Fig. 2.4</th><th>Fig. 2.5</th><th></th></tr>
<tr><td>epidermis</td><td>thick(er) / two cells thick</td><td>thin(ner) / one cell thick</td><td>;</td></tr>
<tr><td rowspan="2">vascular bundles</td><td>positioned towards top of midrib</td><td>positioned in centre of midrib</td><td>;</td></tr>
<tr><td>larger (in relation to width of T.S)</td><td>smaller (in relation to width of T.S)</td><td>;</td></tr>
<tr><td>lower surface of leaf</td><td>has infoldings / spaces / AW</td><td>continuous / smooth / no infoldings / no spaces</td><td>;</td></tr>
<tr><td>spongy mesophyll</td><td>more / bigger, air spaces</td><td>fewer / smaller, air spaces</td><td>;</td></tr>
<tr><td>width of section</td><td>more cell layers</td><td>fewer cell layers</td><td>;</td></tr>
<tr><td>hairs</td><td>not present</td><td>present (upper and lower epidermis)</td><td>;</td></tr>
</table></td><td>4</td></tr>
</table>

© UCLES 2020

Question	Answer	Marks
2(c)(i)	1 records measured length of line **Z** ; **A** suitable range of measurements based on printed diagram 2 shows mm and converts to μm by multiplying by 1000 and shows division by magnification (× 200) ; 3 appropriate units for final answer (μm) ; 4 shows answer to two or three significant figures ;	**4**
2(c)(ii)	stage micrometer ;	**1**

© UCLES 2020

Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/33**

Paper 3 Paper 33 (Advanced Practical Skills 1) **May/June 2020**

MARK SCHEME

Maximum Mark: 40

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

© UCLES 2020

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.

© UCLES 2020

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.

© UCLES 2020

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.

© UCLES 2020

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.

Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same marking point
R	reject
A	accept
I	ignore
AVP	any valid point
AW	alternative wording (where responses vary more than usual)
ecf	error carried forward
underline	actual word underlined must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument

© UCLES 2020

Question	Answer	Marks
1(a)(i)	at least three concentrations (between 20% and 12%) ; correct volumes of **G** and **W** to make total volumes of 10 cm^3 for each concentration ;	**2**
1(a)(ii)	1 *heading for independent variable:* percentage concentration of glucose and to left of dependent variable ; 2 *heading for dependent variable:* time and units ; 3 records results for at least four concentrations ; 4 *expected trend:* highest percentage concentration of glucose has the shortest time to end-point ; 5 records time as whole seconds ;	**5**
1(a)(iii)	time for **U** is closest to the result for 20% glucose ;	**1**
1(a)(iv)	correct estimate for **U** according to results ;	**1**
1(a)(v)	1 use a narrower range of concentrations centred around the estimate of **U** ; 2 use at least five more concentrations ; 3 plot a graph for the standards and read off the result for **U** ; 4 repeat measurements for all standard concentrations and for **U** and calculate means ; 5 method to measure time to end-point more accurately ; e.g. use of colorimeter described record video of reaction including timer use several independent observers 6 run experiments one at a time / stagger the start times ;	**3**
1(a)(vi)	1 *idea that* starting reactions with all concentrations at the same time makes it difficult to accurately record all end-points at the moment each is reached ; 2 difficult to judge the end-point ;	**2**
1(a)(vii)	*any one from:* 1 time each concentration separately ; 2 use a colorimeter qualified ; 3 AVP ; e.g. record video of reaction including timer use several independent observers	**1**

© UCLES 2020

Question	Answer	Marks
1(b)	1 *x*-axis: time / hours and *y*-axis: glucose concentration / mmol dm^{-3} ; 2 scale on *x*-axis: 0.5 to 2 cm, labelled at least every 2 cm and *y*-axis: 2 to 2 cm, labelled at least every 2 cm *or* 1 to 2 cm starting at 5.0, labelled at least every 2 cm ; 3 correct plotting of all points using small crosses or dots in circles ; 4 points joined with thin line passing through all points as either a smooth curve or straight lines joining each point to the next ;	4
2(a)(i)	**TS Iris root** 1 suitable size and no shading and draws at least five layers of tissue ; 2 draws whole root section and no cells ; 3 draws correct shape (not round) ; 4 shows correct distribution of tissues (air spaces, vascular tissue) ; 5 label line and label to endodermis ;	5
2(a)(ii)	1 suitable size and draws lines that are continuous, thin and sharp ; 2 draws one large xylem vessel and three small xylem vessels and each smaller cell touches the large xylem vessel and at least one other smaller cell ; 3 draws two lines around each cell and three lines where cells touch ; 4 draws cells with irregular (angular) shapes ; 5 label line and label to cell wall ;	5

© UCLES 2020

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(b)</td><td>1 record only differences (shape, position, fine detail) not similarities ;

2, 3 and 4
any three from:

<table>
<tr><th>feature</th><th>K1</th><th>Fig 2.1</th><th></th></tr>
<tr><td>large xylem vessels</td><td>few(er)</td><td>many / more</td><td>;</td></tr>
<tr><td>vascular bundles</td><td>small(er)</td><td>large(r)</td><td>;</td></tr>
<tr><td>(relative) number of air spaces</td><td>many / more</td><td>few(er)</td><td>;</td></tr>
<tr><td>(relative) size of air spaces</td><td>large(r)</td><td>small(er)</td><td>;</td></tr>
<tr><td>shape of air spaces</td><td>long(er) and thin(ner)</td><td>small(er) and round(er)</td><td>;</td></tr>
</table></td><td>4</td></tr>
<tr><td>2(c)(i)</td><td>correct measurements for cell Q (line q) and cell T (line t) ;
A suitable range of measurements based on printed diagram
same units for diameters of Q and T ;</td><td>2</td></tr>
<tr><td>2(c)(ii)</td><td>1 shows measurement of t divided by measurement of q and ×100 / shows measurement of q divided by measurement of t and ×100 ;
2 shows 100 – answer to mp1 ;
3 shows correct answer ;

or
1 shows measurement of t minus measurement of q and ×100 / shows measurement of q minus measurement of t ;
2 shows difference in measurements (mp1) divided by measurement of q and ×100 / shows difference in measurements (mp1) divided by measurement of t and ×100 ;
3 shows correct answer ;</td><td>3</td></tr>
</table>

Question	Answer	Marks
2(c)(iii)	*any two from:* *idea of:* 1 more adhesion (H bonds) between water molecules and, lignin / cellulose / cell walls, in narrower xylem vessels **; ora** 2 (so) more resistance to flow (in narrower xylem vessels) **; ora** 3 (so) supports greater height of water column (in narrower xylem vessels) **; ora** 4 cohesion (H bonds) between water molecules harder to break (in narrower xylem vessels) **; ora**	**2**

© UCLES 2020

Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/34**

Paper 3 Paper 34 (Advanced Practical Skills 2) **May/June 2020**

MARK SCHEME

Maximum Mark: 40

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

© UCLES 2020

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.

© UCLES 2020

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.

© UCLES 2020

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.

© UCLES 2020

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.

Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same marking point
R	reject
A	accept
I	ignore
AVP	any valid point
AW	alternative wording (where responses vary more than usual)
ecf	error carried forward
underline	actual word underlined must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument

© UCLES 2020

Question	Answer	Marks
1(a)(i)	1 at least three additional concentrations (between 10 and 0) ; 2 correct volumes of **S** and **W** to make total volumes of 50 cm^3 for each concentration ;	**2**
1(a)(ii)	states a volume that is between 30 cm^3 and 50 cm^3 ;	**1**
1(a)(iii)	1 *heading for independent variable:* concentration and percentage and to the left of the dependent variable ; 2 *heading for dependent variable:* distance and mm *or* cm ; 3 records results for at least four concentrations ; 4 *correct trend*: 10% concentration of sodium chloride has the largest distance ; 5 records distance as whole mm or to 0.5 mm ;	**5**
1(a)(iv)	time for **U** is closest to the result for 5% sodium chloride ;	**1**
1(a)(v)	1 the 10% sodium chloride solution had a lower water potential than the potato cells / the potato cells had a higher water potential than the 10% sodium chloride solution ; 2 the 0% sodium chloride solution had a higher water potential than the potato cells / the potato cells had a lower water potential than the 0% sodium chloride solution ;	**2**
1(a)(vi)	distance ;	**1**
1(a)(vii)	*any three from:* 1 use a narrower range of concentrations centred around the estimate of **U** ; 2 use at least five more concentrations (of sodium chloride) ; 3 use a protractor (to measure the angle of bend) ; 4 use a distance that is greater than 3 cm from where the potato piece is held to where it is pushed ; 5 use a method to ensure potato pieces are of the same thickness ; e.g. use same cork borer for all pieces 6 run experiments one at a time / stagger the start times ; 7 plot a graph for the standards and read off the result for **U** ; 8 repeat measurements for each concentration, including **U**, and calculate the mean ;	**3**

© UCLES 2020

Question	Answer	Marks
1(a)(viii)	ruler / graph paper and no effect (on estimating the concentration of **U**) and (because) the same, ruler / graph paper was used each time / the error was the same each time *or* ruler / graph paper and has an affect (on measured result) and (because) the true value will not be that measured *or* syringe and has an effect and (because) the concentrations will be different to those required *or* syringe and has no effect and (because) the concentrations will be the same since the proportions of **S** and **W** will be the same **;**	**1**
1(b)(i)	1 *x*-axis: temperature / °C and *y*-axis: number of molecules per mm^2 **;** 2 scale on *x*-axis: 20 to 2 cm, labelled at least every 2 cm and scale on *y*-axis: 5 to 2 cm, labelled at least every 2 cm **;** 3 correct plotting of all points using small crosses or dots in circles**;** 4 points joined with thin line passing through all points as either a smooth curve or straight lines joining each point to the next **;**	**4**
1(b)(ii)	1 as the temperature increases the number of molecules (diffusing) per mm^2 (of membrane) increases **;** 2 (because) the higher the temperature the, higher the kinetic energy of the molecules / the greater the permeability of the membrane **;**	**2**

Question	Answer	Marks
2(a)(i)	**TS *Ammophila*** 1 suitable size and no shading **;** 2 correct shape of outline of whole section of the leaf on **N1** and no cells drawn **;** 3 correct distribution and proportions of tissues **;** 4 vascular tissue subdivided **;** 5 label line and label to epidermis **;**	**5**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)(ii)</td><td>TS Ammophila

1 suitable size <u>and</u> draws lines that are continuous, thin and sharp ;
2 draws three epidermal cells that are adjacent and touching <u>and</u> with a trichome attached to <u>one</u> of the cells ;
3 draws two lines drawn around each cell <u>and</u> three lines where cells touch ;
4 draws at least one cell with rounded shape ;
5 label line and label to cell wall ;</td><td>5</td></tr>
<tr><td>2(b)</td><td>1 records only observable differences ;

2, 3 and 4
any three from:

<table>
<tr><th>feature</th><th>N1</th><th>Fig. 2.1</th><th></th></tr>
<tr><td>shape</td><td>rolled / AW</td><td>round</td><td>;</td></tr>
<tr><td>epidermal cell walls</td><td>thick(er)</td><td>thin(ner)</td><td>;</td></tr>
<tr><td>layer under epidermis</td><td>thick(er) / more than one layer</td><td>thin(ner) / one layer</td><td>;</td></tr>
<tr><td>upper epidermis</td><td>folded / irregular / AW</td><td>smooth</td><td>;</td></tr>
<tr><td>trichomes</td><td>present / many</td><td>absent / none</td><td>;</td></tr>
<tr><td>number of vascular bundles</td><td>many / more</td><td>few(er) / one</td><td>;</td></tr>
<tr><td>shape of vascular bundle</td><td>oval / AW</td><td>round(er)</td><td>;</td></tr>
<tr><td>palisade layer</td><td>thin(ner)</td><td>thick(er)</td><td>;</td></tr>
<tr><td>AVP</td><td></td><td></td><td>;</td></tr>
</table>
</td><td>4</td></tr>
</table>

© UCLES 2020

Question	Answer	Marks
2(c)	1 records measured diameter of the leaf (across **Q**–**R**) and states units **;** **A** suitable range of measurements based on printed diagram 2 records measured diameter of the vascular tissue (across **Q–R**) and states units **;** **A** suitable range of measurements based on printed diagram 3 presents ratio in a format that is consistent with diameter of leaf : diameter of vascular bundle **;** **A** actual measured figures or simplified figures 4 numbers in ratio written as whole numbers **;** e.g. 3 : 1 / 4 : 1 / 7 : 2	**4**

© UCLES 2020

Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/35**

Paper 3 Paper 35 (Advanced Practical Skills 1) **May/June 2020**

MARK SCHEME

Maximum Mark: 40

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

© UCLES 2020

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.

© UCLES 2020

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.

© UCLES 2020

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.

© UCLES 2020

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.

Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same marking point
R	reject
A	accept
I	ignore
AVP	any valid point
AW	alternative wording (where responses vary more than usual)
ecf	error carried forward
underline	actual word underlined must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument

© UCLES 2020

Question	Answer	Marks
1(a)(i)	**Y** – low and **H** – medium / high and **C** – medium / high **;**	**1**
1(a)(ii)	1 *labels under correct sequence of beakers:* 0.5, 0.25, 0.125, 0.0625 and % once **;** 2 shows transfer of 10 (cm^3) from second beaker to third beaker and 10 (cm^3) from third beaker to fourth beaker and 10 (cm^3) from fourth beaker to fifth beaker and cm^3 once **;** 3 shows 10 (cm^3) of **W** added to each beaker and cm^3 once **;**	**3**
1(a)(iii)	1 *heading for independent variable:* percentage concentration of copper sulfate solution / AW and units and to the left of the dependent variable **;** 2 *heading for dependent variable*: time and s / sec / seconds **;** 3 records results for at least five concentrations **;** 4 records results in whole seconds **;** *5 expected trend:* highest percentage copper sulfate solution has the longest time to collect oxygen **;**	**5**
1(a)(iv)	(percentage) concentration of copper sulfate (solution) **;**	**1**
1(a)(v)	1 use (thermostatically controlled water-baths at different temperatures **;** 2 state at least five different temperatures between 0 °C and 100 °C / *ref. to* equilibrating **Y** and **H** to required temperature before mixing **;**	**2**
1(b)(i)	1 change in mass: (-)6.24 **;** 2 percentage change: -2.50 **;**	**2**
1(b)(ii)	repeat experiment and calculate a mean **;**	**1**

© UCLES 2020

Question	Answer	Marks
1(c)(i)	1 *x*-axis: inhibitor and *y*-axis: volume of oxygen after 5 minutes / cm^3 ; 2 scale on *y*-axis: 2 to 2 cm, labelled at least every 2 cm and bars labelled on *x*-axis with letters of inhibitors ; 3 all bars plotted accurately, with horizontal line at the top of each ; 4 bars of equal width and separated and drawn with thin continuous lines ;	**4**
1(c)(ii)	*any three from :* 1 inhibitor similar shape to substrate ; 2 inhibitor complementary shape to active site of enzyme ; 3 inhibitor, binds to / competes with substrate for, the active site ; 4 fewer, enzyme-substrate complexes / ESC, formed ;	**3**

Question	Answer	Marks
2(a)(i)	**TS *Euphorbia* leaf** 1 suitable size and no shading ; 2 draws whole leaf section and no cells ; 3 correct proportions of tissues ; 4 correct shapes and number of, tissues / layers ; 5 label line and label to upper epidermis ;	**5**
2(a)(ii)	**TS *Euphorbia* leaf** 1 suitable size and draws lines that are continuous, thin and sharp ; 2 draws four cells in a line and adjacent cells are touching ; 3 draws two lines around each cell and three lines where cells touch ; 4 label line and label to one cell wall ;	**4**
2(b)(i)	1 (records length of line **X**–**Y** as) 78 (eyepiece graticule units) ; 2 78×22.7 ; 3 1771 μm / 1.77 mm ; **A** answers to 2 or more significant figures	**3**

© UCLES 2020

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(b)(ii)</td><td>1 shows addition of the five numbers <u>and</u> division by five ;
2 shows correct answer as 69.9 <u>and</u> states units as μm ; A 69.86</td><td>2</td></tr>
<tr><td>2(c)</td><td>1 records only observable differences ;

2, 3 and 4
any three from:

<table>
<tr><th>feature</th><th>L1</th><th>Fig. 2.3</th><th></th></tr>
<tr><td>(relative) size of vascular tissue</td><td>small(er)</td><td>large(r)</td><td>;</td></tr>
<tr><td>shape of vascular tissue</td><td>round(er)</td><td>heart-shaped / AW</td><td>;</td></tr>
<tr><td>ring of cells around vascular tissue</td><td>absent / not present / none</td><td>present</td><td>;</td></tr>
<tr><td>xylem</td><td>randomly arranged</td><td>arranged in rows</td><td>;</td></tr>
<tr><td>(relative) size of air spaces</td><td>large(r)</td><td>small(er)</td><td>;</td></tr>
<tr><td>epidermis</td><td>cells have inclusions</td><td>cells have no inclusions</td><td>;</td></tr>
<tr><td>cuticle</td><td>thin(ner) / absent / not present</td><td>thick(er) / present</td><td>;</td></tr>
<tr><td>(relative) number of layers</td><td>few(er)</td><td>more</td><td>;</td></tr>
<tr><td>palisade layer</td><td>present in the midrib / above vascular bundle</td><td>absent in the midrib / absent above vascular bundle</td><td>;</td></tr>
</table>
</td><td>4</td></tr>
</table>

© UCLES 2020