UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2008 question paper

9700 BIOLOGY

9700/31 Paper 31 (Advanced Practical 1), maximum raw mark 40

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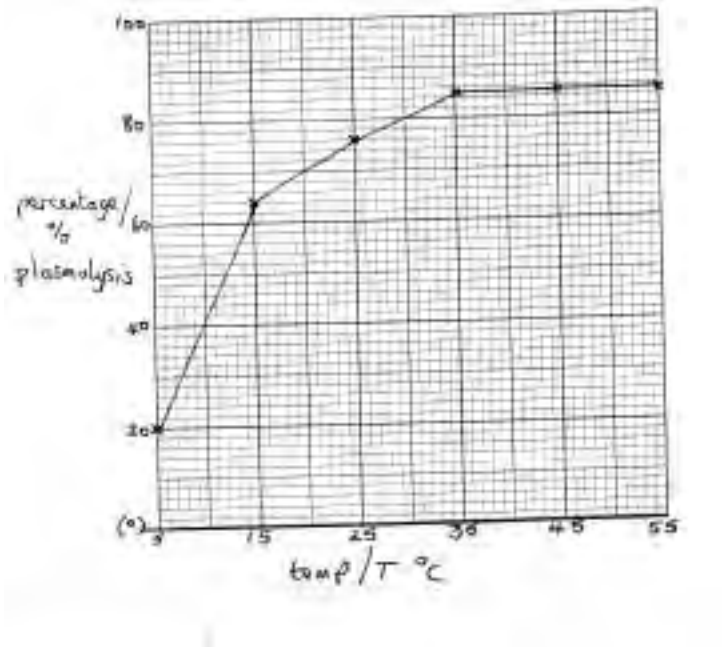
UNIVERSITY of CAMBRIDGE
International Examinations

Question	Expected Answers			Additional Guidance	Marks
Record OBSERVATIONS and NUMERICAL MEAN DEGREE OF PLASMOLYSIS				2PDO recording, 2MMO collection, 2MMO decision.	
1 (a) (i)	table, **AND** plasmolysis/numerical (estimate) ; shows **5** cells recorded per solution; (water) 1 or label; (**S1**) number more than water or label; (**S2**) number between **S1** and water or label;	(all table) cells drawn between different text	**AND** (*heading above data)* **W** or water or 0 and S1 or 1 and S2 or 0.5; Ignore units. Look at mean first (if there) so should be 1 – ignore any decimal places. Numbers mostly 1 if 5 cells recorded.	Mark best table, ignore any additional text or drawings. No outer boundary needed. Any evidence of five cells only, e.g. five drawn per solution or total cells 5 or 1 + 3 + 2 + 1 + 1 1 / 2 / 3 / 4 none / slight / extensive / severe Allow any correct numbers. Ignore decimal places.	**[6]**
Describe and explain observations from water, S1 and S2.				3 MMO decisions	
1 (a) (ii)	**Idea of** 1. high/0 to low/ from higher to lower less negative/0 to more negative water potential/ down water potential gradient 2. (in water) cells turgid/no or slight plasmolysis 3. (in **S1**) cells plasmolysed/flaccid/described **OR** (in **S2**) no/less/capped plasmolysis/described accept cytoplasm/cell membrane pulled away from cell wall/vacuole shrinks. **Reject** cell shrinks		**AND** by osmosis; **AND** water has moved in/no net movement/correct idea of water out; **AND** water moved out; **AND** no net movement/water moved out;	In correct context. Accept ψ. Solute/osmotic potential is ignored but must be the same as water potential i.e. from high to low so reject pt1 if wrong way. Ignore hypotonic and hypertonic but must be in correct context if used. Ignore 'no change'. **Must be correct with the candidate's own results**.	**[3]**

Identify two sources of error in this experiment			2 ACE interpretation	
1 (a) (iii)	**Two from** difficult to judge degree of plasmolysis, or have to estimate between values for plasmolysis; evaporation from solutions/concentration of solution changes/(**S1**/**S2**)diluted by distilled water; (cells) left different times/too short a time/not long enough; AVP; volume/no. of drops used, or different onions, or different parts of onion/not fresh/have been frozen/stored;	Reject just time or just volume alone. Accept different or varied. Reject immersed. Reject should be same time – not an error. Reject air bubbles. Reject amount.	Mark for any correct. Reject **improvements**. Such as 'should keep time the same, etc.'	**[2 max]**
Suggest how you would improve this experiment.		ACE improvements		
1 (a) (iv)	one/more/serial dilution concentration; examples at least 3 in addition to 0.0, 0.5 and 1.0 ; repeat each concentration/more than one strip (per concentration); keep the time the same/give an example of time/longer time; keep the volume the same **AND** method/use burette/graduated pipette, or smaller syringe /count no. of drops/AW, or cover solution to prevent evaporation, or immerse in **S1** or **S2** before mounting; same onion/part of onion/fresh onion; count more cells or more than 5/have more detailed numerical estimates;	Beware repeat experiment with different variable. Reject measuring cylinder. Accept photographs.		**[3 max]**

Complete the Table 1.2 by calculating the missing values			PDO display		
1 (b) (i)	**64 AND 85;**		***A whole numbers only and both correct***		**[1]**
1 (b) (ii)					
	O	x-axis T/temp./temperature **AND** °C	**AND** y-axis percentage/% plasmolysis;		**[1]**
	S/P	scale as shown/x axis must start at 5, allow no 0 and no 100 marked	**AND** plotting crosses or dot in circle ONLY **AND** 5 (20), 25(76), 45 and 55 (both 85) plotted correctly; NO cross larger than **X** or **O**. Plots 20, 76 must be on horizontal line, both 85's between the horizontal lines. Ignore incorrect calculated mean plots i.e. 15 and 35	Reject blobs in or out of circle.	**[1]**
	L	either straight lines joining each point or smooth curve; quality – no thicker than _____ not feathery, for the complete line. Check 5 to 15 must be connected point to point exactly, by straight line or curve **AND** 45 to 55 must be a horizontal line. Ignore 25 and 35 unless candidate draws up and down.		Reject any extrapolation beyond either axis.	**[1]**

State temperature at which 50% plasmolysis occurred				ACE interpretation		
1 (b) (iii)	take reading from candidate's own graph **AND** ^{o}C;			Allow only 0.0 or 0.5, no intermediate decimals must round correctly.		**[1]**
Percentage plasmolysis is proportional to temperature, draw conclusion and include whether the data supports the hypothesis and produce a revised hypothesis if necessary				ACE conclusion		
1 (c)	**Draws conclusion:** as temp. increases the percentage plasmolysis increases/is proportional; **Then one of** quotes figs. between 5^{o}C and 55^{o}C and the two %'s **OR** (increases) up to 35^{o}C or no more plasmolysis after 35^{o}C;	supports hypothesis (reject supports conclusion); **(but if rejected because of conclusion then can still have)** **Then** quotes figs between 5^{o}C and 55^{o}C and the two %'s **OR** (increases) up to 35^{o}C or no more plasmolysis after 35^{o}C;	does support at start but then does not support, or partially supports hypothesis (reject conclusion) **(but if rejected because of conclusion then can still have)** or is not a straight line/not linear or is not proportional**;** **Then one of** after 15 not linear; levels off/stops increasing/up to a point;	Needs clear statement. Reject any ref. to **100%** plasmolysis or cells dying/denatures. **ACCEPT 35/45 OR BETWEEN, DEPENDING ON THE CANDIDATE'S GRAPH.**	**IGNORE** rate.	**[1]** **[1]**
					Total	**[21]**

Draw a LARGE, LOW-POWER plan diagram of photomicrograph fig. 2.1. (trachea)				1MMO collection, 3 PDO layout	
2 (a) (i)	sharp, clear unbroken lines, no cells at least 8 lines across lumen at any point; incomplete ring of cartilage;	**AND** 3 bulges; **AND** no shading	**AND** larger than 6cm;	Allow 3 ringed errors for first part of point 1. Ignore additional shaded circles and one layer with dashes. NO block shading of layers. Has to have drawn whole specimen.	

Point 1

No more than three errors ringed.

Point 3 anywhere in diagram at any point there are 8 lines across.

[4]

Use this information to calculate the actual width of the lumen.		2MMO collection, 1PDO recording, 1PDO display	
2 (a) (ii)	Each division on stage scale is 0.1 mm = V. First and second mark reject if any measurements given e.g. mm. If point 1 right then must be answer from box below. If point 1 wrong then can have any other pair.	Allow units or divisions.	

First Mark	No.of eyepiece grat. W	7	15		29/30				
Second Mark	No.of eyepiece grat. Y	8	7	16	7	14	21	32	39
	No on stage micrometer Z	9	4	9	2	4	6	9	11

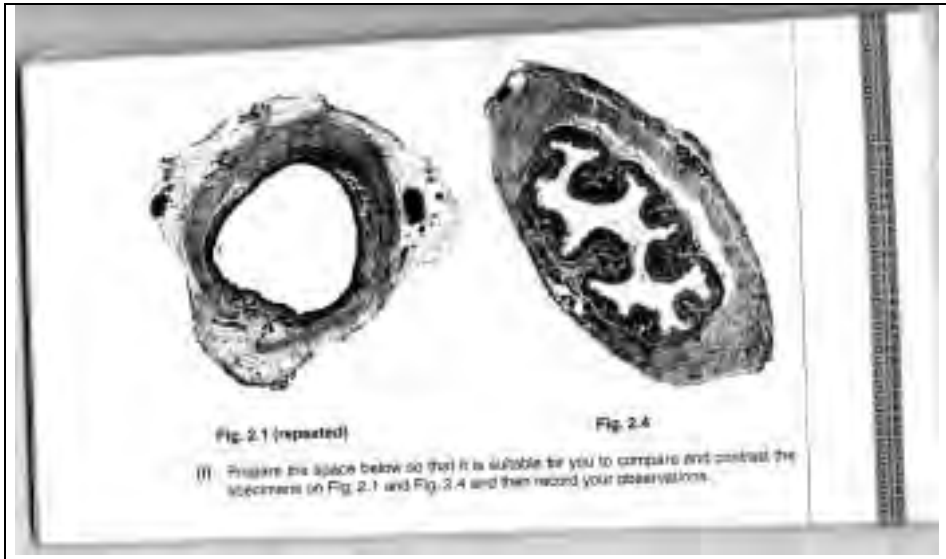
Third Mark	Show logical reasoning	**EITHER** Z divided by Y first then proceed and allow multiplication by either V and then W, or W and then V, even though not strictly the correct reasoning. Ignore answer and units. Rej. if additional figs., even if x1.	**OR** Z x V AND divided by Y. followed by x W. Ignore answer and units. Rej. if additional figs. even if x1. Ignore multiplication for units, even metres.
Fourth Mark	Need NOT be the correct answer. Reject if given choice of units unless both correct.	Either answer (between 100 and 999 with) μm. Allow standard form if correct. Reject metres.	OR answer (between 0.1 and 0.99 with) mm. Allow standard form if correct. Reject metres.

First two marks are for – collecting the correct data. The third mark is for display – showing clear reasoning in the calculation.

Fourth mark is for recording – use of the correct units.

[4]

Suggest how an error in measuring the width of the lumen could occur.		1 Ace interpretation		
2 (a) (iii)	Not knowing where the edge is **Or** lumen or shape irregular shape or not circular **Or** preparation squashed **Or** only 1 measurement **Or** thickness of lines (stage micrometer) **Or** (lumen) between divisions on eyepiece graticule **Or** focussing of both scales (NOT specimen) **Or** lining up the scales.	Ignore **parallax error.**	*Any lumen as question does not specify this lumen.* Reject thickness of scale and lines on eyepiece graticule.	**[1]**



Compare and contrast specimens Fig 2.1 and 2.4.

2 MMO collection 1 PDO recording 2 ACE interpretation

2 (b) (i)

Organised as a table/venn diagram/ruled boxes connected, correctly headed; comparative statements opposite each other/in one sentence;

	Fig. 2.1	Fig. 2.4
Both have	lumen;	
Inner layer/membrane/wall or lumen shape	smooth/rounded,	folded/irregular/ lobed;
lumen	larger/wider or smaller/narrower; Allow either way round	
Overall shape positive statement on both sides	triangular/ rounded circular,	oval AW;
Cartilage/C shape (layer)	present/has,	none/no;
contents	nothing/no,	filled/has;

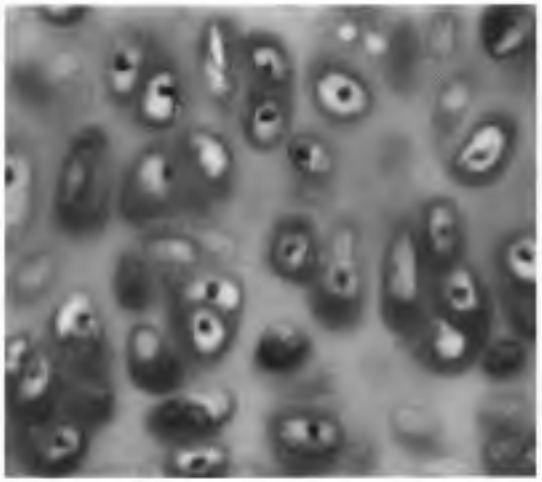
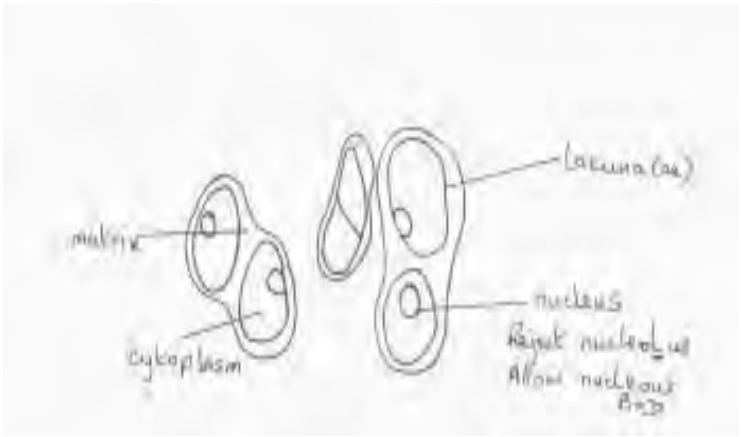
If named headings only e.g. artery/vein then reject. **[1]**

Then 3 for showing comparative statements if correct + lumen + larger difference. **[1]**

Most pairs of statements are comparative. **[1]**

Must have at least 1 similarity.
Accept hollow/cavity/space
IGNORE tubular (in question)
any ref. to cells or cilia as not visible.
Uses tissue names and lighter/darker and 3-D descriptors e.g. spherical.
Allow two drawings correctly headed with correct annotations.
Ignore 'no hollow'.

Max 2 for differences

Both involved in transport. State one observation that relates to this function.		ACE conclusion		
2 (b) (ii)	lumen/space/cavity/are hollow/tubular;			**[1]**
Make a labelled drawing of 5 representative cells that are close together.		1MMO collection, 3 MMO decisions		
2 (c)	1 group of 5 complete lacunae on fig. 2.5; line drawn around any lacuna; shape/relative size/position of 2 nuclei compares well with those in their marked group ; label lines to nucleus plus one from: cytoplasm/lacunae/chondrocyte/chondroblast/matrix;	Allow 5 separate circles but if these are joined as one circle, it will only contain five complete lacunae. Ignore part lacunae. Ignore shading. Accept the best two. Accept nucleous. Reject if second 'l'.	**Reject** if not drawn 5 lacunae.	
 **Fig. 2.5**				**[4]**