

MARK SCHEME for the May/June 2013 series

9700 BIOLOGY

9700/31

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

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.

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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)
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
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
ACE	Analysis, Conclusions and Evaluation (skills)
MMO	Manipulations, Measurement and Observation (skills)
PDO	Presentation of Data and Observations (skills)

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Expected Answers				
1 (a) (i)				[max 15]
mp1	(MMO Decision) test for <u>glucose/reducing sugar</u> before <u>sucrose/non-reducing sugar</u> ;			
mp2	(MMO Decision) <u>tests</u> (gets a result for) only remaining solutions in next test so test 1 S1, S2, S3, S4, S5 AND test 2 S1, S2, S3, S4, S5 minus solution(s) identified in test 1 AND test 3 S1, S2, S3, S4, S5 minus solution(s) identified in test 1 and test 2 AND test 4 S1, S2, S3, S4, S5 minus solution(s) identified in test 1, test 2 and test 3;			
mp3	(MMO Decision) <u>cm³ or ml(s) once</u>	AND volume of only Benedict's (solution) or sum of volumes of Fehling's A and B	equal to or more than volume of sample;	
mp4	(PDO Recording) draws in all the row lines in test 1 results table only;			
		starch test	glucose test	sucrose test
Decision on method M only starch, glucose, sucrose tests ignore protein test		✓ or X	✓ or X	✓ or X
R and I only awarded in correct context of molecule being tested and reagent and for sucrose only if after glucose (mp1 awarded)		test 1	test 2	test 3
collection records R		✓ or X	✓ or X	✓ or X
conclusion identification I		✓ or X	✓ or X	✓ or X

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M, R and **I** are same marking points but can only be awarded in correct contexts of molecule tested and reagent for as shown below:

M decision on	(starch) <i>Idea of</i> uses <u>iodine</u> or <u>Lugol's</u> ; do not give mark if heated	(<u>glucose</u> (ignore reducing/non-reducing) or <u>reducing sugar</u> only) <u>Benedict's</u> AND <u>boil</u> or heat to <u>degrees</u> or <u>°C</u> AND any whole number 80 to and including 100 or range within 80 to 100 e.g. 80 to 100;	(<u>sucrose</u> (ignore reducing/non-reducing) or <u>non-reducing sugar</u> only add acid/ <u>HCl</u> / named acid AND heat/ warm AND neutralise/adds base/alkali/ named alkali;	(protein) ignore method
R Records	(starch + iodine) <u>only one</u> positive result blue/black or black or navy blue or dark blue;	(glucose/reducing sugar + Benedict's) <u>only one</u> positive result green or yellow or orange or red or brown or any combination;	(sucrose/non-reducing sugar + Benedict's) <u>only one</u> positive result green or yellow or orange or red or brown or any combination; ignore brick only award if test done after glucose test. do not give mark if S2 and S5 tested	(protein + Biuret or KOH/NaOH and copper sulphate or Biuret A and B) <u>only one</u> positive result biuret only accept lilac or purple or mauve or violet;
<i>the first test must have recorded results for <u>all five</u> solutions. Tests 2 and 3 must have recorded results for <u>at least two</u> solutions</i>				
I Conclusion	(starch + iodine) (S)4 and <u>starch</u> ;	(glucose/reducing sugar + Benedicts) (S)5 and <u>glucose</u> ;	(sucrose/non-reducing test + Benedicts) (S)2 and <u>sucrose</u> ; only award if test done after glucose test	(protein + biuret or KOH/NaOH and copper sulphate or biuret A and B); (S)3 and <u>protein</u>
Test 4 I is only awarded for (S)1 and contains no biological molecules/ none;				
[max 15]				

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(ii)			[1]
ACE interpretation 1		S ₂ ;	
(b)			[3]
ACE improvements 2	mp1	(independent variable) (using reducing sugars or named reducing sugar/glucose/standard solutions) at least 5 sugar concentrations or at least five examples of concentrations;	
	mp2	<u>serial dilution</u> or <u>simple dilution</u> or described method for making different concentrations;	
ACE improvements 1	mp3	(dependent variable) compare results/colour of plant extracts/samples/unknown with known (standard) <u>solutions</u> ;	
			[Total: 19]

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2 (a) (i) [2]				
do not give either mark if include units other than ep(g)u(nits)				
MMO collection 2	mp1	L	M	N
		any numbers which add up to 11or 11.5 or 12		ignore
	mp1	any 4 values which add up to 30;		
(ii) [3]				
PDO layout 1	mp1	suitable plan diagram do not give mark if - any line outside the drawn line given - any line off the grid - any shading - any ruled line		AND clear, sharp, unbroken lines; do not give mark if - less than 3 enclosed areas (ignore cells) - any part of line 1mm or thicker (use grid) - any feathery or broken or dashed line or gap - any tail or overlap
PDO recording 1	mp2	3 bands (3 lines) which dip downwards	AND (completed outline at base as) an enclosed area from ends of lines provided	AND two converging lines to R;
MMO decision 1	mp3	(draws correct proportion and shape of layers)		
		3 lines in the top half	AND both of the top 2 bands are wider than 3 rd band;	
(iii) [2]				
PDO display 2	mp1	(inside the drawn outline) shows counting of all complete 1 cm by 1 cm squares AND those squares which are half or more than half;		
	mp1	number clearly linked to bundle AND number clearly linked to xylem	AND larger whole number to smaller whole number to lowest denominator OR as fraction larger number over smaller number to lowest denominator;	

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(b) (i)				[4]
if draw a chart then only give mp1				
PDO layout 4	mp1	x-axis <u>time of day(/) hours</u>	AND y-axis <u>rate of transpiration (/) g cm⁻² hr⁻¹ ;</u>	
	mp2	scale as x-axis <u>5:00 hours to 2 cm, labelled each 2 cm</u>	AND y-axis <u>0.5 to 2 cm labelled each 2 cm ;</u>	
	mp3	correct plotting of all points as small cross or dot(in circle) or cross in circle;		
	mp4	<u>six</u> plots with <u>ruled</u> lines exactly point to point	AND (quality) <u>smooth line less than 1 mm thick;</u>	
(ii)				[1]
ACE interpretation 1	correct reading from graph with g cm ⁻² hr ⁻¹ ;			

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(c)				[4]
PDO layout 1	mp1	suitable drawing; do not give mark if - any shading - draw over the print of the question - any ruled lines - less than 40 mm at widest distance across largest cell - less than six enclosed areas or if any outer lines (of enclosure) - are thicker than 1 mm - are feathery or broken/dashed or have a gap - have any tail or overlap		
MMO collection 1	mp2	only <u>6</u> complete cells drawn AND as two groups of 3 touching cells;		
PDO recording 1	mp3	7 or fewer cells	(cells between the layer of stained cells and the vascular bundles) widest dimension of the biggest cell is at least twice the narrowest dimension of the smallest cell (from the layer of stained cells);	
MMO decision 1	mp4	in one group of three cells, all cells must be drawn with double lines all the way round AND where two pairs of cells touch there must be three lines (representing the middle lamella);		

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(d)					[max 5]
PDO recording 1	mp1	organise as a table with only three columns or rows separated by lines		AND headed J1 and Fig. 2.3	AND third column headed feature or AW or contains at least one feature;
MMO collection 1	mp1	collected only differences;			
ACE interpretation MAX 3	max 3	mp	feature	J1	Fig. 2.3
		mp1	vascular bundle or xylem position	not in a ring or separate or irregular or scattered or further away from epidermis than others	in a ring or in line or regular or continuous or altogether or near epidermis
			any ref to size	(either way but must be comparative) variation in sizes (small and large) Ignore thickness	
			number	(either way but must be comparative) Idea of few(er) with more or numerous	
			shape	star-shaped or egg-shaped/AW or pointed at one end	rounded or circular;
		mp2	continuous layer/cambium	absent or has not or no(ne)	present or has or yes;
		mp3	trichome or hairs NOT root hair Accept spike/thorn or hairs etc on cuticle	absent or has not or no(ne) small(er) or few(er)	present or has or yes large(r) or more;
		mp4	hollow or gap or pith or centre or parenchyma (cells)	present or has or yes absent or has not or no(ne)	absent or has not or no(ne) present or has or yes;
		mp5	thickened cells/layer/ collenchyma/ sclerenchyma	present or has or yes	absent or has not or no(ne);
		mp6	layer under epidermis might be called cortex	thin(ner)	thick(er);
					[Total: 21]