

MARK SCHEME for the May/June 2008 question paper

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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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Skill	Total marks	Breakdown of marks		Question 1	Question 2
Manipulation, measurement and observation	16 marks	Successful collection of data and observations	8 marks	2	6
		Nature of measurements or observations	8 marks	5	3
Presentation of data and observations	12 marks	Recording data and observations	4 marks	2	2
		Display of calculation and reasoning	2 marks	1	1
		Data layout	6 marks	3	3
Analysis, conclusions and evaluation	12 marks	Interpretation of data or observations and identifying sources of error	6 marks	3	3
		Drawing conclusions	3 marks	2	1
		Suggesting improvements	3 marks	3	0

- MMO = Manipulation, measurement and observation
Collection = successful collection of data and observations
Decisions = decisions relating to measurements or observations
- PDO = Presentation of data and observations
Recording = recording data and observations
Display = display of calculation and reasoning
Layout = data layout
- ACE = Analysis, conclusions and evaluation
Interpretation = interpretation of data or observations and identifying sources of error
Conclusions = drawing conclusions
Improvements = suggesting improvements

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Question	Sections	Learning outcomes	Indicative material	mark
1 (a) (i)	MMO collection	Use their apparatus to collect an appropriate quantity of ..observations including subtle differences in colour.	all starch/iodine tests, negative/no colour change/orange/red; S2, violet/purple/mauve;	2
	MMO decisions	Sufficient distinct observations are made to identify the dissolved substances in a solution.	S1, glucose, S2, protein, S3, carbohydrate/sucrose/non-reducing sugar; (all correct)	1
	PDO recording	Present ...observations in a single table of results. Include in table of results columns for raw data and for deductions. Use column headings that ...conform to accepted scientific conventions.	single table drawn with all cells ruled; (1 st /top) solution, colour changes/tests shown, conclusions/identification shown;	2
(ii)	MMO decisions	Qualitative observations consistent with materials supplied. Identify the dissolved substances in a solution.	idea of blue/negative test with Benedicts; therefore not glucose; boil with acid/HCl, neutralise with sodium bicarbonate, repeat benedict's test;	3
(iii)	ACE interpretation	Describe the patterns and trends shown by tables.	correct estimate with colour change from their results, with units;	1
(iv)	ACE interpretation	Identify the most significant sources of error in an experiment.	two from difficult to judge colour/may be between colours; volumes used different from those used for table; volume of Benedicts may have been different; heating time/temperature may have been different	2 max

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	(v)	ACE improvements	Suggest modifications to an experimental arrangement that will improve the accuracy of the experiment or the accuracy of the observations that can be made, including the use of new methods or strategies to investigate the question.	S1 use same volume/example of volume as for known glucose; add same/excess volume of Benedicts to S1 and known glucose; heat/boil for same length of time; repeat all measurements; use more known concentrations of glucose; e.g. of accurate use of equipment/burette/graduated pipette;	3 max	
1	(b)	(i)	PDO display	Use correct number of significant figures for calculated quantities.	<u>30</u> ;	1
		(ii)	MMO decisions	Replicate readings or observations as necessary.	anomalous/does not fit trend/pattern/described;	1
		(iii)	PDO layout	Select which variables to plot and plot appropriately on clearly labelled x- and y-axes. Choose scales for the graph axes that allow the graph to be read easily, such as 1, 2 or 5 units to a 20mm square. Make the best use of the space available, using over half of the length and width of the grid. Plot all points to an appropriate accuracy. Follow IOB recommendations for putting lines on graphs.	O percentage concentration of starch on x-axis, <u>and</u> mean transmission of light/arbitrary units on y-axis ; S scale, more than half grid(x and y) used for plotted area; P all points correctly plotted with crosses/dots (in circles), points joined with ruled lines/curve through all points;	3
	(c)	ACE conclusion	Draw conclusion from an experiment...considering whether the experimental data supports a given hypothesis ..making further predictions.	idea that data does not (totally) support the hypothesis; as concentration of starch suspension increases the transmission of light changes slower/less after 1.5/2.0%;	1 1	
				Total	21	

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2 (a) (i)	MMO collection	Follow instruction given in the form of written instructions or diagrams. Use their apparatus to collect an appropriate quantity of data.	half drawn, no cells drawn, no shading;	4
	PDO layout	Make drawings large, unshaded. Use fine, clear unbroken lines showing clear outlines of structures.	(half) larger than 9 cm width and fine clear, unbroken lines; vascular bundles correctly placed; proportions correct;	
(ii)	MMO collection	Follow instruction given in the form of written instructions or diagrams. Make measurements using ...graticules.	number of epg divisions across trichome correct; correct answer and units for calculation;	2
	PDO recording	Record raw readings of quantities to same degree of precision.	whole numbers of epg divisions;	1
	PDO display	Show working in calculations, key steps in working.	(epg divisions/no. of stage divisions) x epg divisions for trichome;	1
(iii)	ACE interpretation	Identify the most significant sources of error in an experiment.	parallax/not knowing where base is;	1
(iv)	ACE conclusion	Draw conclusions from interpretations of observations.	traps water/reduces evaporation;	1
(b)	MMO collection	Follow instruction given in the form of written instructions.	8–12 cells drawn;	1
	MMO decisions	Qualitative observations consistent with materials supplied. Show all structures that can be seen in a defined part of the specimen.	shape of cells as on slide; cell walls drawn; 2 correct labels;;	3 max

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(c)	MMO collection	Use their apparatus to collect an appropriate quantity of data or observations, including subtle differences in colour or other properties of materials.	hairs/no hairs; rolled leaf/not rolled; circular/semicircular; vascular bundles separate/vascular bundles in middle; more vascular bundles/fewer vascular bundles;	2 + 1 (3) max
	ACE interpretation	Describe and summarise key points of a set of observations.	comparative statements opposite each other;	1 max
	PDO recording	Make and record sufficient accurate measurements and observations.	organised as a table/venn diagram/ruled connected boxes, correctly headed;	1
			Total	19
			Paper Total	40