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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2007 question paper

9700 BIOLOGY

9700/31 Paper 31 (Advanced Practical 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	3	5
		Nature of measurements or observations	8 marks	6	2
Presentation of data and observations	12 marks	Recording data and observations	4 marks	2	2
		Display of calculation and reasoning	2 marks	0	2
		Data layout	6 marks	4	2
Analysis, conclusions and evaluation	12 marks	Interpretation of data or observations and identifying sources of error	6 marks	5	1
		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 no.	Mark Scheme points **Accept H_2O_2 for hydrogen peroxide**	Mark	'what if's/extra notes
1 (a) (i) PDO recording	table, 4 concentrations recorded; (first/top) hydrogen peroxide , (other) number of bubbles and (unit of time);	1 1	Allow no outer boundary (does not need the bottom or top edge lines) lines do not need to be ruled- see examination report all cell lines must be shown Ignore beaker 1 etc./and excess columns Ignore vol – as this is an unknown unit Reject other units %/cm^3 /volume/ units in body of table Accept time taken with no. of bubbles/(time eg s, secs, mins.)/or rate of bubble production with units
1 (a) (ii) ACE Interpretation	bubbles different sizes/no.of bubbles; loss of gas/not airtight/difficult to put bung in ;	1 max	e.g. released too quickly/unevenly/miscounts bubbles Accept amount of bubbles Reject **no** bubbles see examination report.
1 (a) (iii) ACE Improvements	method of measuring volume; use closed system/syringe to add substrate; use petroleum/Vaseline; use a waterbath; repeat/replicate; use a buffer; equilibration; mix using glass rod/shake extract and hydrogen peroxide;	3 max	collect gas in measuring cylinder/burette/using (gas) syringe/manometer/slow speed video recording Reject biuret/inverted test tube Accept if graduated Reject air conditioning Reject larger volume of H_2O_2/increase measuring time/measure height of froth/have someone else help etc./cleaning apparatus/additional H_2O_2 concentrations ignore mistakes
1 (b) (i) MMO collection	1. idea of keeping the volume/mass/size of potato the same; 2. subdivides more than 1to give at two different surface areas; 3. method mark e.g. trim/remove/peel skin (from potato)/ using scalpel/cork borer;	3	Alternative wording 1 etc cm^3 cube/gives three dimensions/cylinder with quoted length/diameter with quoted length/gives a mass. Reject crushing Must be clear that using 2 constant volumes/mass and then splitting these into different surface areas Credit on diagrams Max 1 if volume not kept the same e.g. could get 1 method mark

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1 (b) (ii) MMO decisions	boil/heat above 80°C/no potato/implies potato replaced; to show effect of enzyme/catalyst/enzyme will not work;	1 1	Ignore enzyme denatured 'use boiled potato as this will have a denatured enzyme' = po 1 only: need to add 'so this will not work' to get pt 2. Accept point 2 even if haven't got point 1. e.g. replace hydrogen peroxide reject pt 1 but then write this is to show that 'enzyme doesn't work' accept pt 2.
1 (b) (iii) PDO layout • select which variable(s) to plot and plot appropriately on clearly labelled x- and y-axes • plot all points or bars to an appropriate accuracy follow the IOB recommendations for putting lines on graphs	O area/cm^2 on x axis, <u>and</u> time/secs 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); L points joined with ruled lines/curve through all points;	4	Wrong orientation/labels loses O mark but can gain S, P and L no awkward scales should be x axis 1cm to 1 vol and y axis 2cms to 50 secs./1 cm to 20 secs allow other simple scales Reject plotting if awkward scale used. **Where a point eg 27 should clearly be above or below a line Reject if on the line.** See examination report. no dips in curve allowed especially between last two points, extrapolation beyond first and last points by 2 squares only/reject if go over axis line thickness of line less than half a square has to be one continuous line
1 (b) (iv) ACE interpretation describe the patterns and trends shown by tables and graphs **1 (b) (v)** ACE conclusion	1. as surface area increases time to release gas decreases/gets shorter/rate increases/AW; 2 (more area) more <u>active sites</u> (exposed); 3. so hydrogen peroxide/substrate binds/attaches, to <u>active site</u>/more ESC's formed;	1 2	Ora as surface area decreases time to release gas increases/rate is slower/AW ignore Inversely proportional Mark iv and v together reject point 1 if answer to **iv** is contradictory in **v**. Accepts collides/links/occupies/slots into/filled Reject reacts with Read carefully for where the active sites are

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1 (b) (vi) ACE interpretation find an unknown value by using co-ordinates	check 5.5 cm^2 from their graph/allow 1 either side of your reading; secs/s;	1 1	Units can be awarded if value incorrect. If scale awkward try to read as close as possible can't do this scale totally incorrect. Accept where 1 small square = 4 whole number only, where 1 small square = 5 accept to .5 only.
1 (b) (vii) ACE interpretation calculate other quantities	40/fig from **b vi**;	1	If no working then calculate and award mark if answer correct. See examination report on significant figures.
1 (c) MMO decisions	1. range of at least 5 regularly spaced different temperatures; 2. use of waterbath/described; 3. volume of hydrogen peroxide constant; 4. volume of potato/extract constant; 5. concentration of hydrogen peroxide constant/same beaker; 6. warm hydrogen peroxide and potato/extract separately first; 7. method of measurement to give rate; 8. repeat;	1 1 2 max	Ignore 80+°C and below 5°C regular = 5 or multiples Allow room temperature plus 4 Points 1 and 2 then 2 from points 3 to 7 Reject amount/quantity Reject enzyme/substrate – see examination report. If quote a volume/mass needs to be clear kept constant may only get this when repeat expt.
2 (a) PDO display show their working in calculations, and the key steps in their reasoning	100;	1	
2 (b) (i)	credit given in **2 (b) (ii)**	–	

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2 (b) (ii) ACE conclusions	stage scale is magnified is more/eyepiece graticule is not magnified as much/by (objective) lens;	1	Reject Just magnified/highly Accept high**er** X40 allowed if they have ringed x40 in **b i**
2 b (iii) MMO collection follow instructions given in the form of written instructions or diagrams	look at units given then if micrometres check answer is 100 or **2 a** divided by their epg/if mm then 0.1 or 0.01/epg ;	1	epg is eyepiece graticule ecf is error carried forward NB assessing 'key steps in reasoning to make calculation' therefore method of calculation If answer incorrect/no units then look for correct working : With micrometers for 100 or ecf (**2 a**)/ no of epg or
PDO display show working in calculations and the key steps in the reasoning	answer whole number;	1	With mm 0.1/no. of epg or 0.01/no.of epg; max 1

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2 (b) (iv) MMO Collection use their apparatus to collect an appropriate quantity of data or observations, including subtle differences in colour or other properties of materials ACE Interpretation use their apparatus to collect an appropriate quantity of data or observations, including subtle differences in colour or other properties of materials	Check answer is **b i**; x **b iii**/x100/epg or x0.1/epg or 0.01/epg;	1 1	If answer incorrect but have written down their working as answer from **b i** ; x their answer from **b iii** then two marks; or **b i** ; x 100/epg OR 0.1/epg OR 0.01/epg; Ignore units Can still get 1 mark if they have neither of the above but have shown that used either **b i** or multiplied by **b iii**;

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2 (c) PDO layout	sharp, clear, unbroken lines, no shading, quarter;	1	Quarter shown by 5 to 7 vascular bundles
MMO collection use their apparatus to collect an appropriate quantity of data or observations, including subtle differences in colour or other properties of materials MMO decision	no cells, larger than $\frac{1}{3}$ rd width;	1	
	epidermis to is less than distance from top edge of vascular bundle to space of pith;	1	Narrowest point to widest point Look for vascular bundle nearest to epidermis.
	small and large vascular bundles;	1	
	two correct labels of tissues;	1	Ignore cell names

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2 (d) PDO layout	sharp, clear, unbroken lines;	1	Max 1 for textbook see examination report. No touching cell wall lines/complete cell walls
MMO collection	3–8 , touching, larger than 6 cm;	1	Reject if more than 8 cells.
PDO Recording	**drawn** phloem sieve tube, plus one other type of cell from xylem vessel/sclerenchyma/companion cell;	1	Reject if drawing not like slide e.g. too much detail drawn sieve plate and pores between cells or nuclei in cells. Phloem sieve cell (psc) should • not have right angle/sharp corners • have fairly thin or single line cell wall • bigger than companion cell
	any 2 from (phloem) sieve tube/cell, companion cell, xylem (vessel), sclerenchyma correctly **labelled**;	1	Companion cell vs phloem sieve cell • smaller than psc or xylem vessel/sclerenchyma • thinner cell wall than xylem vessel/sclerenchyma Xylem vessel/sclerenchyma vs pst/companion cell • thicker cell wall • sclerenchyma smaller and thicker wall than xylem