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Cambridge International General Certificate of Secondary Education

BIOLOGY

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Paper 6 Alternative to Practical

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MARK SCHEME

Maximum Mark: 40

Published

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This document consists of **8** printed pages.

Mark schemes will use these abbreviations

- ; separates marking points
- / alternatives
- **I** ignore
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- **ecf** credit a correct statement / calculation that follows a previous wrong response
- **ora** or reverse argument
- () the word / phrase in brackets is not required, but sets the context
- underline actual word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

Question	Answer	Marks	Guidance
1(a)(i)	table drawn with minimum two columns and a line between heading and data ; appropriate column / row headings <u>and</u> appropriate units for percentage concentration of amylase time for starch to be digested / minutes ; three correct amylase concentrations recorded (either order) ; three correct timings recorded ; six correct timings recorded ;	5	R if units in body of table I units in the body of the table
1(a)(ii)	drops (for B at 3, 4 and 5 min) have merged / AW ; results for C have different end times ; results for C are different at 3 min ; no repeats ;	1	any one from: A at 4/5 mins I enzyme will be denatured by high temperature / results qualitative / subjective / no control / human error
1(a)(iii)	(remove a sample from each of the test-tubes and) add (equal volume of) Benedict's solution ; heat (in a water-bath) ;	2	

Question	Answer	Marks	Guidance														
1(b)(i)	<table><tr><td><i>variable</i></td><td><i>controlled by</i></td></tr><tr><td>volume / amount of starch (solution)</td><td>5 cm³ / same volume , used in each</td></tr><tr><td>concentration / amount of starch (solution)</td><td>same concentration of starch solution / used in each</td></tr><tr><td>concentration / amount of iodine</td><td>same iodine solution used in each</td></tr><tr><td>volume of enzyme / amylase</td><td>1 cm³ used</td></tr><tr><td>temperature</td><td>(maintained at) 60°C</td></tr><tr><td>time</td><td>3 minutes for equilibration / testing for, 7 / 8 / 9 / 10, minutes</td></tr></table> ; ;	<i>variable</i>	<i>controlled by</i>	volume / amount of starch (solution)	5 cm ³ / same volume , used in each	concentration / amount of starch (solution)	same concentration of starch solution / used in each	concentration / amount of iodine	same iodine solution used in each	volume of enzyme / amylase	1 cm ³ used	temperature	(maintained at) 60°C	time	3 minutes for equilibration / testing for, 7 / 8 / 9 / 10, minutes	2	one mark for the variable, one mark for method of controlling which must related I amount of enzyme I same temperature
<i>variable</i>	<i>controlled by</i>																
volume / amount of starch (solution)	5 cm ³ / same volume , used in each																
concentration / amount of starch (solution)	same concentration of starch solution / used in each																
concentration / amount of iodine	same iodine solution used in each																
volume of enzyme / amylase	1 cm ³ used																
temperature	(maintained at) 60°C																
time	3 minutes for equilibration / testing for, 7 / 8 / 9 / 10, minutes																
1(b)(ii)	so the contents of all the test-tubes reach the same temperature / AW ;	1															
1(b)(iii)	to show that there is no starch in the enzyme solution / amylase does not react with starch / AW ;	1															

Question	Answer	Marks	Guidance														
1(c)(i)	idea of judging the colour of the endpoint by eye ; idea of doing several procedures at the same time ; idea of using one drop for both spots of iodine ; idea that 1 drop for both spots (could cause contamination); idea of: two samples needed at the same time with the same rod, (then there will be a difference in the actual time) ; idea of: size of drops (from either starch or iodine) added varies ;	2															
1(c)(ii)	<table><tr><th><i>e.g. of error</i></th><th><i>improvement</i></th></tr><tr><td>judging colour by eye</td><td>have a standard colour for comparison / use colorimeter</td></tr><tr><td>timing and sampling at same time</td><td>start timer then mix and sample and note time when samples taken / AW</td></tr><tr><td>one drop for two samples / one glass rod</td><td>use two rods / pipette</td></tr><tr><td>contamination</td><td>use two rods / pipette</td></tr><tr><td>two samples at the same time</td><td>use two glass rods or do trials separately</td></tr><tr><td>drop size (for either iodine of drop from glass rod)</td><td>use a pipette / syringe</td></tr></table> ;	<i>e.g. of error</i>	<i>improvement</i>	judging colour by eye	have a standard colour for comparison / use colorimeter	timing and sampling at same time	start timer then mix and sample and note time when samples taken / AW	one drop for two samples / one glass rod	use two rods / pipette	contamination	use two rods / pipette	two samples at the same time	use two glass rods or do trials separately	drop size (for either iodine of drop from glass rod)	use a pipette / syringe	1	improvement must match one of the errors from 1(c)(i)
<i>e.g. of error</i>	<i>improvement</i>																
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Question	Answer	Marks	Guidance
1(d)(i)	300 (mg) ;;;	3	if answer incorrect one mark for correct unit and one mark for correct working: $(3 \times 2 \times 0.5) \div 3 \text{ cm}^3$ is max 2
1(d)(ii)	3.4 ;	1	ecf from 1(d)(i)
1(d)(iii)	A (xes) – labelled with units ; S (cale) – even scale ; P (lot) – all given points plotted accurately $\pm \frac{1}{2}$ square ; L (ines) – each line drawn (with a ruler) point to point / smooth free-hand curve through points ;	4	

Question	Answer			Marks	Guidance
2(a)(i)	feature	epidermis cell	guard cell	2	one mark per correct row
	shape	wavy outline	oval / bean, shaped / AW ;		
	chloroplasts / cell inclusions	absent	present ;		
	cell wall	thin	thick / thick on inside edge ;		
	cell size	large	small ;		
	cell arrangement	not paired	in pairs ;		

Question	Answer	Marks	Guidance
2(a)(ii)	outline single clear continuous lines, no shading, 2 cells drawn ; drawing occupies at least 50 mm along X–Y ; stoma width is about one sixth of total width of XY ; cell walls drawn as double line not too wide ;	4	
2(b)	(diameter of guard cells and stomata) value within the range of 31–34 mm ; line drawn on candidates diagram and measurement ± 1 mm; calculated magnification ;	3	
2(c)	absorption (rate) is lower than transpiration 09:00 to 18:00 / during the day / during the light ora ; absorption (rate) is higher than transpiration from 18:00 to 06:00 / at night / in the dark ora ; absorption peaks at 18.00 and transpiration peaks between 14:00 to 16:00 / absorption rate peaks after transpiration rate ora ; transpiration rate increases faster than absorption rate ; comparative data quote for both curves ; rate of absorption and rate transpiration are equal between 08:00 to 09:00 / at 18:00 ;	2	A times in am and pm equivalents A some variation in the 09:00 time

Question	Answer	Marks	Guidance
2(d)	1 ref. to using at least 3 temperatures / humidity ; 2 ref. to (three) values for temperature / humidity ; 3 ref. to means of obtaining the different temperatures / humidity; 4 ref. to checking that the apparatus does not leak ; 5 ref. to one controlled variable ; 6 ref. to second controlled variable; 7 ref. to measuring distance moved (by the air) along capillary ; 8 ref. to fixed time / timing for a fixed distance ; 9 ref. to refilling capillary between measurements ; 10 ref. to at least two replicates ; 11 use same shoot / same number of leaves / same area of leaves ; 12 AVP ; e.g. detail of apparatus set up e.g. cutting shoot underwater / drying leaves allow apparatus to equilibrate before taking any readings	6	A high, medium and low for humidity and temperature e.g. for mp 5 and mp 6: light intensity, light wavelength, wind speed, temperature or humidity