

CAMBRIDGE INTERNATIONAL EXAMINATIONS**Cambridge International Advanced Subsidiary and Advanced Level****MARK SCHEME for the May/June 2015 series****9700 BIOLOGY****9700/52**Paper 5 (Planning, Analysis and Evaluation),
maximum raw mark 30

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Mark scheme abbreviations:

;	separates marking points
/	alternatives answers for the same point
R	reject
A	accept (for answers correctly cued by the question, or extra guidance)
AW	alternative wording (where responses vary more than usual)
<u>underline</u>	actual word given must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument
ecf	error carried forward
I	ignore
mp	marking point (with relevant number)

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Question	Expected answer	Extra guidance	Mark
1 (a)	<i>independent: <u>concentration</u> of amylase / enzyme ;</i> <i>dependent: diameter / area of brown zone ;</i>	I amount R (amylase) extract A radius of brown zone A starch free / digested starch / clear zone A area of brown zone minus well R blue zone	[2]
(b)	any 8 from: <i>independent variable</i> 1 ref. to method of diluting the 0.5 g dm^{-3} amylase / stock amylase solution and to give a minimum of 5 dilutions ; 2 ref. to concentrations from 0.5 g dm^{-3} downwards with correct units ; 3 use of a <u>control</u> with example ; <i>dependent variable</i> 4 ref. to a suitable method of measuring diameters / width / radius / area of brown zones ;	1 0.0 and 0.5 g dm^{-3} can be included in the number of dilutions A serial / series / simple / proportional / dilution as method OR a description. Use the formula $C_1V_1 = C_2V_2$ to make... A If the fungal extract is diluted instead of amylase but R mp5 2 minimum of 3 other stated values between 0.5 g dm^{-3} and 0.0 g dm^{-3} must correspond to dilution method chosen ecf if no method given A 10 fold or a 50% reduction serial dilution 3 A water / 0.0 g dm^{-3} / boiled or denatured extract / enzyme 4 e.g. using (suitable) ruler / callipers / string and ruler R metre ruler I graticules OR use a (transparent) grid / graph paper and count the number of squares OR take a photograph and measure using one the methods for finding area NOTE: method of measuring must match what they have stated they are measuring.	

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5	ref. to testing the (fungal) extract/fungal amylase/fungal enzyme ;	5	R if dilute the fungal extract	
6	plot a calibration curve of known concentrations and use it to determine extract concentration ;	6	A compare extract result with results of known concentrations to identify extract concentration OR find approx. range of concentration and then do more at smaller intervals to identify extract concentration	
<i>standardising variables (max. 3)</i>				
7	ref. to suitable stated volume/same volume of amylase (in each well) ;	7	If a volume is stated – max 1 cm ³ I amount/known	
8	leave (all plates) for same period of time ;	8	if time stated, minimum 30 min/max 24 hours	
9	method of maintaining at same/constant/optimum/stated temperature ;	9	e.g. incubator/constant temp. room A water bath if temp. stated, any single temp. in range 15–65 °C I air conditioning	
10	use a buffer to keep the pH of the agar same ;	10	e.g. making or adding buffer to agar or starch (solutions) A adding buffer to the amylase solution before using it A if stated, any single pH	
11	same <u>concentration</u> of starch (in the agar plates) ;	11	I ref. to other nutrients in agar, I amount	
12	same depth/volume of agar in Petri dish ;	12	A depth of agar plate I mass of agar/depth of wells	
13	cover to prevent contamination / evaporation ;			
<i>safety</i>				
14	ref. to low risk investigation/hazard <u>and</u> suitable safety precaution ;	14	fungal/enzyme allergy or fungus/enzyme/iodine/agar is irritant <u>and</u> wearing gloves/eye protection/mask I iodine as an allergen R no risk	
<i>reliability</i>				
15	ref. to a minimum of three replicates <u>and</u> calculate a mean or identify/eliminate/remove anomalies ;	15	A original and 2 more/several/many/multiple A outliers for anomalies R reduce anomalies	[max 8]

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(c)	use a (glucose) biosensor / glucose dipstick or test-strip / named test strip, e.g. clinistix / uristix ; (because) γ-amylase will produce glucose only / β-amylase will produce maltose (mainly) ;	A use Benedict's test and EITHER weigh precipitate OR use colorimeter to find the <u>intensity of blue solution</u> left OR time the <u>first appearance</u> of a colour change A chromatography and stain (to show sugars) A Barfoed's test for monosaccharides <i>I idea that γ-amylase produces more glucose than β-amylase</i> R ora	[2]
(d) (i)	<u>1963</u> shown on extract B, plate 5 ; <u>1809</u> shown on extract D, plate 3 ;		[2]
(ii)	reject / eliminate / ignore / leave out (affected data from calculations) ;	A repeat until consistent results obtained I repeat unqualified OR repeat to find a mean	[1]

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(iii)	correct values for $\Sigma x = \underline{1820}$ and $\bar{x} = 303 / 303.3 / 303.3^*$ and $(x - \bar{x})^2$; <table><tr><td>$(x - \bar{x})^2$ allowed</td><td>341</td><td>341.3</td><td>341.34</td><td>341.4</td><td>342</td></tr><tr><td>$(x - \bar{x})^2$ not allowed</td><td>341.32</td><td>341.2</td><td></td><td></td><td></td></tr></table> correct value of s from table ; <table><tr><td>correct values of s ($\pm$)</td><td>8.(0)</td><td>8.26</td><td>8.27</td><td>8.3</td></tr></table>	$(x - \bar{x})^2$ allowed	341	341.3	341.34	341.4	342	$(x - \bar{x})^2$ not allowed	341.32	341.2				correct values of s ($\pm$)	8.(0)	8.26	8.27	8.3	e.g. <table><tr><td>Σ</td><td>1820</td><td></td><td>342</td></tr><tr><td>$\bar{x}$</td><td>303</td><td></td><td></td></tr></table> allow ecf for s from wrong value of $\sum (x - \bar{x})^2$	Σ	1820		342	$\bar{x}$	303			
$(x - \bar{x})^2$ allowed	341	341.3	341.34	341.4	342																							
$(x - \bar{x})^2$ not allowed	341.32	341.2																										
correct values of s ($\pm$)	8.(0)	8.26	8.27	8.3																								
Σ	1820		342																									
$\bar{x}$	303																											
(iv)	any 3 from: 1 the larger / AW the brown area the more amylase / more enzyme activity ora OR the larger / AW the brown area the more gene copies ;ora 2 (person or extract) A had the <u>highest</u> / AW <u>concentration</u> of amylase / (person or extract) F has <u>lowest</u> AW <u>concentration</u> of amylase ; 3 (person) A has the highest number of gene copies / (person) F has the lowest number of gene copies ; 4 ref. to genetic variation in population (for the production of amylase) ;	<i>Ignore ref. to proportionality / positive correlation between enzyme concentration and gene copies</i> A strongest / largest / most / ora weakest / smallest / least A A>B>C>D>E>F I copying results without any conclusion about rank order																										
		Total:	[20]																									

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2 (a)	any 3 from: <i>variation in volunteers</i> 1 body mass / weight ; 2 ref. to use of drugs e.g. medication / self-inflicted ; 3 alcohol consumption ; 4 smoking status ; 5 ref. to ethnicity ; 6 volunteer all have the same 'handedness' ; 7 no medical / named medical condition affecting nerve conduction ; <i>variation in method of applying test</i> 8 same arm tested ; 9 idea of volunteer not moving (during the test) ; 10 electrical charge / coulombs / voltage / potential difference ; 11 same number of volunteers in each age category ;	Mark the first three given. <i>I environmental factors, e.g. temperature / light / noise in room / time of day</i> <i>I diet</i> <i>I ref. to distance between or position of electrodes / time of charge application</i> 7 e.g. Multiple Sclerosis(MS), Myalgic Encephalitis(ME), Muscular Dystrophy(MD), Motor Neurone Disease (MND),spinal bifida, polio A disease of the nervous system 9 e.g. at rest / sitting / lying down 10 A electrical stimulus I current	[max 3]
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(b)	age / years	mean conduction velocity $\pm S_M$	confidence limits		note: must have both numbers correct for one mark	[1]
			lower limit	upper limit		
	60–69	52.2 $\pm$ 0.675	<u>50.85</u>	<u>53.55</u> ;		
(c) (i)	30–39 and 70–79 OR 40–49 and 70–79 OR 50–59 and 70–79 ; there is no overlap of (confidence) limits / S_M ;				A descriptions, e.g. upper limit of 70–79 does not reach lower limit of 30–39 I error bars overlapping / range(bars) not overlapping I ref. to mean conduction velocity	[2]
(ii)	test: t test ; reason: comparing (two) <u>means</u> / normal distribution / continuous data ;				R continuous variation	[2]
(iii)	there is no <u>significant</u> difference between the (mean) conduction velocities / NCV of (individuals from) different age groups ;				needs to be clear that the significant difference is in the conduction velocity and the not the ages A the difference in (mean) conduction velocities of individuals from different age groups is not <u>significant</u> A stated age categories / women of different ages / young(er) and old(er) women / with age	1
(d)	large sample size / number of people tested ;				A tested 394 individuals / many people / lots of people ; I sufficient / enough people tested I number of different age categories / ref. to standard error	[1]
					Total:	[10]