UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2010 question paper for the guidance of teachers

9700 BIOLOGY

9700/53 Paper 5 (Planning, Analysis and Evaluation), maximum raw mark 30

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.

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Mark schemes abbreviations:

; separates marking points

/ alternative answers for the same point

R reject

A accept (for answers correctly cued by the question, or guidance on the mark scheme)

AW alternative wording (where responses vary more than usual)

underline 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

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Question	Expected answer	Extra guidance	Mark
1 (a) (i)	time taken for blue colour to become colourless / AW ;	**A** time to change colour / AW	[1]
(ii)	to prevent oxygen entering / prevent re-oxidation of methylene blue ;	**A** the idea of it allows the methylene blue to work as a hydrogen acceptor **Ignore** air, carbon dioxide, gas exchange	[1]
(iii)	7 of: *independent variable:* 1. ref. to water-baths at different temperatures ; 2. at least 5 different temperatures ; 3. ref. to suitable range ; 4. ref. to retesting within the approximate optimum zone ; *dependent variable* 5. ref. to fastest time until blue disappears is optimum ; 6. ref. to colour comparison / control without methylene blue added ; *control variables* 7. ref. to standard volume of yeast / suspension (in tube) ; 8. ref. to adding standard volume methylene blue ; *procedure* 9. ref. inverting / stirring (to mix indicator and yeast) ; 10. ref. to repeats / replicates – min 3 **and** mean value to remove anomalies ; *safety:* 11. ref. to a low risk experiment ;	1. allow other suitable means of maintaining constant temperature 3. e.g. 0 °C – 70 °C. Any range in this but at least one below 30 °C and one above 5. **A** ...becomes colourless 7. **R** amount unqualified **A** known mass / weight for (dried) yeast provided some water added **Ignore** glucose 8. **R** amount /drop(s) **A** inject known volume of methylene blue through the oil layer 11. **A** ref. to possible toxicity of methylene blue / allergy to yeast / hot water **and** tongs, etc.	[7]

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(b)	3 of: 1. (yeast) can use / respire/ metabolise fructose, glucose sucrose and maltose ; 2. (yeast) has enzyme(s) to use above sugar(s) ; **ora** 3. (yeast) uses / takes up, fructose preferentially, as highest rate / AW ; 4. sucrose has a high rate as a source of fructose / AW ; 5. maltose / sucrose are larger so take longer to take up / AW ; 6. disaccharides / named disaccharide have to be hydrolysed / AW ;	1. little / no, use with galactose and lactose 3. **A** refs. to respiration as idea of uses	[3]
(c) (i)	$\frac{\mathbf{4}}{\sqrt{12}}$; = 1.16 / 1.15; = 1 cell;	**A** 4 / 3 **A** 1.2 (1.33 /1.3 if use 4 / 3) allow ecf if any value other than √12 used	[3]
(ii)	ref. to spread of data from the mean value / AW; ref. to larger value the less reliable the results / AW ;	**A** with reference to data in question **R** if accurate mentioned as well as reliable	[2]
(iii)	axes correct and labelled ; correctly plotted bar chart ; error bars correct using S_M values; (*plus and minus 2 and 1)*	*y* – mean, no. cells per mm^3 / population size per mm^3 *x* – each block labelled with correct sugar / key **R** histogram / line graph **A** sd values (plus and minus 8 and 4)	[3]
(iv)	1 of: yes: difference in mean number of cells / AW ; yes: standard error does not give overlap in populations; no: some raw data overlaps / standard deviation overlaps ; inconclusive: as no statistics tests carried out ;	reason must be consistent with their choice ignore qualifications like large / significant **A** 'no' if no statistics done	[1]
			[Total: 21]

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2 (a) (i)	independent – nicotine ; dependent – reaction time ;	**A** cigarette. **Ignore** 'amount' etc. **A** description of reaction time	[2]
(ii)	2 × 2 of: memory test time (for exposure to letters) ; constant time for which stimuli shown / 250 ms ; time between stimuli and test ; constant time / 1000 ms ; non smoking time prior to start of test ; constant time / 12 hours ; nicotine content of cigarette for each test; fixed mass in each cigarette; test group / AW ; same group used ; number of tests / single letters tested ; 50 / same ; difficulty of memory test ; varying the number of letters used (to randomise the test) ;	 **A** amount / figures quoted 0.05mg / 1.1mg **R** 'all regular smokers'	[4]
(b)	3 of: *support:* reaction time decreases with nicotine / higher nicotine (1.1mg) greatest decrease ; 1.1 mg (nicotine) increases number of letters correct / improves accuracy ; *against:* 0.05 mg (nicotine) decreases accuracy / decreases number of letters correct / small differences in number of letters correct ; ref. to error bar overlap in, accuracy data / reaction time between no smoking and 0.05 mg ;		[3]
			[Total: 9]

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