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General Certificate of Education
June 2010

Biology BIO3X

Externally Marked Practical Assignment (EMPA)

Final

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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TASK 1

Question	Part	Marking Guidance	Mark	Comments
1		(Slower breakdown because) less kinetic energy; (So) fewer collisions/E-S complexes formed/ E-S binding;	2	
2		Lactose will have been broken down already (so slower/no reaction); Glucose will be present in milk;	1 max	
3	(a)	Dip into solution for the same amount of time; Read (the colour produced) after the same amount of time; Shake the tube before each sample is taken;	2 max	Effectiveness of Clinistix (neutral) Dip to same depth (neutral)
3	(b)	Prepare a range of (known) glucose concentrations / dilution technique; Compare colour (of Clinistix from each concentration) to find one which matches (colour value 2);	2	Allow % as concentration Glucose may be implied. Must use colour
4		Benedict's would give a positive result / appropriate colour with both (glucose and lactose); Galactose / glucose is (also) a reducing sugar;	1 max	Accept better answer.
5		Measure the time taken to go a particular colour/value (on the scale); Calculate rate by dividing by time;	2	Must be to a particular colour not time taken.

TASK 2

<table>
<tr><th>Question</th><th>Part</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>6</td><td></td><td>Data presented clearly with full descriptions of independent and dependent variables;

pH in first column;

Units in headings and not in body of table;</td><td>3</td><td>Note: These marks can be awarded irrespective of the quality of the data

Do not allow mixed units.
Mark as 3 ticks in column</td></tr>
<tr><td></td><td></td><td>Quality of data

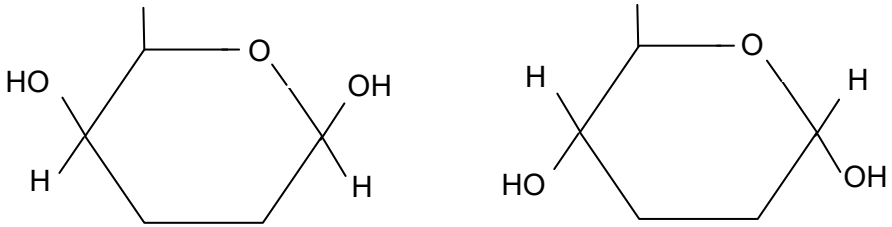
<table><tr><td>Points distributed randomly with no apparent trend</td><td>0</td></tr><tr><td>Points show a general trend.</td><td>1</td></tr></table></td><td>1</td><td>Fourth tick in column if awarded

To score this mark data must be collected independently by the candidate.</td></tr>
</table>

7		Data is plotted as a line graph; pH on x-axis, rate or time on y-axis; Axes labelled correctly with appropriate units; Scaling correct; Accuracy of plotting; Points joined with best-fitting curve or with ruled lines as appropriate;	6 max	 i.e. pH, time or 1/time. These scales should allow for accurate plotting and reading of the graph. If bar chart used do not penalise scale on x axis. If ICT used it should be possible to read the points with appropriate precision. Depending on the data obtained: • Points should be joined with curve of best fit if it is felt that intermediate values are likely to fall on such a curve • Alternatively, all points should be joined with straight lines (if it is felt that the position of the intermediate points cannot be predicted reliably) • No marks should be awarded if the curve is extrapolated beyond the range of data collected.

EMPA Test

Section A

Question	Part	Marking Guidance	Mark	Comments
8	(a)	So they reached the temperature of water bath/to equilibrate;	1	Do not allow “same temperature” alone
8	(b)	Measure temperature of tube /solutions;	1	
9		Two hexose molecules drawn correctly; With OH in correct positions; 	2	Ignore C6 Ignore labels
10	(a)	Above/below optimum/pH 6.0 enzyme denatures/tertiary shape changes; Changes shape/charge of active site; Hydrogen bonds are broken; Substrate does not fit/bind/fewer E-S complexes formed / enzyme no longer complementary;	3 max	Accept ionic bonds Disulfide bonds (neutral) Reference to peptide bonds penalises marking point.

10	(b)	Not valid because peak could be anywhere between pH 5.5 - 6.0 / pH 6.0 - 7.5 / pH 5.5 - 7.5 / student should have repeated the experiment at appropriate pH; Joining points with straight lines means you can't be certain of the intermediate values;	2	
10	(c)	Add each pH (buffer) / soak test strips in different pH (buffers); Add known/constant amount of glucose; Should get same colour (at all pHs);	3	Accept pH within range / non-specific Accept only glucose (no lactose)

Section B

Question	Part	Marking Guidance	Mark	Comments
11		So there is no/less food in digestive system; Which could affect the absorption of glucose;	2	
12	(a)	14/15 – 58 / 59 or 43 – 45 (mg per 100cm^3);	1	Wrong calculation does not disqualify
12	(b)	The larger the person the more blood they would have; But same amount of glucose absorbed / all/50g absorbed; Larger people would have a lower concentration of blood glucose;	2 max	
13		1. Any reference to overlap between all 3 groups; 2. One lactase deficient subject had high blood glucose/similar to control; 3. Some control / Group A subjects had the similar blood glucose to LD /Group B subjects; 4. Some IBS subjects had similar results to lactase deficient subjects;	3max	
14		Increase in the first 3 – 4 hours and then decrease;	1	
15		Little/no difference (at 8 hours); Between all groups;	2	
16		Respiration (produce CO_2); By cells/tissues;	2	

17		Clear differences between the lactose deficient and IBS / control group; No overlap in SD;	2	Accept between all groups
18		High sucrose/starch diet leads to increase in lactase activity;	1	
19		Not valid/cannot be certain because overlap in SD between high sucrose and high starch; Study based on rats (not human) so may not apply to human;	2	
		Total	**30**	