**General Certificate of Education (A-level)
June 2011**

Human Biology   **HBI3X**

(Specification 2405)

Unit 3X: Externally Marked Practical Assignment

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 events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process 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 standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised 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.

HBI3X Task Sheet 1

Question	Marking Guidance	Mark	Comments
1	Addition of water to split/break molecule/disaccharide/lactose/bond;	1	Ignore references to specific bonds
2(a)	To keep pH constant/stop changes in pH;	1	
2(b)	<u>Optimum</u> pH for enzyme/lactase / pH of (small) intestine / a pH that does not <u>denature</u> enzyme/lactase;	1	Reject reference to stomach
3	Remove excess <u>glucose</u> / keep volume of liquid used the same; Prevent false high reading for glucose;	2	For point 2, reject idea that more glucose will be produced (on test strip)
4	Volume total is 5cm^3 / same as experimental tube/X; Enzyme/lactase replaced by boiled/denatured enzyme or 2cm^3 water/buffer;	2	Accept descriptions of contents i.e. lactose (2)+ buffer (1)+ water (2) **OR** lactose + buffer + water + denatured/boiled lactase/enzyme
5	Draw (straight) line of best fit / use straight (line) part of curve; Use/calculate slope/gradient/glucose (produced) per minute / formula given (change in concentration divided by time);	2	
6	Colour is qualitative/not quantitative/categoric/not numeric/discrete/not continuous;	1	
	Task Sheet 1 Total	**10**	

HBI3X Task Sheet 2

Question	Marking Guidance	Mark	Comments
7	Data presented clearly with full descriptions of both the independent variable (type/sample of milk) and dependent variable (glucose concentration);	1	This may be recorded either by a full title or by complete headings at the top of the table. E.g. if 'glucose' is recorded in the table, the title should give more detail by reference to concentration.
7	Independent variable (type/sample of milk) in first column;	1	
7	Unit clearly stated (mmol dm^{-3}) and <u>only</u> in the heading to the column for the DV;	1	Accept mmol/L or mg/dL as unit Accept use of solidus or brackets to separate units
7	Trend shows similar glucose concentration/increase (before and after treatment) in milk **A** <u>and</u> no glucose in milk **B** before treatment;	1	
8	Accurate calculation <u>and</u> plotting of mean concentration of glucose;	1	Reject if rate is plotted
8	Graph has independent variable (sample/type of milk) on x-axis and dependent variable (glucose concentration) on y-axis;	1	Allow error of rate as DV in this case.
8	Appropriate scales selected for the x and y axes;	1	Scales should allow for both accurate plotting and reading of the graph. Both size of graph and proportion of graph paper used should be taken into account. Y-axis should be linear.

8	Both axes correctly labelled with appropriate units;	1	Units for glucose = mmol dm^{-3} (or mmol/L or mg/DL) on y-axis and 'before' and 'after' treatment identifiable on x-axis.
			Accept where rate or change in concentration has been plotted provided units are correct.
8	Data presented as a bar chart;	1	
8	Bars of equal width and do not touch between 2 milk samples;	1	Accept if bars for 'before' and 'after' treatment for same milk do touch. Allow single bar for milk samples where rate plotted
	Task Sheet 2 Total	**10**	

HBI3X EMPA Written Test Section A

Question	Marking Guidance	Mark	Comments
9(a)	Glucose oxidase + peroxidase / enzymes; (Blue) dye (of colour 1)/coloured compound;	2	Reject dye of colour 2
9(b)	Not specific to glucose / reacts with reducing sugars; Not quantitative / qualitative/only shows if (reducing) sugar is present; Would also react with lactose / with galactose;	2 max	"It could react with lactose which is a reducing sugar" would score 2 marks
10	Lactase/enzyme is specific/has distinctive tertiary structure/shape/ active site; (So) only lactose can fit/form ES complex/is complementary;	2	Look for idea of why specific if not identified by the term
11	Allow reactants/contents/tubes to reach (required)/ be at same temperature; (So) temperature is not (an experimental) variable;	2	Reactants are lactose + buffer + lactase Point 2 needs idea of a (potential) variable
12	$C_{12}H_{22}O_{11}$;	1	
13	Sample **A** because: 'Lactose-free' milk has already had lactase added; Glucose present because lactose already digested/hydrolysed/broken down ;	2	No mark for **A** but answer must be in this context.

14	Absent Present;	1	
15	Suitable suggestion; With explanation; E.g. Use a water bath; To reduce/prevent fluctuations in temperature/keep temperature constant; Carry out at 37^{0}C; Optimum temperature for enzyme / like conditions in the gut; Use more samples of milk/carry out repeats; To reduce effect of anomalies;	2 max	Only one pair allowed and no transfer between pairs. Accept remove/eliminate anomalies
	Section A Total	**14**	

HBI3X Written Test Section B

Question	Marking Guidance	Mark	Comments
16	Lactose (in gut) reduces/lowers water potential; Water leaves cells / prevents uptake of water by cells (lining intestine);	2	Concept Explanation either way but look for context of in or out of cells
17	Gases/bloating/pain/discomfort discourages drinking milk; Few/no symptoms experienced when other/solid foods eaten/when not drinking milk;	2	Ignore references to conscious choice
18	Eliminate lactose-containing products from diet / add lactase enzymes to diet; (Described) symptoms persist = lactose tolerant / symptoms do not persist = lactose intolerant; *OR* Test faeces for presence of lactose; Lactose present means lack of lactase to digest it/lactose intolerant / Lactose absent means lactase present to digest it/lactose tolerant;	2	e.g. milk/dairy products Only one pair allowed and no transfer between pairs.
19(a)	Negative correlation / populations with low percentage of lactose intolerant have greater milk production;	1	Accept converse for description
19(b)	African cattle herders/Northern Europeans; Most of population(s) can tolerate milk/milk products;	2	Allow 'few/low percentage are lactose intolerant'

20(a)	Intake increases with age to 18 and then falls; Increase to 18 years as <u>bones</u> grow / 18 years <u>bones</u>/skeleton at full size / little <u>bone</u> growth after 18 years;	2 max	Accept 18-19 in all cases Reject *body* growth/strong bones Ignore references to teeth
20(b)	(Between) 0.5-0.9 and 1-3 (years); (Percentage change =) 85.18 / 85.19 / 85.2 / 85(%);	2	
21	1. Lactase gene not 'switched off'; 2. (Due to) mutation; 3. Humans keeping cattle drink (a lot of) milk / milk provides calcium; 4. (Milk drinkers) have an advantage / have no/little calcium deficiency; 5. Survive and reproduce; 6. Pass on allele (for continued lactase production) to offspring; 7. Allele spreads/increases in frequency, in population;	3 max	 Accept calcium deficiency problem e.g. brittle bones; Accept gene or allele in this context
Section B Total		**16**	