Version 1.0

General Certificate of Education
June 2010

Human Biology HBI3X

Externally Marked Practical Assignment

Unit 3

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.

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).
Registered address: AQA, Devas Street, Manchester M15 6EX

TASK SHEET 1 (10 marks)

Question	Part	Sub Part	Marking Guidance	Mark	Comments
1	a		Avoid damage to dividing cells/cells in mitosis / avoid hand contact with acid;	1	
1	b		Make chromosomes/nucleus/DNA visible / stop mitosis;	1	*Ignore 'it stains'*
1	c		Macerate/soften tissue / separate cells / kill cells;	1	*Accept cells for tissue*
1	d		Increase (kinetic) energy / faster reaction (with acid) / denature proteins / stop mitosis / soften cells/tissue;	1	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
2	a		Form single/thin layer of cells / spread out cells;	1	
2	b		Transfer of cells to second slide; (So) two slides/squashes; Different areas on same slide to view;	2 max	*Accept "both" = two slides*

Question	Part	Sub Part	Marking Guidance	Mark	Comments
3	a		16.03 / 16;	1	
3	b		Only one set of data / not repeated; Did not use root tip; Inaccurate identification of cells showing mitosis / cells not dividing / counting error; Very low number of cells showing mitosis/chromosomes;	2 max	

TASK SHEET 2 (10 marks)

Question 4

Assessment of presentation of raw data table

Marking Guidance	Mark	Comment
Data presented clearly with full descriptions of both the independent (stage of cell division/mitosis/cell cycle) and dependent variable (number of cells);	1	*This may be recorded either by a full title or by complete headings at the top of the table. (E.g. if 'Mitosis' only recorded in the table, the title should give more detail by reference to stage).*
Independent variable (stage etc) in first column and no units given for either variable;	1	
Data illustrate trend of more cells seen in interphase than any other stage;	1	*Reward accuracy of experimental results*
	Total 3	

Question 5

Assessment of Processing

Marking Guidance	Mark	Comments
Time in each stage calculated *accurately*; (using formula)	1	
Independent variable (stage of cell division etc…) on x axis and dependent variable (time for stage etc…) on y axis;	1	
Appropriate scales selected for the x and y axes these scales should allow for both accurate plotting and reading of the graph;	1	*Both size of graph and proportion of graph paper used should be taken into account. Both axes should be linear*
Both axes correctly labelled with appropriate units (minutes) on y axis;	1	*Title may provide more detail of labels*
Mean values plotted accurately;	1	*If ICT bas been used to plot the graph, it should be possible to read the points with appropriate precision*
Data presented as bars;	1	
Bars of equal width and do not touch;	1	*Cannot achieve if not a bar graph*
	Total 7	

Written Paper (30 marks)

Section A (15 marks)

Question	Part	Sub Part	Marking Guidance	Mark	Comments
6			Invasive / difficult to obtain / not localised (in human body); Risk of contamination / infection; (Accessible) cells too small; Not ethical;	2 max	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
7			Cut lengthways / along axis of root tip;	1	*Accept diagrams* *Ignore "not a cross-section" unqualified*

Question	Part	Sub Part	Marking Guidance	Mark	Comments
8	a		Stage correctly identified from processed data / graph; Prophase: Breakdown of nuclear envelope; Formation of spindle/fibres; Division of centrioles; Coiling/condensing of chromosomes; Metaphase: Chromosomes move to centre of cell/equator; As chromatid pairs; Align at equator/description; Anaphase: Separation of chromatid pairs; Move to opposite poles/ends of cell; Pulled by spindle fibres / led by centromere; Telophase: Chromosomes elongate/become thinner; Nuclear envelope forms; Division of cytoplasm; Formations of cell wall;	3 max	*Explanation in context of 'time needed for' consistent with features of the stage given. Maximum of 2 for any <u>one</u> stage only* *Ignore calculation errors in processed data* *Accept correct descriptions for wrongly identified stage (max 2)* *Interphase = 0 marks*
8	b		Chromosomes/DNA not evenly spread out; Chromosomes/DNA take up (more) stain; Different structures take up stain to differing degrees;	2 max	e.g. nucleolus

Question	Part	Sub Part	Marking Guidance	Mark	Comments
9			Number representative / number used large enough / all in one field of view;	1	

<table>
<tr><th>Question</th><th>Part</th><th>Sub Part</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>10</td><td>a</td><td></td><td>
<table>
<tr><th>Stage of mitosis</th><th>Number of cells in stage of mitosis</th><th>Percentage of cells in stage of mitosis</th><th>Time to complete stage of mitosis / minutes</th></tr>
<tr><td>Prophase</td><td>108</td><td>67.5</td><td>54</td></tr>
<tr><td>Metaphase</td><td>16</td><td>10</td><td>8</td></tr>
<tr><td>Anaphase</td><td>8</td><td>5</td><td>4</td></tr>
<tr><td>Telophase</td><td>28</td><td>17.5</td><td>14</td></tr>
</table>
Correct calculations of percentages;
Correct calculations of times;</td><td>2</td><td></td></tr>
<tr><td>10</td><td>b</td><td></td><td>Correct reference to similar/different percentages/times at any (mitotic) stage;
Correct reference to similarity/difference in two calculations / own method adds up to more/less than 80 minutes;
Second calculation assumes interphase is 640 minutes;</td><td>2 max</td><td>N.B. points 1 and 3 available for those who fail to calculate time in (a).</td></tr>
<tr><td>10</td><td>c</td><td></td><td>Scientist’s method based on measurement (so more reliable);
Own method based on an assumption (cell cycle takes 720 minutes);
Both based on same principle (percentage of cells in stage = percentage of time in stage);
Time lengths not actually measured / are estimates;
Scientists method not affected by underestimate/overestimate of time in interphase / did not include interphase;
Reliability affected by sample size;</td><td>2 max</td><td></td></tr>
</table>

Section B (15 marks)

Question	Part	Sub Part	Marking Guidance	Mark	Comments
11	a		1. Interphase is the longest stage (in both cases); 2. Cell cycle/any stage/named stage is shorter/faster in cancer cells; 3. Mitosis is quicker in cancer cells; 4. Cells spend the least time in anaphase; 5. Prophase is longest stage of mitosis/cell division (in both cases); 6. Same trend/pattern;	3 max	
11	b		Cancer cells produce more cells than healthy cells/divide faster than healthy cells; In same time interval/at a quicker rate;	2	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
12			Blood flow less than normal (rate); (Therefore) cells deprived of nutrients/glucose/oxygen; Less/slower cell cycle/cell division/mitosis/production of new cells; Tumour dies/cells die; Division/mitosis/cell uses energy;	3 max	*Accept "needs" energy*

Question	Part	Sub Part	Marking Guidance	Mark	Comments
13			(Chemotherapy) drug/vinblastine is toxic to/damages normal cells; Need to find a safe/the lowest concentration/dose (that is effective);	2	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
14	a		1. (Metaphases) may be in tumour cells or healthy cells; 2. (More cells in metaphase means) metaphase is taking longer / other (named) stages not taking as long; 3. Fewer cells have moved into anaphase/telophase / cells stopped at metaphase; 4. Rise in number of metaphases (over six hours) is due to higher number of (tumour) cells (which divide quicker); 5. Cells already in prophase (when vinblastine given) then cells continue to metaphase;	3 max	*Allow even if 'cells' are unspecified*
14	b		1. Data only relates to one dose / dose level not known; 2. Only one study/no control/only metaphase investigated; 3. Dose/drug may be toxic / have side effects / have greater effect (on metaphase) in healthy cells; 4. Standard deviations show wide spread of results; 5. Fall may not be significant / no overall fall in the number of metaphases / initial rise in number of metaphases; 6. (But) drug may have worked/has slowed cell division (with cells stopped at metaphase so more seen);	2 max	