



**General Certificate of Education (A-level)
June 2012**

Human Biology

HBIO2

(Specification 2405)

Unit 2: Humans - their origins and adaptations

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 students' 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 students' 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.

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Question	Marking guidance	Mark	Comments												
1 (a)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Monosaccharide</th> <th style="width: 33%;">Carbohydrate</th> <th style="width: 33%;">Lipid</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">✓</td> </tr> </tbody> </table>	Monosaccharide	Carbohydrate	Lipid	✓	✓			✓				✓	3	1 mark per row
Monosaccharide	Carbohydrate	Lipid													
✓	✓														
	✓														
		✓													
1 (b)	<ol style="list-style-type: none"> 1. Already present; 2. One step reaction/single hydrolysis reaction/only one bond to break (to release energy); 3. Releases fixed/useable/controlled/small amount of energy; 4. (Energy) released quickly / lots of energy in a small space of time; 	1 max	Accept used for phosphorylation of myosin												
Total		4													

Question	Marking guidance	Mark	Comments
2 (a)	1. (A) Prophase; 2. (C) Anaphase; 3. (D) Telophase;	3	
2 (b)	E;	1	
2 (c)	1. New cells are produced; 2. <u>DNA</u> is replicated/cells are <u>genetically</u> identical/have same <u>genetic</u> information; 3. New cells can perform same function; 4. To replace dead/damaged cells;	2 max	
Total		6	

Question	Marking guidance	Mark	Comments
3	1. Immunological; 2. Biochemical; 3. Anatomical; 4. Behavioural; 5. Biochemical;	5	
Total		5	

Question	Marking guidance	Mark	Comments															
4 (a)	Chromosomes with same gene(s)/loci/appearance;	1	Accept alleles in same place/loci QWC															
4 (b)	<table border="1"> <thead> <tr> <th>Type of human cell</th> <th>Number of chromosomes</th> <th>Mass of DNA / arbitrary units</th> </tr> </thead> <tbody> <tr> <td>Skin cell</td> <td>46</td> <td>12</td> </tr> <tr> <td>Sperm cell</td> <td>23</td> <td>6</td> </tr> <tr> <td>Zygote</td> <td>46</td> <td>(12)</td> </tr> <tr> <td></td> <td>;</td> <td>;</td> </tr> </tbody> </table>	Type of human cell	Number of chromosomes	Mass of DNA / arbitrary units	Skin cell	46	12	Sperm cell	23	6	Zygote	46	(12)		;	;	2	1 mark per column
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Skin cell	46	12																
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	;	;																
4 (c)(i)	<ol style="list-style-type: none"> (Chemical) carcinogen / up to 2 named examples;; (Ionising) radiation / up to 2 named examples;; Mutagen / up to 2 named examples;; UV light; Virus; 	2 max	Generic description achieves 1 mark but is not awarded if an appropriate named example is also given. Accept HPV as example of virus.															
4 (c)(ii)	Tumour suppressor (gene);	1	Accept oncogene / proto-oncogene															
Total		6																

Question	Marking guidance	Mark	Comments
5 (a)	<ol style="list-style-type: none"> 1. Lives/reproduces <u>in</u> another (living) organism/host/human/mosquito; 2. Causing it harm / damaging/bursting red blood cells; 	2	<ol style="list-style-type: none"> 1. Reject idea of <i>on</i> host. Ignore 'lives off' 1. Reject feeds (on blood) 'It' could refer to human or mosquito <p>QWC</p>
5 (b)(i)	<ol style="list-style-type: none"> 1. Inside (red blood) cell; 2. Antigens/surface proteins not detected/antigens not expressed; 3. White cells/antibodies cannot reach/do not attack red blood cells/plasmodium; 	2 max	
5 (b)(ii)	<ol style="list-style-type: none"> 1. <u>More</u> in the blood; 2. (Once released) so many the immune system cannot kill all (before mosquito bites); 3. <u>More</u> chance of being taken up by a mosquito; 4. <u>More</u> in mosquito/<u>more</u> chance of infecting/reaching another human/host; 	2 max	<p>Accept idea of a carrier/vector if mosquito not referred to</p> <p>Ref to idea of 'more' required for both points</p> <p>QWC</p>
Total		6	

Question	Marking guidance	Mark	Comments
6 (a)(i)	<ol style="list-style-type: none"> 1. Organisms that can breed together; 2. Produce fertile offspring; 	2	
6 (a)(ii)	Genus;	1	
6 (b)	<ol style="list-style-type: none"> 1. (Genetic) code copied into RNA; 2. (Code is) in the nucleus; 3. (RNA) moves from nucleus/moves into cytoplasm; 4. To ribosomes; 5. (RNA/code/base sequence) determines the sequence of amino acids; 6. Amino acids linked to form protein; 	3 max	<p>Accept other relevant ways of describing 'code'</p> <p>Accept formation of mRNA for point 1</p>
6 (c)	<ol style="list-style-type: none"> 1. No nucleus in (new) cell/bottom part so no genes/DNA/genetic information (from species B)/ no new RNA can be made; 2. Uses RNA from A (which is from/in the middle part); 3. Protein for cap of species A produced; 	3	
Total		9	

Question	Marking guidance	Mark	Comments
7 (a)(i)	Potassium-argon / stratigraphy;	1	
7 (a)(ii)	<ol style="list-style-type: none"> 1. (Plant/animal remains) contain organic material/named example of organic material; 2. Carbon dating suitable up to 45-60 thousand years ago; 	1 max	
7 (b)	<p>Accept two suitable examples, e.g.</p> <ol style="list-style-type: none"> 1. Charred stones; 2. Charcoal/ash; 3. Charred bones/burnt seeds; 4. Swollen/split grains/seeds; 5. Remains of cooking vessels; 	2 max	Accept other ways of describing 'charred'
7 (c)	<p>Accept one suitable piece of evidence with explanation, e.g.</p> <ol style="list-style-type: none"> 1. Chipped/shaped/sharpened stones; 2. To kill animal/cut flesh/remove skin/for use as weapon; 3. Bones broken deliberately/in a fashion; 4. To extract marrow; 5. Scrape marks on bones; 6. To remove flesh; 	2 max	<p>Allow one pair only</p> <p>Also credit reference to:</p> <p>Stone material not found (commonly) in area;</p> <p>Shows brought from elsewhere (for use as tool);</p> <p>(Use of stones for) shaped bone (pieces);</p> <p>For use as needles/in sewing (skins together) / for use as weapon;</p>
7 (d)	<ol style="list-style-type: none"> 1. Division of labour/description; 2. Development of a home base; 3. Living in small groups/sharing of food; 4. Cooperation; 5. Communication (between group members/while hunting); 6. Varied/healthier diet; 	2 max	<ol style="list-style-type: none"> 1. E.g. males hunted, females gathered seeds etc.
Total		8	

Question	Marking guidance	Mark	Comments
8 (a)	<ol style="list-style-type: none"> 1. Heart rate and stroke volume; 2. Idea that they are multiplied together; 	2	HR x SV scores 2 marks
8 (b)	<p>17 (dm³) = 2 marks;;</p> <p>1 mark for identifying 68% of 25 (dm³) or answer of 3.4(dm³);</p>	2	Allows for error of using CO volume at rest
8 (c)	<ol style="list-style-type: none"> 1. Rate of flow/distribution given in percentages/not given as volumes; 2. Volume of blood reaching the brain is the same; <p>OR</p> <ol style="list-style-type: none"> 3. Rate of flow (as % of cardiac output) decreases; 4. (but) cardiac output increases; <p>OR this could be shown by calculations</p> <ol style="list-style-type: none"> 5. 3% of 25 dm³ = 0.75 dm³; 6. 14% of 5 dm³ = 0.7 dm³; 	2 max	3. Accept approximation of values.
8 (d)	<ol style="list-style-type: none"> 1. (Increase in carbon dioxide) lowers pH; 2. Detected by chemoreceptors; 3. In aorta/carotid (sinuses)/medulla; 4. (Nerve) impulses to/stimulates medulla/cardiovascular centre; 5. <u>More</u> (nerve) impulses (from medulla) to heart/SAN; 	2 max	4. Do not accept signals
Total		8	

Question	Marking guidance	Mark	Comments
9 (a)	(Any form of) preserved remains/ preserved evidence of an organism;	1	E.g. footprint is an example of evidence
9 (b)	1. DNA/base sequence (of DNA) codes for; 2. Proteins/enzymes/pigments that make skin/hair colour(s); OR 3. Analyse the base sequence (of DNA/genes/alleles); 4. Compare with/ look for similarity to modern humans (who have lighter skin/red hair);	2 max	Principles here are either: 1. coding 2. what for OR 3. Analyse 4. compare
9 (c)	1. Absorption of UV-light; 2. In areas of limited sunlight; 3. For production of vitamin D; 4. Better chance of survival;	2 max	1. Reject absorb vitamin D from the sun. 4. Accept less likely to develop rickets
9 (d)	1. Mutation; 2. Changed base sequence/amino acid sequence; 3. New protein/allele; 4. People with (new) allele/red hair reproduced/passed on allele; 5. Change in <u>allele</u> frequency; 6. People (with mutation) had advantage/not selected against/survived better;	3 max	3. Accept affects distribution/production of melanin/pigment 4. Reject references to genes passed on
Total		8	

Question	Marking guidance	Mark	Comments
10 (a)	<ol style="list-style-type: none"> 1. (A mass of) cells dividing uncontrollably; 2. (Tumour can be) benign or malignant; 	2	
10 (b)	<ol style="list-style-type: none"> 1. Chromosomes in form of chromatid pairs; 2. (Chromosomes) attach to spindle; 3. By means of the centromere; 4. On equator/metaphase plate; 5. Separation of chromosomes/chromatids; 6. Spindle pulls (chromosomes/chromatids) to opposite poles/ends of cell; 	5 max	Accept descriptions e.g. as sister chromatids 5. Accept centromere splits
10 (c)	<ol style="list-style-type: none"> 1. Stops growth of tumours/stops mitosis/division; 2. Stops (production of cells that) spread to other parts of body/ metastasis; 	2	2. Allow idea that any cells that might be produced are not viable
10 (d) (i)	<ol style="list-style-type: none"> 1. Group of/all Pacific yew trees/same species in same place; 2. No human influence / breeding is random / trees not planted/not cultivated; 	2	2. For 'breeding' look for idea of reproduction or production of new trees being random
10 (d) (ii)	Appropriate suggestion; Appropriate explanation; e.g. <ol style="list-style-type: none"> 1. 'Wild' trees not killed/ preserved; 2. Maintains biodiversity; 3. Easier to collect; 4. As growing in a limited area; 5. Can breed high-yielding strains; 6. Harvest at most appropriate stage; 	2 max	Mark as a pair only but allow reversal of ideas e.g. biodiversity maintained (suggestion) because wild trees not killed (explanation)

10 (d) (iii)	<ol style="list-style-type: none"> 1. Only bark used; 2. Trees killed / take a long time to grow; 3. Low yield/small amount extracted; 4. Increase in demand (for use); 	2 max	<p>E.g. 'only bark used and there is a low yield from it' gets 2 marks</p> <p>Accept each person might need a lot of the drug/paclitaxel.</p>
10 (e)	<p>In the context of using fungus:</p> <p>Suitable advantage, e.g.</p> <ol style="list-style-type: none"> 1. Easy/quick to grow; 2. Large/continuous supply / allows extensive use / more patients treated; 3. Less/no environmental impact / less trees cut down; 4. Cheaper qualified, e.g. less land needed; 5. Could make other drugs; <p>Suitable disadvantage, e.g.</p> <ol style="list-style-type: none"> 6. Trials are needed / not tested; 7. Could cause side-effects/harm; 8. Expensive qualified, e.g. cost of production/altering; 	5 max	<p>Allow converse arguments for use of Pacific yew</p> <p>Note: If <u>only</u> marks for advantages are awarded, the maximum mark that can be achieved is 4.</p>
Total		20	