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General Certificate of Education

Human Biology 1406

HBIO2 Humans – their origins and adaptations

Mark Scheme

2010 examination – January series

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.

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<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>1</td><td>a</td><td>i</td><td>Group of (similar) organisms that can (reproduce to) produce fertile offspring;</td><td>1</td><td></td></tr>
<tr><td>1</td><td>a</td><td>ii</td><td>Any suitable hominid, e.g., H. habilis / H. erectus / H. neanderthalensis / Australopithecus sp;</td><td>1</td><td></td></tr>
<tr><td>1</td><td>b</td><td></td><td><table><tr><td>Kingdom</td><td>Animalia</td></tr><tr><td>Phylum</td><td>Chordata</td></tr><tr><td>Class</td><td>Mammalia</td></tr><tr><td>Order</td><td>Primata</td></tr><tr><td>Family</td><td>Hominidae</td></tr><tr><td>Genus</td><td>Homo</td></tr><tr><td>Species</td><td>sapiens</td></tr></table>;
;</td><td>2 max</td><td>1 mark per correct column
Accept Animals for Animalia

Do NOT accept initial letters

Accept Homo sapiens for species</td></tr>
</table>

Question	Part	Sub Part	Marking Guidance	Mark	Comments
2	a		(Any two of) DNA is: Double stranded; Longer/larger molecule; Has deoxyribose (not ribose); Has thymine (not uracil);	2 max	Allow converse statements for RNA. Qualify Assume "It" refers to DNA. Note: need not refer to both
2	b	i	Sequence of bases/nucleotides; Specifies sequence of amino acids; Triplet of bases/nucleotides/codons; Specifies one amino acid;	2 max	Can score 2 for both statements about bases Statements about amino acids must be correctly linked to statement about bases
2	b	ii	Different enzymes produced / different amounts of enzyme / no enzyme produced; Different pigment produced / different amount of melanin produced / no melanin produced; Different colour of skin / correct ref to albinism;	2 max	 R: melatonin

Question	Part	Sub Part	Marking Guidance	Mark	Comments
3	a		Two marks for statements about complete lower jaw of *Ramapithecus*. E.g. Narrower than that of humans/ human parabolic; Less rounded than that of humans; Shape is much more like chimpanzee; Front teeth/incisors are not like human (front) teeth; Canines more pointed;	2 max	Accept: larger canines
3	b		Different fragments may not have come from same organism / not joined; Different fragments may not represent whole jaw/teeth missing/is incomplete; So reconstruction may be inaccurate; Need other evidence to confirm or refute; (so conclusion unreliable)	2 max	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
4	a		Decreases by 50%; Per generation / per division; ***OR*** ^{15}N makes up ½ after 1 division; Makes up ¼ after 2nd division;	2	 Only accessible if linked to first marking point
4	b		In DNA replication strands separate; Each acts as template (for formation of new strand); One strand in each new molecule / semi-conservative replication; New strands made using ^{14}N;	2 max	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
5	a	i	(Overall) energy release increases with increase in intensity; Aerobic only at lower intensities, aerobic and anaerobic at higher intensities; Aerobic increases to 65% intensity; Then levels off; Anaerobic starts at same intensity as aerobic levels off/at 65% intensity; Anaerobic increases to 100% intensity;	3 max	
5	a	ii	Increase in concentration of (blood) lactate; Decrease in (blood) pH; Prevents normal contraction/relaxation of muscle (fibres) / action of enzymes (in muscles);	2 max	Accept lactic acid Accept increased acidity
5	b		Oxygen is released from (oxy)haemoglobin; Diffusion out of red blood cell / into muscle cell; Down concentration gradient; maintained by respiration;	2 max	

<table>
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<tr><td>6</td><td>a</td><td>i</td><td>Idea of association with another organism / host;

Idea of benefit to parasite (e.g. food, shelter);

Causing harm to other organism / host;</td><td>2 max</td><td>Accept ‘lives off’</td></tr>
<tr><td>6</td><td>a</td><td>ii</td><td>Migration through blood stream from intestines to lungs;

(Coughed) out of lungs and swallowed;</td><td>2</td><td></td></tr>
<tr><td>6</td><td>a</td><td>iii</td><td>Toxocara only enters humans by chance/accident / life cycle cannot be completed through humans/is not main host;</td><td>1</td><td></td></tr>
<tr><td>6</td><td>b</td><td></td><td><table><tr><th>Adaptation</th><th>Importance of adaptation</th></tr><tr><td>Has suckers on head</td><td>Secures tapeworm in <u>intestines</u> / prevents tapeworm passing out of intestines</td></tr><tr><td>Body is covered by a thick cuticle</td><td>Prevents attack/digestion by enzymes/chemicals (in the intestine)</td></tr></table></td><td>2</td><td>Must be <u>intestines</u>

Must be <u>chemicals</u> from <u>digestive system</u></td></tr>
</table>

Question	Part	Sub Part	Marking Guidance	Mark	Comments
7	a	i	Allows power and/or precision grip(s); (More skilful) use of tools; (More skilful) use of weapons;	2 max	
7	a	ii	Those with opposable thumb / reproduce more successfully; (Mutant) alleles passed on in greater numbers; Increase in allele frequency in next generation; Increase in frequency of opposable thumb in next generation; Repeated over many generations;	3 max	
7	b		Body shape B is taller and thinner (no mark) Larger surface area to volume ratio; Heat lost more easily; Easier to maintain body temperature;	2 max	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
8	a	i	Box 2 – (aortic) pressure receptor; Box 3 – medulla / cardiac centre;	2	 Ignore refs to SAN
8	a	ii	More blood to muscles; More oxygen/glucose to muscles; More aerobic respiration;	2 max	Accept CO_2 removed faster from muscle More oxygenated blood to muscles scores 2 marks
8	b		Decreases pH; Detected by chemoreceptors in aorta/carotid body; (Nerve) impulses to medulla/cardiovascular centre; Impulses from medulla to heart/ventricles; Impulses increase heart rate and/or stroke volume; cardiac output = heart rate × stroke volume / = volume pumped per ventricle per minute;	3 max	Accept increases acidity Accept impulses to SAN Allow increased activity of SAN as an extra marking point

Question	Part	Sub Part	Marking Guidance	Mark	Comments
9	a		More detailed/specific/better communication/teaching is possible; Better information on location of food; Better organisation of hunt / better planning;	2 max	
9	b	i	Sharp increase in number of words learned; At 13 – 14 months / after 12 months;	2	
9	b	ii	Weaker vocabulary; Less able to communicate; So do not attempt to / do not make friends;	2 max	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
10	a		Wheat, barley, beans and lentils all found in that area; More varied diet; Better supply of protein for strength; For humans and stock animals; Can all be cultivated without having to move; Water from nearby rivers (for crops);	3 max	
10	b	i	Variation of yield (about the mean);	1	R - range
10	b	ii	1. Cannot be certain of cause and effect; 2. Other factors may have changed also / not all variables controlled; 3. These could influence yield; 4. Suitable example (eg diet of cattle/conditions under which cattle kept); 5. No animals that have not undergone selective breeding for comparison / no control group; 6. No information on how many animals used / could have used more animals; 7. Small SDs shows relatively little variation; 8. This increases reliability of data;	4 max	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
11	a	i	Same antigens/receptors / cell surface proteins; On cell membrane / on plasma membrane;	2	
11	a	ii	1. Genes/DNA control cell division; 2. (Proto-)oncogenes; 3. (Genes) mutate; 4. (Mutation) as a result of ionising radiation/e.g. or carcinogenic chemicals/e.g.; 5. (Mutated genes) produce excess growth factor/receptor protein; 6. Cells divide in an uncontrolled manner; 7. By mitosis; 8. Tumour suppressor genes don't work; 9. Mass of cells/tumour forms; 10. Not detected/attacked by immune system;	6 max	
11	b	i	Metastasis;	1	
11	b	ii	Benign tumour enclosed in a membrane / connective tissue; In one place / no metastasis / doesn't spread; Slower growing; Easier to operate on /easier to remove;	3 max	

11	c		Suggests that cell 'suddenly' becomes cancer cell / happens in one day / suggests a single event to convert body cell to cancer cell; Random mutations can happen 'on any day (to initiate)'; Several stages involved in transformation / examples of some stages / changes occur over a period of time; But 'one day' all the necessary changes are complete;	2 max	
11	d	i	(Have lived longer so) More exposure to ionising radiations / e.g.; More exposure to carcinogenic chemicals; More chance of a (harmful) mutation; Accumulation of mutations;	2 max	Qualify The idea of **more** is essential here. It need not be stated **explicitly** every time, but needs to be clearly **implicit** in each statement.
11	d	ii	By fifty most humans have reproduced / finished reproducing; Before cancer develops; No 'selection pressure' due to cancer; No reproductive advantage in cancer defence system; So (evolution by) natural selection not possible in this case;	4 max	