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General Certificate of Education

Human Biology 1406

HBIO2 Humans – their origins and adaptations

Mark Scheme

2009 examination – June series

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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></td><td>D phosphate;
E pentose sugar/deoxyribose;
F (nitrogenous) base/ organic base/ thymine/adenine/ cytosine/guanine;</td><td>3</td><td>In D reject phosphorous
In E
Accept 5-carbon sugar
Reject sugar alone</td></tr>
<tr><td>1</td><td>b</td><td></td><td><table><tr><th></th><th>DNA</th><th>RNA</th></tr><tr><td></td><td>double-stranded</td><td>single-stranded</td></tr><tr><td></td><td>deoxyribose</td><td>ribose</td></tr><tr><td></td><td>Thymine/T</td><td>Uracil/U</td></tr><tr><td></td><td>very large/long</td><td>very small/short</td></tr></table></td><td>2 max</td><td>Accept double helix for DNA
Accept longer and shorter
Need comparison but could be in one box
List rule applies.</td></tr>
</table>

<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>2</td><td>a</td><td></td><td>Putting organisms into groups;
Groups put into larger groups/kingdom largest and species smallest;
With no overlap between groups/lower groups (taxa) more specific features;</td><td>2 max</td><td>Accept converse statements
Accept e.g. of smaller into larger group – e.g. species into genus</td></tr>
<tr><td>2</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/Orders</td><td>Carnivora</td></tr><tr><td>Family/Families</td><td>Canidae</td></tr><tr><td>Genus</td><td>Canis</td></tr><tr><td>Species</td><td>Canis familiaris</td></tr></table></td><td>2</td><td>Mark vertical columns
1 mark for each correct vertical column

For Species
Accept familiaris alone
Reject Familiaris</td></tr>
<tr><td>2</td><td>c</td><td></td><td>Humans choose which organisms breed/organisms are bred;
Chosen for characteristic (by people)/example used;</td><td>2</td><td>Accept examples other than dog
Accept useful genes/alleles</td></tr>
</table>

Question	Part	Sub Part	Marking Guidance	Mark	Comments
3	a		DNA replicated/two DNA strands/molecules; Coiled/condensed/wound up (to make visible); Giving/made of (two) chromatids; Attached at centromere;	2 max	*Accept linear so eukaryote;* *with histone;* *Accept have become shorter and fatter*
3	b	i	Stage **A**, anaphase/prophase; Chromatids/chromosomes moving to poles/chromosomes condensed/coiled/wound up;	2	*Points not linked but need correct description with stage in this case.* *Accept prophase because the image could be interpreted as such*
3	b	ii	Stage **B**, metaphase; Chromosomes on equator/attaching to spindle;	2	*Points not linked* *Accept equator of cell* *Reject centre of cell* *Accept chromatids for chromosomes*

Question	Part	Sub Part	Marking Guidance	Mark	Comments
4	a		Make/restore diploid number/46 chromosomes (at fertilisation); Maintain chromosome number in next generation;	2	*Accept get full set of chromosomes/genes from each parent* *Accept chromosome number would keep doubling*
4	b		Pair/chromosomes separate; (One) goes to each pole/side/end/new cell;	2	**Q** *Accept 2 chromosomes go to each side for 1 mark* *Accept random assortment for 2nd point* *If it is clear candidates refer to meiosis II, then give Chromatids separate;* *4 (haploid) gametes produced;*
4	c		Pair of chromosomes/ chromosome 21s fail to separate; Gamete(s)/egg produced with one extra chromosome/ 24 chromosomes; (Child with) 47 chromosomes/1 extra chromosome/ 3 chromosome 21s;	2	*Accept duplications of part of chr. 21/translocation (17 to 21);*

Question	Part	Sub Part	Marking Guidance	Mark	Comments
5	a		Lose less heat/ retain heat better/easier to keep warm; Easier to maintain/regulate (constant) body temperature/ less food/energy needed;	2	*Accept prevent heat loss* *Reject survive better*
5	b		Correlation between length of forearm and width of hips; Correlation/stronger correlation for 'hot' but not for 'cold'; Greater variation in armlength in hot/greater variation in hip width in cold; Hot areas longer forearm and narrower hips; (Lot of) overlap between two groups/ 'hot top and left and 'cold' bottom and right; People from hot climate (have larger surface area to volume ratio so) faster/easier heat loss;	3 max	*Accept converse or description of correlation*
5	c		Dark skin blocks UV (light); Lower risk of mutation/ (skin) cancer/burning;	2	*Ignore ref. to Vitamin D* *Accept lowers risk of damage to DNA*

Question	Part	Sub Part	Marking Guidance	Mark	Comments
6	a		Fatty acids; Glucose; Glycogen;	2 max	*Accept lactate/lactic acid; two named fatty acids;;* *Accept fat/triglycerides* *Reject glucagon*
6	b		1 (Up to) 200m, phosphocreatine to supply all ATP/energy; 2 This supplies ATP/energy quickly; 3 (Up to) 400 m (phosphocreatine used up so ATP/energy from) anaerobic needed; 4 Doesn't require/require more oxygen (uptake); 5 (Up to) 800m still use anaerobic but lactate not up to harmful amounts; 6 (Up to) 1500m both to supply <u>more</u> ATP/energy; 7 Aerobic respiration prevents lactate build up/(lactate causing) muscle fatigue; 8 5000/10 000m long races/time, so aerobic respiration (with no lactate build up); 9 Short races aerobic not used, too slow;	4 max	*Assume short races are in range 200 to 400m, middle distance are in range 800 to 1500m and long distance are in range 5000 to 10 000 m.*
6	c		Changes shape of protein/tertiary structure/changes active site; (Active site) no longer binds with substrate/no ES complex formed/slower rate of reaction (away from optimum);	2	*Accept denatured*

Question	Part	Sub Part	Marking Guidance	Mark	Comments
7	a		21.6 ; 10.1 2.14 (times);	2	*Correct answer 2 marks* *Accept 2.138/2.139 if seen anywhere in calculation, even if answer simplified to 2/2.1*
7	b		(Radon) radiation increases risk of (lung) cancer/(positive) correlation; Still a risk with no radon (for non-smokers); Risk (about) doubles for smokers and non-smokers; Greater risk for smokers (at all doses);	3 max	*Accept use of figures in calculation for 1 mark* *Note if they get the third point, they may well get the first point as well*
7	c		Three suitable points;;; e.g. Little risk for non-smokers, so not worth it; Any increase in risk affects a lot of people/lung cancer is very serious; Other environmental factors/named factor have greater impact, so spend money there; (Most) people don't spend all their time at home; Smokers choose to smoke, so public funds not warranted/ smokers should be advised to put trap in themselves; Only one study, so don't know if the problem is widespread; Don't know how many people studied, might need larger sample to show risk;	3 max	*Note, students may comment on methodology and this is acceptable*

Question	Part	Sub Part	Marking Guidance	Mark	Comments
8	a		Overall with IED make greatest number of mistakes; (With IED and without make) fewest mistakes with surprise; (With) IED make greatest errors with disgust; Without IED greatest errors with fear; (With) IED and without make about same level of mistakes with fear/ surprise; (With) IED make greater errors with anger/disgust; Suitable ref. to SD;	4 max	
8	b		They think people are looking at them with anger/disgust/fear (when they aren't); They react in self-defence/ with innate behaviour/with similar emotion/example of;	2	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
9	a		All populations reduced (since 1970); (Trend) more cereal per hectare, more reduction; (Negative) correlation; Correlation strongest with intensive/no correlation with non-intensive; Greatest reductions with intensive farming; Large reductions with some non-intensive/some non-intensive greater reductions than intensive;	3 max	*Ignore positive correlation with non-intensive*
9	b		Yes, because appears to be negative correlation/described between cereal per hectare and decline; Yes, because largest drops/more large drops with intensive; No, because falling populations regardless of system used; No, because big fall where non-intensive farming in some countries; No, because some of smallest falls in countries with intensive farming; High cereal production per hectare may not be directly linked to intensive farming; No, countries may not be comparable in terms of changing factor/named factor that changes bird populations;	3 max	
9	c		One suitable suggestion; With explanation; e.g. Building on new land; Removing habitat; Pollution; Toxic to birds; Domestic cats; Killing birds;	2 max	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
10	a		Comparison with existing/modern humans (in Europe); Where pale skins/ red hair found; Gives advantage; In terms of vitamin D (synthesis); (Assuming) similar evolution;	2 max	
10	b		Stratigraphy; Potassium-argon dating; Carbon dating; OR, method named and described;; Example, Stratigraphy; Age of rock layer/sediment layer where found;	2 max	
10	c		Ref. to fluid mosaic model; Protein in phospholipid (bilayer)/intrinsic or extrinsic protein; Part of protein extends beyond membrane; Synthesized at ribosomes; Modified/packaged by Golgi; Inserted into membrane by (Golgi) vesicles;	2 max	
10	d		(Sequence of) bases on DNA changes; RNA changes; (Sequence of) amino acid(s) in protein changes; Shape of receptor/protein changes; Faulty receptor/protein /protein won't specifically; No melanin/ pigment produced;	4 max	*Accept code(coded information) on DNA changes*

Question	Part	Sub Part	Marking Guidance	Mark	Comments
10	e		(From common ancestor) both have named example of common feature; Second example; Different populations (of ancestral species); Different environments/migration; Variation in populations; Mutations (producing new alleles/genes); Isolation (of different populations); Different selection pressures/natural selection; Competition (for means of survival); Example of environmental factor affecting survival; Best adapted (more likely to survive and) reproduce/pass on their alleles; Changes in allele/phenotype frequencies/gene pools; Reproductive isolation (giving new species)/unable to interbreed;	6 max	*Accept groups etc*
10	f		Suitable suggestions;;;; e.g. (Probably) limited sample of bones tested; DNA decays with time; Not known if DNA in bones tested is typical/not all neanderthals had mutation; Assumes common ancestry, may not be true; (Despite precautions) could be contamination with foreign DNA in/on bones; Mutation of gene may have had different effect in neanderthal cells; Assumes same cellular/(metabolic) pathway/phenotype effect of gene in neanderthal and human cells;	4 max	