



General Certificate of Education (A-level)
June 2013

Human Biology

HBIO2

(Specification 2405)

Unit 2: Humans - their origins and adaptations

Final

Mark Scheme

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Question	Marking guidance	Mark	Comments
1 (a)	1. Lose (more) heat / (easier) to keep cool; 2. (Easier) to maintain/regulate (body) temperature; 3. Humans do not have to adapt their behaviour;	2 max	2. Accept do not overheat 3. Accept examples
1 (b)	1. Adaptation: Dark skin; 2. Explanation: Blocks UV (light) / lower risk of mutation/(skin) cancer/burning; 3. Adaptation: Thin layer of fat/eq; 4. Explanation: heat is lost more/easily / less heat is conserved;	2 max	1. Accept more melanin 2. Ignore answers relating to vitamin D production 2. Accept no risk (NFP)

Question	Marking guidance	Mark	Comments
2 (a)	1. (Lived in) small groups; 2. Development of a home base/limited range around a home base; 3. Division of labour (between male and female)/description of; 4. Group cooperation (while hunting/in home base)/sharing of food;	2 max	Accept ideas relating to moving often to new areas to find food / follow animals
2 (b)	1. (To help early humans with) hunting/follow scent trails/collect killed animals; 2. For protection against predators; 3. For warning of danger (by barking);	1 max	Ignore modern ideas such as for the way they look or rounding up sheep Ignore for companionship
2 (c)	1. More food/more regular food supply; 2. Larger populations/communities form/settle / increased reproduction; 3. Develop social structures/different roles/specialists/tools/skills; 4. Allow development of culture/trade;	2 max	2. Accept descriptions of communities

Question	Marking guidance	Mark	Comments								
3 (a)	<u>Semi-conservative</u> ;	1									
3 (b)	<u>Interphase/s-phase</u> ;	1	G1/G2 phase dq interphase								
3 (c)	Joins nucleotides together / forms sugar-phosphate bonds / forms phosphodiester bonds;	1	Reject: Joins <u>bases</u> together / forms H-bonds								
3 (d)	<u>Hydrogen</u> (bond);	1									
3 (e)	<table border="1"><tr><td>35</td><td></td><td></td><td>27</td></tr><tr><td>16</td><td></td><td>27</td><td>22</td></tr></table> ;	35			27	16		27	22	2	1 mark per correct row
35			27								
16		27	22								

Question	Marking guidance	Mark	Comments
4 (a)	(A DNA nucleotide has) Deoxyribose not ribose; (A DNA nucleotide has) Thymine not uracil;	2	Assume 'it' refers to DNA nucleotides Allow clear converse statements for RNA nucleotides
4 (b) (i)	(She meant) genes contain a <u>sequence</u> of bases/nucleotides; (They) can be copied into RNA; (Sequence of bases/nucleotides/RNA) determines the order of amino acids (in a protein)/primary structure of a protein; - One triplet/codon / three bases/nucleotides code for one amino acid;	2 max	- Must be the idea of a sequence eg order of bases is acceptable - Reject bases/nucleotides/RNA making amino acids - Reject one triplet/codon / three bases/nucleotides make one amino acid
4 (b) (ii)	- Appearance/characteristics/traits qualified; (Physical) expression of genotype;	1 max	
4 (b) (iii)	- The sequence of bases/nucleotides in the gene could be different (in the two organisms); (The genes in the two organisms) could be (different) alleles; - Environmental factors/named examples;	1 max	

Question	Marking guidance	Mark	Comments												
5 (a)	<table><tr><th>Mitosis</th><th>Meiosis</th></tr><tr><td>1. (produces) diploid <u>cells</u> / cells with two sets of chromosomes/genes/alleles</td><td>(produces) haploid <u>cells</u> / cells with one set of chromosomes/genes/alleles;</td></tr><tr><td>2. (cells produced are) genetically identical/eq</td><td>(cells produced are) genetically different/eq;</td></tr><tr><td>3. (produces) two cells</td><td>(produces) four cells;</td></tr><tr><td>4. One (cell) division</td><td>Two (cell) divisions;</td></tr><tr><td>5. (produces) somatic/ body cells (in humans)</td><td>(produces) gametes (in humans)</td></tr></table>	Mitosis	Meiosis	1. (produces) diploid <u>cells</u> / cells with two sets of chromosomes/genes/alleles	(produces) haploid <u>cells</u> / cells with one set of chromosomes/genes/alleles;	2. (cells produced are) genetically identical/eq	(cells produced are) genetically different/eq;	3. (produces) two cells	(produces) four cells;	4. One (cell) division	Two (cell) divisions;	5. (produces) somatic/ body cells (in humans)	(produces) gametes (in humans)	2 max	1 mark per correct row 1. Accept suitable use of human chromosome number
	Mitosis	Meiosis													
	1. (produces) diploid <u>cells</u> / cells with two sets of chromosomes/genes/alleles	(produces) haploid <u>cells</u> / cells with one set of chromosomes/genes/alleles;													
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	3. (produces) two cells	(produces) four cells;													
	4. One (cell) division	Two (cell) divisions;													
5. (produces) somatic/ body cells (in humans)	(produces) gametes (in humans)														
5 (b) (i)	<u>Anaphase</u> ;	1													
5 (b) (ii)	(Chromatids gather at opposite poles and) uncoil/uncondense/unwind/become surrounded by <u>nuclear</u> membrane;	1													
5 (c) (i)	<u>Tumour suppressor</u> (gene);	1	Reject proto-oncogene/ oncogene												
5 (c) (ii)	1. (They) have a mutation in/(DNA) damage; 2. To <u>one</u> of their genes/alleles controlling cell division/growth / tumour suppressor genes;	2	Accept proto-oncogene/ tumour suppressor gene more susceptible to mutation / more likely to mutate in some people for one mark												

5 (c) (iii)	1. Radiation/named example; 2. Chemical carcinogen/named example;	1 max	Accept viruses/correct named example such as HPV/HIV/Hepatitis B/C Reject answers relating to old age increasing exposure time to environmental factors Reject incorrect examples of radiation eg IR/radio
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Question	Marking guidance	Mark	Comments
6 (a) (i)	- As the years increase so does the milk yield / positive correlation; - Increase is faster after 1952/1953;	2	
6 (a) (ii)	25%;;	2	Correct answer gets 2 marks Allow 1 mark for answers that clearly show change between years (1000) divided by starting value (4000)
6 (a) (iii)	- Extend the X-axis to the year 2000 (and extend Y-axis to 7000); - Extrapolate/extend curve (as required/and read from graph); - Read value off the Y-axis; OR Accept suitable descriptions of calculations from the graph, eg - Work out mean rate of increase per year; (and) add to the value for 1988;	2 max	Accept extend line
6 (b)	- Farmers/humans select the best characteristics/animals/organisms; - And (only) breed from these; (This is) repeated over many generations;	2	Accept idea that organism is selected/chosen Accept examples of best characteristics eg highest milk yield Q

Question	Marking guidance	Mark	Comments
7 (a) (i)	Yes 1. All categories/foxes show higher (%) infection in winter than summer; No 2. No indication of what higher temperature/cold is / no idea what temperatures are in winter/summer; 3. Sample size (in summer) too small to be representative;	1 max	No mark for yes/no Reject any answers relating to human infection
7 (a) (ii)	1. In most cases/females young foxes have lower % infection than adult foxes; 2. (Except) in <u>winter</u> a greater % young <u>males</u> infected than adult males; 3. Data is only for foxes, not all animals;	2 max	Accept converse
7 (b)	Hooks and suckers on its head (i) Secures <i>E. multilocularis</i>/parasite to (small) <u>intestine</u> / prevents <i>E. multilocularis</i>/parasite passing out of (small) <u>intestine</u>; No digestive system (ii) (<i>E. multilocularis</i>/parasite) doesn't have to use resources to produce digestive system / more resources available for reproduction; Production of thousands of eggs which are dispersed into faeces (iii) Increased chance that eggs will survive / infect new host / to allow eggs to reach new hosts / more chance of completing life cycle; Resistance to all known disinfectants (iv) Increase chance of survival outside of host;	4 max	1 mark for an advantage in each category

Question	Marking guidance	Mark	Comments
8 (a)	A group of (similar) organisms that can (reproduce to) produce fertile offspring;	1	
8 (b)	1. Small canines; 2. A short/(more) parabola-shaped/rounded jaw; 3. Flattened teeth (with a larger biting area);	2 max	2. Accept 'same shape'
8 (c)	1. Narrow jaw / shape more like chimpanzee; 2. Jaw less rounded//less parabola shaped/more u-shaped than humans; 3. Front teeth/incisors are not like human (front) teeth; 4. Canines more pointed;	2 max	
8 (d) (i)	Middle box should be ticked;	1	Accept crosses
8 (d) (ii)	1. Compare DNA/sequence of bases/nucleotides; 2. Compare same/named protein/sequence of amino acids /primary structure of proteins; 3. DNA hybridisation/description of; 4. Immunological/description of;	2 max	Reject any embryological ideas Ignore behavioural ideas such as type of food eaten Ignore anatomical ideas such as examining under a microscope for micro-wear, enamel thickness or musculature

Question	Marking guidance	Mark	Comments
9 (a)	1. (ProEnergize group show) improvement in aerobic and/or anaerobic respiration suggests more energy/ATP available; 2. More aerobic respiration could delay muscle fatigue/build-up of lactate/lactic acid; 3. Placebo group show improvement/increase (more)/same change; 4. Credit references to overlaps in S.D. showing no real/significant difference between groups/results could be due to chance; 5. Improvement/increased energy could be due to training alone;	3 max	Maximum of two marks if only one side of the evaluation is given 1. Reject ideas relating to more energy being produced
9 (b) (i)	1. (High intensity training causes) increased respiration; 2. (respiration) increases carbon dioxide levels/lowers blood pH; 3. (Increase in carbon dioxide/fall in pH) detected by chemoreceptors; 4. In carotid/aortic bodies / medulla; 5. <u>Increased frequency/more</u> nerve impulses <u>to</u> respiratory centre/of medulla; 6. Increased frequency/more impulses (from respiratory centre) to diaphragm/intercostal muscles;	4 max	5. and 6. must be the idea of increase at least once to score either mark 5. and 6. Reject signals/messages/information Q
9 (b) (ii)	Oxidise lactate/lactic acid (build up);	1	Accept to repay oxygen debt Accept ideas suggesting that blood still has high CO₂/low pH causing the high breathing rate

Question	Marking guidance	Mark	Comments												
10 (a)	<table><tr><td>Phylum</td><td></td></tr><tr><td>Class</td><td></td></tr><tr><td>Order</td><td></td></tr><tr><td>Family</td><td></td></tr><tr><td></td><td><i>Onthophagus</i></td></tr><tr><td></td><td><i>taurus / Onthohagus taurus</i></td></tr></table> ;;	Phylum		Class		Order		Family			<i>Onthophagus</i>		<i>taurus / Onthohagus taurus</i>	2	One mark for each correct column
Phylum															
Class															
Order															
Family															
	<i>Onthophagus</i>														
	<i>taurus / Onthohagus taurus</i>														
10 (b)	1. Variation present (in size of horn) in population; 2. When there are few females small horns is an advantage; 3. Those with small horns more likely to mate/reproduce; 4. (These) pass on alleles/genes (to next generation/offspring); 5. More/increase (in frequency) of small horn <u>alleles</u>; 6. Increased frequency of small horns; 7. Repeated over many generations;	6 max	Accept that mutations may cause change in horn size 2. Must be the idea of not many females												
10 (c) (i)	Organisms can pass on acquired/changed characteristics;	1													
10 (c) (ii)	Yes 1. Dung beetles cannot change the size of their horns; 2. In response to a differing number of/more/fewer females;	2 max	No mark for yes Allow 1 mark for simple answers stating that dung beetles cannot change characteristics and pass them on												

10 (d)	1. Scientists found (in populations) with more females fighting is most successful; 2. Beetles with large horns win most mates (when female population is large); 3. Scientists only did one study / did not repeat the study; 4. (Scientists) only studied one species; 5. (Scientists) only studied three countries/populations; 6. Beetles in other countries may have different strategies/not all (beetle) species may show these strategies;	4 max	Maximum of three marks if only one side of the evaluation is given Accept converse for mark points 1 and 2
10 (e) (i)	1. The populations (of dung beetle) are geographically isolated; 2. Different selection pressures / differing number of females in each population; 3. Different strategies advantageous in each population; 4. Populations become genetically/phenotypically different; 5. (Therefore they are) <u>reproductively isolated</u>; 6. Unable to produce fertile offspring;	4 max	1. Accept examples of geographical isolation 2. Reject incorrect examples of selection pressures eg different temperatures/ environments 4. Accept correct examples of genetic/phenotypic change 4. Ignore different characteristics
10 (e) (ii)	(Diversity would) increase;	1	