



**General Certificate of Education
June 2010**

Human Biology

HBIO2

Humans-their origins and adaptations

Unit 2

Final

<i>Mark Scheme</i>

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Question	Part	Sub Part	Marking Guidance	Mark	Comments
1	a		(Pentose) sugar/deoxyribose and phosphate;	1	<i>Reject ribose and phosphorus</i>
1	b		Semi-conservative replication; Complementary pairing; Hydrogen bonding (of bases/nucleotides); Condensation/described of nucleotides; DNA polymerase involved;	3 max	<i>Accept example (A, T and C,G)</i>

Question	Part	Sub Part	Marking Guidance	Mark	Comments								
2	a	i	(Q –) S – P – R;	1									
2	a	ii	<table><tr><th>Cells formed by mitosis</th><th>Cells formed by meiosis</th></tr><tr><td>diploid</td><td>haploid</td></tr><tr><td>genetically identical/eq.</td><td>genetic variation/eq.</td></tr><tr><td>2</td><td>4</td></tr></table>	Cells formed by mitosis	Cells formed by meiosis	diploid	haploid	genetically identical/eq.	genetic variation/eq.	2	4	2 max	<i>1 mark per correct comparison</i> <i>Accept 46 /2 copies of genes/ 2 copies of allele for diploid and 23/ 1 copy of genes/ 1 copy of alleles for haploid</i>
Cells formed by mitosis	Cells formed by meiosis												
diploid	haploid												
genetically identical/eq.	genetic variation/eq.												
2	4												
2	b		Chromosome pair/chromosomes 21 do not separate/non-disjunction/non-disjunction of chromatids in meiosis II; Cell has one extra chromosome/has 24 chromosomes /has two of chromosome 21; Combines with other gamete with 23 chromosomes / with one chromosome 21/with normal gamete; Child has 47 chromosomes / has three of chromosome 21/has an extra chromosome;	2 max	<i>Accept appropriate references to translocation</i>								

Question	Part	Sub Part	Marking Guidance	Mark	Comments
3	a	i	Live in or on/ close association with another organism/ lives in or on host; (Parasite benefits and) host is harmed;	2	<i>Accept 'lives off' or 'feeds from'</i>
3	a	ii	Has hooks to hold it in place; Thick/resistant outer layer; Can respire in low oxygen concentrations; Can produce anti-enzymes;	2 max	<i>Accept can respire anaerobically</i>
3	b		1. Reduces/prevents transfer of <u>eggs/parasite</u> to humans <u>from fur/from saliva/from faeces</u> ; 2. Prevents reproduction/release of eggs/no source of eggs;	2	

Question	Part	Sub Part	Marking Guidance	Mark	Comments	
4	a		Any two of:	2 max		
			DNA			RNA
			Large molecule			Smaller
			Double stranded			Single stranded
			Contains Thymine (T)			Contains Uracil (U)
			Contains deoxyribose			Contains ribose
4	b		Base sequence (on DNA/in gene); Determines sequence of amino acids; By determining base sequence on (messenger) RNA; Code is a triplet code/three base code for an amino acid;	2 max		
4	c		Pairs of chromosomes/two chromosomes; With genes for same features / with same genes; At same loci / in same sequence;	2 max	<i>Accept same alleles</i>	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
5	a		ATP	1	
5	b	i	2.57:1/2.6:1/18:7;; Correct answer however derived scores two marks 72:28 scores one mark Correct working from wrong figures scores 1 mark	2 max	<i>Accept</i> <i>0.4/0.39/0.389/0.3889</i>
5	b	ii	Low intensity; At low intensity/below 40% mainly fat used / at high intensity/above 40% mainly carbohydrate used; Long duration exercise; Percentage fat used increases with time / percentage carbohydrate used decreases with time;	3	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
6	a		More food is available; Larger populations; Settled communities; Social structures/different roles; More leisure time; Increased reproduction rate; More trade; Increased/better communications; Domestication of animals/crops; Decrease in biodiversity; Increased use of tools;	4 max	
6	b		Idea that humans control the breeding; Breed the most docile; As easier to handle/control; For many generations/over a period of time;	3 max	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
7	a	i	All three share a recent common ancestor;	1	<i>Accept all three belong to same genus</i>
7	a	ii	<i>Homo erectus</i> : Has larger brain/cranial capacity; Has more upright posture; Is taller; Forehead less sloping; Lower jaw more parabolic in shape/more U-shaped; Teeth smaller;	2 max	<i>Accept converse points for Homo habilis</i>
7	b	i	[Yes] because: Fewer differences between modern human and Neanderthal; So have more genes in common; 20 – 34 differences between modern human and Neanderthal; 47 – 64 differences between modern human and chimpanzee;	2 max	
7	b	ii	Only three Neanderthal samples/only 9 chimpanzee samples/small sample size; May not be typical of all/not representative/not enough results for stats test/may be due to chance;	2	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
8	a	i	Removes variable in investigation; Shows effects due to PEDF; Not due to (variation in) immune response; Allows tumour growth;	2 max	
8	a	ii	Tumours in both groups increase in volume; Tumours from normal prostate cancer cells grow faster / are bigger; No difference in growth to day 7; No significant difference to day 14 (since SD overlap); Difference in growth/volume greatest after day 21;	3	
8	b		Carried out on mice / a different species; Prostate cancers/tumours in humans may respond differently; Only carried out for 28 days; Results may show different pattern over a longer period/carry out for longer to make results conclusive; Only used 5 mice/small sample; May show atypical response / need larger numbers to be sure of a general trend/to be representative; PEDF and cancer cells introduced at same time; Human may already have cancer;	4 max	<i>One mark for reason and one mark for related explanations. Maximum of 2 reasons.</i>

Question	Part	Sub Part	Marking Guidance	Mark	Comments
9	a		Adaptation	2 max	
			How the adaptation gives humans an advantage in their environment		
			Opposable thumb		
			Allows precision and power grips/manipulation;		
9	b	ii	Skin colour	2	
			Darker skin gives protection against UV / Pale skin allows UV penetration for Vitamin D synthesis;		
9	b	i	To allow comparison; Animals have different masses;	2	
9	b	ii	Decreases with age for bipedal locomotion; Increases with age for quadrupedal locomotion;	2	
9	b	iii	Using means can hide patterns/differences; Mean is distorted by anomalies/extreme results; Mean results suggest that quadrupedal locomotion is less efficient/uses more oxygen than bipedalism/little difference between the two; True in older chimps/not true in younger chimps/correct reference to individual differences;	2 max	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
9	b	iv	Correct link of oxygen usage to energy efficiency; (Yes) Mean results show less O₂ consumption for bipedalism; Bipedalism more energy efficient/uses less O₂ in older/mature chimps; Human bipedalism even more energy efficient/uses even less O₂; (No) Mean results suggest that quadrupedal locomotion is almost as efficient/almost the same O₂ usage; Quadrupedalism more efficient in younger chimps; Other (physiological) differences between humans and chimps might explain the different energy efficiencies in Table 2;	2 max	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
10	a		Reduced oxygen carriage/to muscles; Less aerobic respiration; (More) anaerobic respiration; Produces lactate; Lactate causes fatigue;	3 max	<i>Accept climbing increases energy demand (from respiration)</i> <i>Accept lactic acid</i>
10	b	i	All the individuals of one species in a certain area / all the people in a particular place;	1	
10	b	ii	1. Variation in red blood cell count in original population; 2. Those with highest count have survival advantage; 3. Because they can carry more oxygen; 4. Allowing more aerobic respiration; 5. Reproduce in greater numbers; 6. Pass on (advantageous) alleles (in greater numbers); 7. Increase in frequency of advantageous allele; 8. Increase in frequency of those with high blood cell count; 9. Repeated over many generations;	6 max	<i>Accept mutation(s) that lead to more red blood cells produced</i> <i>Accept genes</i>
10	c		At high altitudes, same volume of blood carries less oxygen; Dilated arteries allow increased blood flow; To lungs; Increased uptake of oxygen (in lungs); Compensates for lower carriage by haemoglobin;	3 max	

10	d	More haemoglobin per red blood cell; Compensate for lower binding rate; Would carry more oxygen (in same volume of blood); No need for increase breathing / heart rate; OR Different haemoglobin; Binds more strongly to oxygen / has higher affinity for oxygen; Compensates for lower pp oxygen; Would carry more oxygen than normal haemoglobin; OR Increased lung capacity; Bigger volume of air per breath / increased tidal volume; Increases transfer of oxygen to blood/increases gas exchange; Compensates for slower diffusion;	3 max	
10	e	Adapt to high altitudes whilst training; e.g. increased red blood cells count / increased haemoglobin concentration; Can carry more oxygen at normal altitudes than before; More aerobic respiration/less anaerobic respiration; Less lactate produced; Increased endurance / increased performance/less fatigue;	4 max	