Version 1

General Certificate of Education (A-level)
June 2011

Human Biology HBIO2

(Specification 2405)

Unit 2: Humans - their origins and adaptations

Final

Mark Scheme

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Question	Marking Guidance	Mark	Additional Guidance
1(a)	Sequence: C,A,D,B;;;	3 max	1 mark per correct box to 3 max
1(b)(i)	Q;	1	
1(b)(ii)	Cell/nucleus has divided / is dividing (into two);	1	Accept – mitosis (occurring) Ignore refs to chromosomes dividing

Question	Marking Guidance	Mark	Additional Guidance
2(a)	Downs' syndrome; Extra (chromosome) is present; (Chromosome) 21;	3	Statement 'extra (chromosome) 21 is present' / another 21 is present / three 21's are present scores 2
2(b)	Have same gene(s); In same places/loci/in same sequence; Same shape/same size/centromere in same place; Come together in meiosis;	2 max	Accept have same alleles Ignore refs to genetically identical Ignore refs to DNA base sequences Accept correct refs to crossing over

Question	Marking guidance	Mark	Additional Guidance
3(a)	Two suitable differences between DNA and RNA;; e.g. DNA is double stranded, RNA is single stranded; DNA has thymine present, RNA has Uracil present; DNA is larger/heavier/longer, RNA is smaller/lighter/shorter; DNA has a deoxyribose sugar, RNA has a ribose sugar; DNA stays in the nucleus, RNA leaves the nucleus;	2 max	1 mark per correct row to 2 max Accept T and U
3(b)	Three suitable examples;;; e.g. Carries coded information about the sequence of amino acids; Copied from DNA/gene; Code is in sequence of bases / triplet / three bases / a codon codes for one amino acid; Moves out of nucleus/goes into cytoplasm; To ribosomes;	3 max	Accept codons allow anticodons / tRNA to bind Accept carries ‘start’ and ‘stop’ codes Accept moves through ribosomes

Question	Marking Guidance	Mark	Additional Guidance
4(a)	Tall and thin bodies; Large surface area to volume ratio; Lose heat easily/faster / more heat;	2 max	Ignore references to insulating fat layers Accept large surface area to mass ratio or equivalent Accept small volume to surface area ratio
4(b)	Higher numbers of blood cells (no mark) Each red blood cell carries less oxygen; Increased numbers compensate/more red blood cells to carry oxygen / more oxygen carried; A special form of haemoglobin (no mark) Higher affinity for oxygen; More oxygen carried (in red cells) / higher saturation; Binds with oxygen at low concentrations of oxygen/at concentrations found at high altitudes/at lower concentrations than 'normal' haemoglobin; Only releases at low concentrations; Allow each of the following once only in either context Lower concentration of / less oxygen (in atmosphere) at high altitudes; (Adaptation) allows normal amounts of oxygen to reach cells / enough/more oxygen to named tissue; More/enough oxygen for respiration;	4 max	Max 3 for either part Ignore references to oxygen reaching organs quicker

Question	Marking Guidance	Mark	Additional Guidance
5(a)	Codes for proteins; (That) inhibit cell division; (That) cause cell death/apoptosis; Of cells with damaged/mutated DNA;	2 max	
5(b)	Suggest causal relationship because (no mark) Curves for increase in smoking and increase in cancer similar shape; Time for cancer to develop/ time lag; Takes 20 years/dates; To stage where it can be diagnosed / explanation of time lag; Causal relationship not proved because (no mark) Data shows correlation; Other/named factor may influence the development of cancer; Other/named factors may not have been controlled;	4 max	3 max if only 'for' statements

Question	Marking Guidance	Mark	Additional Guidance
6 (a)	Glycogen; Glucose/(blood) sugar; Protein/amino acids; ATP;	2 max	Accept Phosphocreatine Ignore carbohydrate
6 (b)(i)	Increases to max. Of 0.6g min^{-1}; At % HRmax 73;	2	Correct figures no units = 1 mark Accept range 72-74
6 (b)(ii)	Oxygen (no mark) More intense exercise uses / needs more energy / ATP / oxygen; Oxygen needed for aerobic respiration; To produce ATP / release energy; Greater uptake of oxygen means more energy / ATP; Heart rate (no mark) Oxygen carried in blood; Faster HR means faster delivery rate (of oxygen);	4 max	3 max unless both issues addressed Ignore 'to produce energy'

Question	Marking Guidance	Mark	Additional Guidance
7(a)	Two suitable adaptations of T.canis e.g. Has hooks; Reduced locomotory system; Produces many eggs / high reproductive rate; Sticky eggs; Can infect other hosts; Can respire anaerobically / can survive in low oxygen environment; Secretes anti enzymes / can resist host's enzymes; Thick cuticle / sheds cuticle; Reduced sensory organs;	2 max	Ignore suckers Ignore references to skin
7(b)	Eggs transferred (no mark) From litter area/faeces; From infected soil; From fur / being licked / petting/stroking dog;;	2 max	
7(c)(i)	Higher (percentage infection) rates in the outskirts;	1	Accept references to more likely to be infected in outskirts

7(c)(ii)	Small numbers (of children)/small sample; Some (categories) very low / e.g. of low figures quoted; May be atypical / anomalies / anomalous examples have big effect; Other factors may influence infection rates; These factors are not controlled;	2 max	Such as general health / ability to resist infection

Question	Marking Guidance	Mark	Additional Guidance
8(a)	Learn more / more time to learn (skills); Such as better language; Better communication; Example of survival value of better communication – sharing information about food locations / instructing on tool/weapon use; Can learn through problem solving; Can learn through play;	2 max	
8(b)(i)	Allow communication without language / without talking; e.g; Can signal 'intent'/'approachability' / eq. / Anger/scowling means stay away / Happiness/smiling / means 'can approach' / Improve social bonding	2	
8(b)(ii)	Yes (no mark) Percentage correct recognitions decrease; Percentage of 'Other' expressions identified increase; An example quoted with correct numbers; No (no mark) Some differences are very small; An example quoted with correct numbers;	4 max	

Question	Marking Guidance	Mark	Additional Guidance
9(a)	Sequence: 1 Some crop plants and stock animals were domesticated 2 Improved farming techniques generated food surpluses 3 Different people developed different skills as societies became more complex	2	All three correct = 2 marks One correct = 1 mark
9(b)(i)	Pots with maize starch 9000 years old; Maize pollen 9000 years old; Maize must be older than this; Genetically similarity suggests teosinte evolved into maize; As a result of mutations / selective breeding;	5 max	Max 4 for (i) Need to state 9000 years only once for marking points 1 and 2.
9(b)(ii)	Cutting tools (suggest clearance of woodland / removal of trees); Burnt wood (suggest clearance of woodland / removal of trees); Pollen (from maize) indicates cultivation (of maize);		
9(b)(iii)	Woodland has more species / types of plants; Woodland has more habitats / niches; Woodland has more (variety of) food;	3	Accept converse argument for maize Accept loss/destruction of habitat as converse Accept idea of more complex foodwebs in woodland

Question	Marking Guidance	Mark	Additional Guidance
10(a)	Ardipithicus;	1	
10(b)	Potassium argon dating; Stratigraphy/description;	2	Reject – carbon dating
10(c)	Many /36 /(near) complete specimens; (Increases reliability of) dating / estimating age; (Increases reliability of) reconstructions; One/few specimens could be anomalous; Few specimens could lead to erroneous reconstructions; As with Rampithicus; Work of many biologists increases reliability (of interpretation/reconstruction); Work of many biologists reduces bias;	3 max	
10(d)(i)	Three suitable advantages of bipedalism;;; Frees forelimbs for other functions / for carrying / for manipulation; Gives extra height / better view of surroundings; Exposes more of body to cooler air; Faster movement/more efficient (movement);	3 max	

10(d)(ii)	Variation in ancestral population/some can knuckle-walk; Knuckle-walking is an advantage; As retain long fingers for climbing; Can also walk on the ground; More likely to survive to reproduce; More likely to pass on (advantageous)alleles; Repeated over many generations; Increased frequency of (knuckle walking)allele; Increase in numbers that are knuckle walkers/have this characteristic/advantage;	6 max	Max 5 if knuckle walking not mentioned
10(d)(iii)	Three suitable examples of evidence with explanation;;; e.g More fossils for comparison; More complete fossils/skeletons so better reconstruction / better comparison; More intermediate fossils/specimens help decide between hypothesis; Specimens / evidence / fossil of <u>common ancestor</u> to see if hypothesis 2 is true; DNA to compare sequences/hybridisation / matching/similarity; Immunology / protein/amino acid sequences to see relationships;	3 max	Ignore references to similar/different DNA structure

10(e)	2% different/98% similar; Convert 2% to number of genes; Divide by mutation rate / multiply by time for one mutation;	2 max	

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