Version 1

**General Certificate of Education (A-level)**
**January 2012**

# Human Biology HBIO2

## (Specification 2405)

## Unit 2: Humans - their origins and adaptations

# Post-Standardisation

***Mark Scheme***

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 events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process 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 standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.



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| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| 1(a) | 1. Deoxyribose;<br>2. Guanine;<br>3. Uracil; | 3 | Marking from left to right<br>Accept G<br>Accept U |
| 1(b) | DNA:<br>1. Large/long, to hold a lot of information;<br>2. Double-stranded/complementary base pairing, to allow for replication/so stable;<br>3. Weak hydrogen bonds between bases easily broken for replication;<br>RNA:<br>4. Small/ so can leave nucleus/move to ribosomes / since carries code for one gene; | 2 max | Only 1 mark for each molecule<br>Accept references to bond strengths in DNA |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| 2(a) | 1. Growth;<br>2. Repair; | 2 | Accept any other valid answer – cell replacement; cancer; |
| 2(b) | Metaphase,<br>1. Chromatids held together at centromere;<br>2. (Each) chromosome/centromere attached to spindle;<br>3. At equator of cell/spindle;<br>Anaphase,<br>4. Centromere divides/chromatids separate;<br>5. One chromatid/chromosome moves towards each pole/opposite poles (of spindle); | 4 max | Accept – chromosomes pulled apart |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| 3(a) | 1. A length of DNA;<br>2. That codes for a protein/polypeptide/nature of/development of organism; | 2 | QWC |
| 3(b)(i) | 1. Series of (biochemical) reactions;<br>2. Catalysed by enzymes;<br>3. Where product of one reaction is substrate for the next; | 2 max | |
| 3(b)(ii) | 1. Change in base sequence (of the gene's DNA);<br>2. (So) change in sequence of amino acids in PAH/enzyme;<br>3. (So) tertiary structure/3D shape changes; | 2 max | Accept order of bases<br>Accept descriptions of bonds forming in wrong places between amino acids<br>Reject change in amino acids made/produced |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| 4(a) | 1. Failure of chromosome (pairs) to separate;<br>2. Failure of chromatids to separate;<br>3. During anaphase;<br>4. (So) both chromosomes/chromatids go to one pole of spindle; | 2 max | |
| 4(b) | 1. 1, 2 and 5;<br>2. They contain an extra chromosome;<br>3. At fertilisation, gives zygote/embryo/baby with 3 copies of chromosome (21)/47 chromosomes in total; | 3 | |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| 5(a) | 1. Cats/dogs carry the parasite / have eggs/*Toxocara* in faeces;<br>2. Humans infected via faeces (of cats and dogs);<br>3. Humans ingest eggs;<br>4. Contact with fur/stroking/animal licking; | 2 max | |
| 5(b) | Three suitable features e.g.,<br>1. Association with another organism/lives in intestines;<br>2. Produces toxin that harms/ harms host;<br>3. Has means of transmission from one host to another;<br>4. Survives in gut of host/not digested; | 3 max | |
| 5(c) | 1. First column – Family;<br>2. Second column – **Genus** Salmonella <u>and</u> **Species** enteritidis; | 2 | Accept Salmonella enteritidis or S. enteritidis for species |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| 6(a) | 1. (the number of years spent as a child) increases;<br>2. None in *Australopithecus;*<br>3. Suitable qualification using numerical data; | 2 max | |
| 6(b) | 1. Other hominids only from fossils / only *Homo sapiens* observed;<br>2. Can't know (directly) about psychological/social development (in fossil hominids); | 2 | |
| 6(c) | 1. Increases survival chances;<br>2. Can judge if other people are a threat;<br>3. Or likely to be helpful/friendly;<br>4. When verbal communication not very good/well developed / allows communication without talking;<br>5. Helps bonding with parents; | 3 max | |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| 7(a) | 1. Clearing land for arable/crops;<br>2. Clearing land for grazing;<br>3. Trees felled for timber (for houses/farm buildings/fuel); | 2 max | |
| 7(b) | 1. Horse chestnut and fir have fewest insects (on leaves);<br>2. So few British insects can eat them;<br>3. Only considered leaf eaters, might be many insects eating other parts of these trees;<br>4. Results of survey might not be reliable, only one survey/wood;<br>5. No information about the total number of insects; | 3 max | |
| 7(c) | 1. Reduce biodiversity;<br>2. Will be fewer (insect) species;<br>3. Fewer/no other tree species;<br>4. Fewer food sources/habitats for many species;<br>5. Other species destroyed during planting;<br>6. Impact less with Scots pine;<br>7. Because more species (of insects) associated with (than fir); | 3 max | Accept fewer niches |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| 8(a)(i) | Athlete's heart rate,<br>1. Doesn't go up as high;<br>2. Falls back to normal rate faster;<br>3. Lower at rest; | 2 max | Accept use of figures from graph |
| 8(a)(ii) | 1. Athlete has greater cardiac output;<br>2. (Due to) greater stroke volume;<br>3. (So) each beat gets<br>4. more blood/oxygen to tissues/muscles;<br>5. Removes lactate/repays oxygen debt faster after exercise / less lactate/oxygen debt build up; | 2 max | |
| 8(b)(i) | 1. (Energy sources) ATP, creatine phosphate, anaerobic respiration of glucose, aerobic respiration of glucose;<br>2. Race lasts 210 seconds which is too long to rely on ATP stores / creatine phosphate / anaerobic respiration of glucose;<br>3. 1500m race - creatine phosphate / anaerobic / aerobic respiration supplies ATP quickly; | 2 max | Accept anaerobic and aerobic respiration of glucose |
| 8(b)(ii) | 1. Aerobic respiration of glucose/carbohydrate provides energy for long enough;<br>2. And supplies it faster than respiration of triglycerides/fatty acids;<br>3. So they can run faster for longer; | 2 max | |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| 9(a) | 1. Salt soln./A greater tumour growth/ increase in mass than other groups;<br>2. Least/no growth/increase in mass with TA and radiotherapy/C;<br>3. TA on its own/B does reduce growth of tumour/cause less rapid increase in mass;<br>4. Appropriate use of values for SD; | 3 max | QWC |
| 9(b)(i) | Spread of tumour/cancer cells to other parts of the body (away from original tumour); | 1 | Accept - growth of secondary tumours<br>QWC |
| 9(b)(ii) | For<br>1. TA reduces growth of tumours (in mice);<br>2. Little/no growth if used with radiotherapy;<br>Against<br>3. Don't know if it works on human tumours/mice tumours might be different;<br>4. Might have harmful side effects in humans;<br>5. Could make brain/lung tumours become cancerous/metastasised;<br>6. (If effective) has to be used only for colon tumours/after checking no brain/lung tumours present;<br>7. Small sample sizes;<br>8. No data about radiotherapy on its own; | 4 max | Reject TA reduces mass of tumours |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| 10(a)(i) | 1. Stratigraphy;<br>2. Potassium-argon dating;<br>3. Carbon dating; | 2 max | |
| 10(a)(ii) | Two suitable ways e.g.<br>*Homo sapiens* has,<br>1. Larger cranium/cranial capacity;<br>2. More upright/erect posture;<br>3. Smaller eyebrow ridges; | 2 max | |
| 10(b)(i) | All of the individuals of the same species living in the same area; | 1 | |
| 10(b)(ii) | 1. No interbreeding between the two populations / no gene/allele flow;<br>2. Different environment for each population / suitable named example;<br>3. Different selection factors/pressures;<br>4. Example of, e.g. <u>different</u> predators/diseases/food organisms;<br>5. (Genetic) variation in each population;<br>6. Caused by mutation;<br>7. Some individuals have selective advantage/better adapted;<br>8. Differential survival/some more likely to survive; | 6 max | |

| | | | |
|---|---|---|---|
| | 9. To reproduce to pass their alleles to next generation;<br>10. Change in alleles/genes/gene pools/allele frequencies/phenotype frequencies;<br>11. If reproductive isolation, then new species; | | QWC |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| 10(b)(iii) | 1. Interbreeding (between populations) tranfers/carries alleles from one population to another;<br>2. Do not become reproductively isolated; | 2 | |
| 10(c) | Two suitable adaptations;; with benefits;;<br>e.g.<br>1. Low surface area to volume ratio/short, round body;<br>2. Allows less heat loss;<br>3. Light skin colour;<br>4. Allows more light to enter skin for vitamin D synthesis/prevents rickets; | 4 | |
| 10(d) | Three suitable suggestions;;;<br>e.g.<br>1. More efficient use of tools/fire;<br>2. Killed them in fights;<br>3. Competed with others for food;<br>4. Competed for territory;<br>5. Brought in new diseases; | 3 max | |