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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Biology 6811

AEA Biology

Mark Scheme

2008 examination - June series

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Question 1

(a) *Allow one mark for each valid adaptation and supporting reason.*
For example:
Streamlined shape overcoming drag;
Large amount of subcutaneous fat/blubber as insulation in cold water;
Large size producing small surface area to volume ratio and less heat loss;
Myoglobin allowing oxygen to be stored (for use underwater);
Glands necessary to excrete salt taken in; 4 max

(b) (i) (Involve species that are) only distantly related/belong to different orders/families; 1

(ii) DNA coding for nucleotide sequences;
on RNA (that forms part of) ribosomes; 2

(c) There will be more changes in nucleotide sequences than in amino acid sequences;
Substitution of a base may result in coding for the same amino acid;
Particularly true of third base; 3

(d) *Allow one mark for explanation of effect and one for link with function or form.*
For example:
Altered amino acid may not affect active site of an enzyme;
So still able to carry out its catalytic properties; 2

(e) (i) Original cytosine may have been substituted;
And (then) new base substituted by cytosine; 2

(ii) Almost all/most nucleotides may have been substituted;
Further substituted results in no (detectable) change;
Can no longer use this to determine evolutionary relationships; 2 max

(f) Obtained from stomach contents of dead/stranded individuals; 1

(g) Proteins are digested to amino acids;
Amino acids combined in different proportions in synthesis of protein in mammal;`
Amino acids metabolised;
There are fewer different amino acids than there are fatty acids; 3 max

(h) (i) Fatty acids absorbed from the food/gut enter blood (via lymphatic system);
Represent recent/last meal;
Fatty acids stored as lipid in blubber;
Will accumulate over long period; 3 max

(ii) Female fur seals must feed / return to water while lactating/suckling young as passage refers to short term information;
Female true seals remain on land as the information is long term; 2

Total 25

Question 2

(a) (Chemical energy used by animal) derived from respiration;
Some anaerobic respiration may occur (so not exactly equivalent);
At rest, not likely that anaerobic respiration is significant; 2 max

(b) Muscle contraction for maintenance activities/heart beat/ventilation;
Active transport/uptake against concentration gradient;
Synthesis/anabolism; 3

(c) Would generate less heat;
Which would be difficult to dissipate/lose in hot conditions
OR
Food in limited supply in desert;
Low metabolic rate means less food required; 2

(d) Metabolic rate per gram is inversely proportional to body mass / larger than body mass, the lower the metabolic rate per gram / negative correlation between metabolic rate per gram and body mass; 1

(e) Extrapolation suggests high metabolic rate;
Metabolism associated with heat production / high rate of heat production;
Large so small surface area to volume ratio;
Unable to lose sufficient heat / likely to overheat; 4

(f) Blood (plasma) contains dissolved substances/solutes (that increase viscosity);
Particular proteins/albumin/globulin;
Platelets/white cells 2 max

(g) (i) (Maximum) oxygen carrying capacity;
Work done by heart in pumping blood;
More viscous blood flows more slowly (reducing rate of oxygen delivery); 3

(ii) Partial exposure of oxygen in lungs/alveoli lower (at higher altitudes);
Extra haemoglobin compensates for low percentage saturation; 2

(h) (i) Carry out appropriate statistical test / calculation correlation coefficient;
Test statistic should show probability of less than 0.05;
That result was due to chance; 2 max

(ii) Would not then be fully saturated with haemoglobin in the lungs; 1

(iii) High P_{50} means that blood unloads oxygen more readily / dissociation curve displaced to the right;
At partial pressure of oxygen in the tissues, haemoglobin releases more oxygen;
High Bohr effect means dissociation curve displaced further to right / more oxygen released;
Red blood cell diameter and haemoglobin concentration have no effect; 3 max

Total 25