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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Biology 6416

Specification B

BYB4 Energy, Control and Continuity

Mark Scheme

2007 examination - January series

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Question 1

(a) Two (surface) membranes/envelope;
Smooth outer membrane;
DNA;
Ribosomes;
Electron carriers;
Internal membranes large SA;
(*reference to SA of **inner** membrane)* (any **two**) 2 max

(b) (i) **E** to cristae;

(ii) **K** to matrix; 2

(c) ETC stops/transfer of electrons down the chain stops;
No (release of) energy, to phosphorylate ADP/stops phosphorylation;
Krebs cycle stops, no (oxidised) NAD/FAD/oxidised coenzymes/ no Substrate-linked phosphorylation;
2 max

Total 6

Question 2

(a) Phylum class order family genus; 1

(b) (i) Prokaryotes; 1

(ii) Ribosomes/DNA/cytoplasm/cell membrane;
(a*ccept flagellum/cell wall/unicellular*) 1

(iii) Eukaryotic/any named eukaryotic organelle; 1

(c) (Cell wall of) chitin/hyphae/ mycellium/heterotrophic feeding/multinucleate;
(*accept spores released in asexual reproduction*) 1

Total 5

Question 3

(a) (i) 100/reference to original value / blank reading – light meter reading (%); 1

(ii) Oxygen produced (per unit) time/change in oxygen concentration per unit time; 1

(b) (i) Suitable factor kept constant: e.g.

Light intensity/type of glass/distance of meter/ carbon dioxide concentration/ concentration of algae; 1

(ii) Decrease in carbon dioxide/hydrogencarbonate ions; 1

(c) Light-dependent reaction/chlorophyll absorbs light/physical reaction;
No (direct) enzyme involvement; 2

Total 6

Question 4

(a) *Two linked points:*

Crossing over/exchange of material (between chromatids);
Different combinations of alleles/linkage groups changed/broken;

OR

Independent assortment/alignment of (homologous) chromosomes;
Different combinations of (maternal and paternal) chromosomes/alleles; 2 max

(b)

Gamete genotype D | | d
M | | m;

Offspring genotype D | | d
M | | m;

Offspring phenotypes Abnormal males/(all) (no females); 3

Total 5

Question 5

(a) Discontinuous;
(Only) two /discrete classes; 1

(b) (i) 1. Mutation, unbanded/banded form/variation;
2. Different environments/selection pressures;
3. Camouflage/description; (*Accept crypsis)*
4. Selection by predation/description;
5. (Survive to) reproduce/pass on advantageous alleles;
6. Change in allele frequency (in the next generation);
7. No gene flow between populations; 4 max

(ii) *Two suitable suggestions: e.g.*

(Back) mutation;
Migration (of banded snakes from mainland);
Banded could be recessive so still get (occasional) homozygotes/ heterozygous advantage;
Stabilising selection/description of;
Selection pressure stays the same; 2 max

Total 8

Question 6

(a) Expressed (in the phenotype);
In the absence of the dominant allele/ only when homozymous/<u>not</u> when heterozygous; 2

(b)

(Parent genotypes) S1S2 S1S3;

(Gametes) S1 S2 S1 S3;
(*max if gamete correct)*

(Offspring genotypes) S1S1 S1S3 S1S2 S2S3;

(Offspring phenotypes) white (spot) white (spot) white (spot) small yellow (spot);

Ratio 3 1;

4 max

Total 6

Question 7

(a) Muscle A contracts wing moves down;
Muscle B contracts wing moves up;
As one muscle relaxes the other contracts; 2 max

(b) Reduced/no synthesis/release of acetylcholine;
No /slower diffusion/movement (of neurotransmitter) across synapse/to motor end plate/neuromuscular junction/receptors;
Postsynaptic (membrane) /muscle not depolarised/description/ no action potential;
Muscle does not <u>contract</u>; 3 max

(c) Binding/changing shape/removing tropomyosin;
Exposes actin binding sites;
Myosin head attaches/cross-bridge formation;
Activates ATPase; 3 max

Total 8

Question 8

(a) 1. Active transport/pump sodium (ions) back out (potassium in);
2. Less permeable to sodium (ions)/membrane more permeable to potassium (ions);
3. Sodium ions diffuse in / potassium ions move out/ positive on the outside;
2 max

(b) 1. Active transport stops/pump stops;
2. Sodium (ions) no longer pumped <u>out</u>;
3. Sodium ions continue to diffuse/move in;
4. Accumulating sodium ions inside/becomes less negative inside;
5. Potassium (ions) equilibrium (quickly) established/potassium (ions) no longer pumped in;
6. Respiration stops/no ATP 4 max

Total 6

Question 9

(a) (i) Refraction at cornea;
Ciliary muscle contracts;
Suspensory ligaments slacken/loose tension/less taut *(reject relax)*;
Lens fatter/shorter/more convex/more curved/decreased radius of curvature;
Light refracted/bent more/lens has a shorter focal length;
4 max

(ii) (In water) less difference between RI of water and cornea;
So light bent less/not much;
Focused behind retina; 2 max

(b) 1. Large number of cones in fovea/ fewer rods;
2. More rods in the periphery;
3. Cones have no retinal convergence/separate nerve fibres/neurones/rods reverse argument;
4. More impulses from fovea;
5. Sensory area/visual cortex large, to process/interpret/deal with impulses; 4

(c) Closer the cones to each other/ the more concentrated the cones/the more cones, the greater the acuity;
The smaller the minimal angle/ objects closer together still stimulate <u>separate</u> cones; 2

(d) <u>Autonomic</u> control;
Parasympathetic (nerve);
Acetylcholine released/transmitter;
Tear glands <u>continuously</u> produce tears;
<u>Increased</u> tear production/irritant/ emotional tears, more impulses (along parasympathetic nerve); 3 max

Total 15

Question 10

(a) (i)
1. In the ascending limb sodium(ions) actively removed;
2. Ascending limb impermeable to water;
3. In descending limb sodium(ions) diffuse in;
4. Descending limb water moves out/permeable to water;
5. Low water potential/high concentration of ions in the medulla/tissue fluid;
6. The longer the loop/the deeper into medulla, the lower the water potential in medulla/tissue fluid;
7. Water leaves collecting duct/DCT;
8. By osmosis/down water potential gradient; (*credit once only*) 6 max

(ii)
1. When water potential of the blood too low;
2. Detected by receptors in the hypothalamus;
3. Pituitary secretes/releases (more) ADH;
4. ADH increases the permeability/recruitment of aquaporins/opens channels for water in the DCT/collecting duct;
5. <u>More</u> water is reabsorbed/leaves the nephron moves into the blood;
6. By osmosis down the water potential gradient; 4 max

(b) (i)
Ammonia not urea;
Ammonia (into labyrinth) enters by diffusion, not (ultra) filtration;
Reabsorption of glucose from labyrinth, not PCT/no reabsorption in PCT;
All salt reabsorbed/no salt in urine, comparison to humans;
Concentrated urine not produced; 3 max

(ii)
Water potential lower in cytoplasm of cells/fresh water higher water potential than cells/idea of water potential gradient;
(Removal of excess water) prevents osmotic damage;

OR

All salts reabsorbed (because difficult to replace);
Take in excess water and need to remove it; 2

Total 15

QWC 1