



General Certificate of Education

Biology 6411 *Specification A*

BYA6 Physiology and the Environment

Mark Scheme

2005 examination – June series

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 meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting 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 the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting 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.

BYA 6

Question 1

- (a) (i) no (photo)receptor cells at **Y**/no rods and cones; 1
- (ii) **X** has many / only cones / more cones than **Z**;
which each synapse to a single neurone / bipolar cell / no retinal convergence;
- OR*
- Z** has mainly rods/more rods than cones;
which share/converge on neurones / bipolar cells; 2
- (b) three types (of cone cell);
each cell/pigment sensitive to different wavelength/colour of light; 2
- Total 5
-

Question 2

- (a) (i) (body temperature always equals the air temperature) because it cannot
regulate its body temperature; 1
- (ii) lizard **A** can gain heat from the sun; 1
- (b) movement is dependent upon enzyme-catalysed reactions;
molecules have less kinetic energy at lower temperatures;
less enzyme activity;
slower metabolism / rate of respiration / less ATP available; 2 max
- Total 4
-

Question 3

- (a) increasing carbon dioxide concentration / partial pressure;
(*decrease in oxygen negates*) 1
- (b) (oxygen is used in) respiration;
therefore diffuses (from tracheae) to tissues;
oxygen unable to enter organism; 2 max
- (c) spiracles not open all the time;
therefore there is less water loss (by diffusion through spiracles); 2
- Total 5
-

Question 4

- (a) closed open closed;
closed closed open; 2
- (b) active transport / pump of Na⁺ out of axon;
diffusion of K⁺ out of axon / little diffusion of Na⁺ into the axon; 2
- (c) can not pass through phospholipid bilayer;
because water soluble / not lipid soluble / charged / hydrophilic / hydrated; 2
- Total 6

Question 5

- (a) medulla; 1
- (b) **A** increase
B increase; 1
- (c) it spreads through the atria / right atrium / through cardiac muscle;
to the atrioventricular node;
then through conduction fibres / bundle of His / Purkyne fibres); 3
- Total 5

Question 6

- (a) 0.01 / 0.0105;
(allow 1 mark for 52 500/5 000 000) 2
- (b) (at the tissues at low pp oxygen) the shrew's haemoglobin is less saturated
with oxygen / has reduced affinity;
oxyhaemoglobin dissociates more readily / haemoglobin releases oxygen
more readily / more oxygen released;
allowing greater demand / respiration rate; 3
- Total 5

Question 7

- (a) Two marks for correct answer of 64.285/64.3/64;
(allow 1 mark for $(8100/100 \times 30) / 37.8$) 2
- (b) dissolve in / add ethanol then mix with water;
emulsion / white colour indicates triglycerides present; 2
- (c) (i) hydrolysis; 1
- (ii) (bile) emulsifies (fat droplets);
increasing surface area;
for lipase action;
increases the pH (towards optimum for lipase); 3 max
- (d) (i) increase the surface area for absorption;
(ignore wrong ref. to name) 1
- (ii) **R** = tissue fluid/interstitial fluid/extracellular fluid/intercellular space;
S = lymph(atic) vessel/lymph capillary/lacteal; 2
- (iii) proteins are synthesised by **U**;
involvement of ribosomes;
protein isolation / transport (inside RER);
vesicle formation; 2 max
- (iv) exocytosis / description of;
because of size / too large to leave by other methods; 2

Total 15

Question 8

- (a) (i) where a change triggers a response which reduces the effect of a change; 1
- (ii) e.g. sweating, breathing, defaecating, other valid example; 2 max
*(reject respiration
evaporation not acceptable as a 2nd mark if sweating or breathing given)*
- (iii) hypothalamus; 1
- (b) (i) pituitary; 1
(ignore anterior pituitary)
- (ii) 1. ADH causes vesicles containing aquaporins / aquaporins to be inserted into membrane / collecting duct wall/plasma;
2. water enters cell through aquaporins;
3. by osmosis / diffusion / down a water potential gradient;
4. (from cell) to capillary;
5. via interstitial fluid; 4 max
- (c) (i) excessive urination / drinking / diluted urine / thirst; 1
- (ii) because males only have one X chromosome/do not have Y chromosome;
a single copy of the recessive allele will be expressed; 2
- (iii) recessive alleles can be carried by individuals without showing effects/
dominant allele always expressed;
organism that are carriers more likely to reproduce/affected organism
less likely to reproduce;
therefore recessive alleles are more likely to be passed on/dominant alleles
less likely to be passed on; 3

Total 15

Question 9

- (a) (i) 1. (when light intensity is increased) tension in the xylem becomes greater / more negative / stronger;
2. (this increase) takes place over ≈ 100 second;
3. then levels out;
4. stomata open (more);
5. increased evaporation / transpiration;
6. therefore the water potential of leaf cells becomes more negative / lower;
7. therefore more water moves from xylem to surrounding cells;
8. down a water potential gradient;
9. correct ref. to hydrogen bonds / cohesion; 5 max
- (b) humidity will affect (the rate of) evaporation / transpiration;
increased humidity / humid conditions decreases rate of water loss; 2
- (c) 1. continuous / leaf to root column of water;
2. H-bonds;
3. cohesion;
4. column under tension / pull transmitted; 4
- (d) 1. method is C4 photosynthesis / correct ref. to a 4-carbon molecule;
2. carbon dioxide stored in a molecule;
(*reject 3-carbon molecule/RuBP*)
3. stomata close during day / hot conditions;
4. reducing water loss;
5. low carbon dioxide concentration inside leaves;
6. carbon dioxide released from molecules for photosynthesis;
7. allows efficient use of high light intensity;
allow
8. effect of inhibition of RUBISCO is overcome; 4 max

Total 15
