



General Certificate of Education

Biology 5416

Specification B

BYB3/W Physiology and Transport

Mark Scheme

2007 examination - January series

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Question 1

- (a) Arteries have thick(er) muscular walls;
 Arteries have more elastic tissue;
 Veins have (relatively) larger lumen;
 Veins have valves; 2 max
(any 2 correct statements, comparison not necessary)

- (b) (i) Supply oxygen/glucose to heart (muscle); 1
 (ii) Aorta; 1

(c)

Heart Actions	Ventricles filling	Ventricles emptying
Ventricles relaxed	✓	
AV valve open	✓	
Semilunar valves open		✓
Blood flows into pulmonary artery		✓

2

*(4 correct ticks = 2 marks)
 (3 out of 4 correct ticks = 1 mark only)*

Total 6

Question 2

- (a) Anaerobic respiration; 1

- (b) General description of curve referring to before, during and after dive;
 Detail of curve e.g. low until 25 minutes / increase to 120 mg per100cm³/
 until 30 minutes / maximum at 40 minutes/ decrease to original level after
 65 minutes;
 Low/constant lactate before dive due to aerobic /no anaerobic respiration;
 Slow build up (during dive) due to using oxygen in blood/muscles/myoglobin;
 Lactate continues to be released into the blood after dive;
 (Decrease) as lactate is broken down/ converted to pyruvate/glucose/
 glycogen;
 Using oxygen; 4 max

Total 5

Question 3

Impulses from inspiratory centre/respiratory centre/medulla;

Cause contraction of intercostals and diaphragm (muscles);

(So) air is breathed in;

Stretch receptors (in lungs) stimulated;

Inspiratory centre inhibited/expiratory centre no longer inhibited/ expiratory centre stimulated;

No/few impulses to diaphragm and intercostals muscles;

Intercostals and diaphragm (muscles) relax;

Air exhaled and lungs deflate;

6 max

Total 6**Question 4**

(a) Measure time taken;

For bubble to move a given distance;

Calculate cross sectional area of capillary tubing;

Calculate volume of water taken up (and so lost);

Per unit time;

3 max

(b) Surface area of leaves/ number of stomata/number of leaves/size of leaves;

As larger number/area mean more water loss;

Diameter of stem;

Thicker stem will have more xylem;

2

(c) (i) Lines closer together between A and stoma/shortest distance to 60%;

So a steeper diffusion/concentration gradient;

2

(ii) Drops rapidly between 5 and 10(μm) (diameter) and little change between 10-40(μm);

Smaller diameter stomata have faster water loss;

Diffusion gradient not as steep as diameter increases;

Smaller stomata have more 'edge' of area;

3 max

Total 10**Question 5**

(a) Anywhere on right atrium;

1.

(b) (i) Apex/bottom of the ventricles;

1

(ii) Ventricles must empty/contract from the bottom;

So more blood can be forced towards the aorta/pulmonary artery/so ventricles can empty completely;

So semi lunar valves forced open/AV valves forced closed;

2 max

- (c) Increases CO₂ /lowers blood pH;
 Detected by chemoreceptors;
 In aorta/carotid artery;
 Impulses to cardiac centre/medulla;
 Impulses in sympathetic nerves;
 (More impulses) to SA node;
 (accept references to adrenaline for 1 mark) 4 max

Total 8**Question 6**

- (a) (i) Hydrostatic pressure; 1
 (ii) Osmosis/lower Ψ in capillary; 1
 (iii) Stop backflow;
 No pumping action/only pressure of surrounding tissues to force lymph along; 2
- (b) (i) Can carry more oxygen (to (respiring) tissues)/more Hb/more efficient O₂ uptake;
 Needed because less oxygen available/at altitude lower ppO₂; 2
 (ii) Sheep and llama;
 Because they produce large numbers of red cells even when raised at sea level;
 (accept converse for human and rabbit) 2

Total 8**Question 7**

- (a) A = Endodermis;
 B = Phloem; 2
- (b) 1 Root hair cells have lower water potential (than soil);
 2 Due to active uptake of ions;
 3 So water enters root hair cells by osmosis;
 4 Passes along apoplast pathway;
 5 Through (water filled spaces of) cell walls;
 6 Passes along symplast pathway;
 7 Through plasmodesmata/cytoplasm;
 8 Casparian strip forces water from apoplast into protoplasm/cytoplasm/ into symplast;
 9 Water moves from cell to cell/enters xylem by osmosis;
 10 Salts pumped into xylem to lower water potential; 6 max

- (c) Most stomata on inner lower surface;
Rolling increases humidity around stomata/protects stomata from wind;
Reducing the diffusion gradient;
Reduces surface area exposed to sun/wind;
So less water is lost by transpiration/evaporation;

2 max

Total 10