



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme January 2004

GCE

Biology A/ Human Biology

Unit BYA6

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Question 1

(a)

| | | |
|-----------|-----------------------------|-----------|
| gastrin; | | |
| | duodenum / small intestine; | not ileum |
| secretin; | | |

3

(c) It is shorter/faster because of nerve impulses / transport along nerves rapid;
Hormones travel through the blood stream (so are slower);

2

Total 5 marks

Question 2

(a) (i) glucagon; [Insist on spelling] 1

(ii) liver; 1

(b) A change to the normal level initiates a response which reduces the effect/
reverses/acts against the change; 1

(d) it is highly branched;
therefore lots of ends for condensation/hydrolysis;
OR
Polymer/polysaccharide of (alpha) glucose;
Therefore can release (lots of) glucose;
OR
Glycosidic bonds;
Easily broken/hydrolysed to release glucose; 2

Total 5 marks

Question 3

(a) (i) kinesis;
movement is random / rate of turning changes / does not move towards/
away from light; 2

(ii) advantage related to light/shade;
e.g. remains in shade so avoids predators 1

(b) energy transfer between trophic levels is very inefficient;
because of energy used in respiration / by movement;
incomplete consumption of prey by flatworms; max 2

Total 5 marks

Question 4

- (a) (gills have) lamellae on filaments;
lots of both; 2
- (b) (i) all 3 go up; [Accept converse] 1
- (ii) more oxygen can be supplied;
for more respiration; [Accept answer relating to CO₂] 2

Total 5 marks

Question 5

- (a) (i) blue because only blue-sensitive cones are stimulated; 1
- (ii) because both green and red (sensitive) cones stimulated;
[reject mixing of light] 1
- (b) allele for colour vision confers an advantage to the organism;
relevance (of colour vision) e.g. better foraging, detection of predators;
therefore organisms with allele for colour vision more likely to survive
to reproductive age/breed/have more offspring;
and pass this gene/allele on to their offspring; max 3

Total 5 marks

Question 6

- (a) Transports Na⁺ and K⁺;
By active transport / pump / against concentration gradient;
Restores ion balance after an action potential;
[reject K⁺ out and Na⁺ in] 2
- (b) each protein has a specific tertiary structure/shape;
because the ions have different sizes/shape/charge;
[reject receptors binding] max 2
- (c) fewer protein B molecules, which transport sodium ions;
more protein A molecules, which transport potassium ions; max 1

Total 5 marks

Question 7

- (a) any two named polymers [subsets = 1 max. (e.g. protein/haemoglobin)] 2
- (b) (i) it is respired e.g. enters the Krebs cycle; [*Accept* metabolised] 1
- (ii) ammonia is highly toxic / urea is less toxic; 1
- (iii) via the gills / urine; 1
- (c) (i) hydrostatic pressure / description of pressure;
causes ultrafiltration at Bowman's capsule/glomeruli/renal capsule;
through basement membrane;
enabled by small size of urea molecule; max 2
- (ii) reabsorption of water; [water out]
by osmosis;
at the PCT / descending LoH;
at the DCT / CD;
active transport of ions/glucose creates gradient (in context); max 4
- (d) (i) by (simple) diffusion; [*reject* facilitated] 1
- (ii) to maintain concentration gradients / stop reaching equilibrium;
[idea of maintaining concentration gradients] 1
- (iii) ions, glucose and amino acids would diffuse into the dialysate;
because of their concentration gradients;
Causing deficiency in these substances;

OR

the WP of the dialysate would be higher/less negative than the WP of the surrounding tissues;
therefore osmosis would take place into the cells surrounding the abdominal cavity;
causing these cells to burst / damaging these cells / cannot be excreted; max 2

Total 15 marks

Question 8

- (a) It is a measure of the concentration of a gas (in a mixture of gases or a liquid); 1
- (b) 37-38% [*Accept* 36 – 39]
- (c) muscle contraction causes increased respiration;
increased CO₂ production lowering blood pH;
lactate released lowering blood pH;
increased heat released therefore increased temperature;
increased O₂ consumption lowering tissue PO₂; max 4
- (d) haemoglobin has a lower affinity for oxygen;
more O₂;
for respiration; max 2
- (e) **3.4 times = 2 marks**
(incorrect answer in which candidate shows amount of oxygen removed at rest is 4.6 and amount removed during exercise is 15.8 = 1 mark) 2
- (e) Nearly all O₂ is transported by haemoglobin / v. little transported in plasma;
EITHER
Haemoglobin is (nearly) fully saturated with O₂ at the alveoli both at rest and when exercising;
Therefore no (very little) further increase is possible;
OR
Haemoglobin is only 95% saturated with oxygen at the alveoli;
Therefore enriching inspired /air with oxygen will raise this to 100%; 3
- (f) increased depth / rate / pulmonary ventilation;
increase stroke volume/heart rate/Q increases blood flow rate;
arterioles [*Accept* artery] supplying the muscles dilate / vasodilation / greater proportion of blood flow to the muscles; max 3

Total 15 marks

Question 9

- (a) water enters root hair cells;
by osmosis;
because active uptake of mineral ions has created a WP gradient;
water moves through the cortex;
(by osmosis) down a WP gradient;
through cell vacuoles and cytoplasm / symplastic pathway;
through cell walls / apoplastic pathway; max 5
- (b) WP in leaf cells decreases / becomes more negative;
therefore water moves out of xylem (into surrounding tissues) by osmosis;
this creates a pull/tension on the water in xylem;
which is in a continuous column / water molecules cohere;
cohesion due to H bonding;
column doesn't break because of adhesion with xylem walls; max 4
- (c) (water is used in) the light-dependent reactions of photosynthesis;
electrons from water enable ATP production / H^+ are used to reduce
NADP / produces O_2 ;
(water can be used in) hydrolysis reactions within the plant;
to create turgor;
as a solvent for transport;
as a medium for chemical reactions;
component of cells / cytoplasm; 6

Total 15 marks
