



## **General Certificate of Education**

# **Human Biology 6413** *Specification A*

**BYA7      The Human Life-Span**

## **Mark Scheme**

*2008 examination - June series*

*Replacement Mark Scheme (16 June 2008)*

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**Question 1**

- (a) (Person) at rest **and one** of: in a warm environment / post-absorptive state / fasting / awake; 1
- (b) (i) Rapid growth;  
High energy usage for synthesis / cell division;  
High SA:Volume;  
So high rate of heat loss; 2 max
- (ii) Less (subcutaneous) fat in males;  
Higher rate of heat loss in males;  
More muscle (tissue) in males;  
Male has / muscle has higher respiration rate;  
*Accept reverse arguments for female* 2 max
- (iii) Less synthesis / loss of muscle with age / decreased hormone production (or named example) / less respiring cells; 1
- Total 6**

**Question 2**

- (a) (On diagram) 'X' on the rise in potential *Reject 'X' at top or bottom* 1
- (b) Active transport of ions / sodium (-potassium) pump / pumping out of sodium ions;  
Supplies / uses / requires energy / ATP;  
So faster/more respiration;  
*(Reject 'anaerobic' respiration)* 3
- (c) (Myelination increases rate because:) [max 1 if "decrease" specified]  
Myelin insulates / myelin prevents ion movements; *Reject 'prevents impulse movements'*  
Saltatory conduction / node to node / ion movements only at nodes; 2  
*Accepts jumps from gap to gap*
- Total 6**

**Question 3**

- (a) Reduced cardiac output / reduced nerve conduction velocity / increased deposition of abdominal fat / loss of muscle tissue / loss of skin elasticity / decline in fertility / menopause (or described) / deterioration of senses (or named example) / other correct example; 1
- (b) (Cow or sheep protein has) different amino acid sequence / primary structure; Stimulates immune response / allergic reaction / rejection; May not fit receptor / different shape / not complementary; 2 max
- (c) (i) Introns removed / need for post-transcriptional modification / post-translational modification; System for doing this only present in eukaryotic cells; 2
- (ii) (No because) quaternary involves more than 1 polypeptide / hGH has only one polypeptide; 1
- Total 6**

**Question 4**

- (a) Hypothalamus is body's temperature regulation centre / monitors body/blood temperature; *Accept references to 'heat'* 1
- (b) (i) Heat lost / used in evaporation of sweat / evaporation from lungs / evaporation of water / heat used to change liquid to gas; 1
- Vasodilation / dilation/widening of arterioles/blood vessels/greater blood flow to the skin / blood flows nearer to body surface ;  
*Reject widening of capillaries/veins*  
Increased radiation/conduction/convection; 2  
*Ignore references to hair flattening/behaviour*
- (c) in range of 36.74 - 36.76 to range of 36.98 - 37.0°C / above 36.74(°C) ; 1
- Total 5**

**Question 5**

- (a) (i) 1 **OR** 2;
- (ii) 3; 2
- (b) (i) 6.5;
- (ii) 3.25; 2
- (c) Any two from: **A , B , C , D and E**; 1
- (d) Only nucleus from sperm / (more) cytoplasm from 2° oocyte / from egg;  
Mitochondria (in cytoplasm) contain DNA; 2
- Total 7**

**Question 6**

- (a) Correct statement of Fick's Law: Rate diffusion  $\propto \frac{\text{Conc. Diff.} \times \text{S.A.}}{\text{Thickness}}$ ;  
*Reject Fick's Law =*  
Thin surface due to few cells thick;  
Large S.A. due to villi / microvilli / folding;  
Concentration difference maintained by blood flow; 4
- (b) CO<sub>2</sub> produced in respiration;  
CO<sub>2</sub> from fetus / CO<sub>2</sub> from placenta;  
Diffuses into mother's blood;  
Forms carbonic acid;  
Release of H<sup>+</sup> ions; 4 max
- (c) Fetal haemoglobin has a higher affinity for oxygen;  
Oxygen moves from mother to fetus; 2
- (d) (i) Falls from 54 to 38-39 / falls by 15-16 (y %); 1
- (ii) 30–31 / 32-33;; (*Accept corr. for (i)*) (2 marks)
- OR
- Fall =  $\frac{y \times 200}{98}$ ; (1 mark) 2 max
- (iii) (On graph) Line drawn to right of mother's line;  
Line passing through (0,0) and (16,98); 2

**Total 15**

**Question 7**

- (a) Aerobic respiration releases more energy /produces more ATP;  
 Little/no lactate produced / does not accumulate;  
 Avoids cramp / muscle fatigue;  
 CO<sub>2</sub> easily removed from the body / CO<sub>2</sub> removed by breathing; 3 max
- (b) (i) Phosphocreatine; 1
- (ii) Phosphocreatine is decreasing / not enough phosphocreatine; 1
- (c) (i) No H-zone;  
 I-band narrower;  
 Sarcomere shorter / Z-lines closer together; 2 max
- (ii) A-band = maximum overlap of actin and myosin (filaments);  
 (Because) actin slides past myosin;  
 (Causing) I-band to shorten / causing Z-lines  
 to move closer;  
 H-zone disappears when actin filaments meet; 3 max
- (d) 1 Ca<sup>2+</sup> channels / gates open;  
 2 Ca<sup>2+</sup> ions enter (neurone);  
 3 Vesicles move towards / fuse with presynaptic membrane;  
 4 Release / exocytosis of transmitter substance / of acetylcholine;  
 5 Diffusion (of transmitter) across gap / cleft;  
 6 (Transmitter) binds to receptors in postsynaptic membrane;  
 7 Na<sup>+</sup> channels open / Na<sup>+</sup> ions enter (postsynaptic side); 5 max

**Total 15**

**Question 8**

- (a)
- 1 Hydrolysis/described;
  - 2 (Protein digested) by endopeptidase(s) / named example;
  - 3 Produces peptides/short chains of amino acids;
  - 4 Produce more/many ends;
  - 5 (Peptides digested) by exopeptidase(s);
  - 6 Produces dipeptides/amino acids;
  - 7 (Di)peptidase on cell surface membranes of/inside epithelium of small intestine;
- 5 max

- (b) *(Must score at least 1 mark for nervous and 1 mark for hormonal for maximum marks)*

Nervous –

- 1 Secretion of gastric juice / pancreatic juice;
- 2 Fast response compared with sustained response for hormonal;
- 3 Reflex response;
- 4 Response to sight / smell of food / food in mouth;
- 5 Coordinated by medulla in brain;

Hormonal –

- 2 *alt* Sustained digestion compared with fast response for nervous ;  
(Allow once only)
- 6 Secretin stimulates release of alkali from pancreas / from small intestine;
- 7 CCKPZ/CCK/PZ stimulates release of bile / alkali from liver / from gall bladder;
- 8 CCKPZ/CCK/PZ stimulates release of enzymes / protease(s) / endopeptidase(s) from pancreas;
- 9 (Alkali) provides optimum pH for enzymes(in small intestine)/acid/HCl provides optimum pH for enzyme(in stomach);
- 10 Gastrin stimulates release of HCL / release of pepsin(ogen) / gastric juice / gastric protease;

5 max

- (c) *(Must score at least 1 mark for **A** and 1 mark for **B** for maximum marks)*

1 **A** / Microvilli – Large S.A.; *Reject 'Villi'*  
 2 Carrier proteins;  
 3 (Carrier proteins for) facilitated diffusion; (linked context)

4 **B** / Mitochondria – Aerobic respiration ; *Reject wrong name for B*  
 5 Produce ATP / release energy; *Reject 'produce' energy*

6 Active transport/transport up gradient;  
 7 Co-transport of amino acids with Na<sup>+</sup> ions / (Active transport) of Na<sup>+</sup> ions out of epithelium / into blood;

5 max

**Total 15**