



## General Certificate of Education

# Human Biology 6413 *Specification A*

*BYA7 The Human Life-Span*

## 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.

## BYA7

### Question 1

- |       |                                                                                                                               |   |
|-------|-------------------------------------------------------------------------------------------------------------------------------|---|
| (a)   | negative / inverse correlation / as age increases sperm motility decreases;                                                   | 1 |
| (b)   | tail / undulipodium beats / waves;<br>(accept <i>flagellum</i> )<br>Mitochondria provide ATP / energy;<br>(not 'make' energy) | 2 |
| (c)   | crossing over;<br>independent / random assortment / segregation;<br>(ignore <i>mutation</i> )                                 | 2 |
| Total |                                                                                                                               | 5 |
- 

### Question 2

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

### Question 3

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

**Question 4**

- (a) pituitary gland;  
(ignore anterior posterior) 1
- (b) (i) hydrolysed/digested/broken down;  
(qualified e.g. by enzymes or in digestive system);  
by carbohydrase / proteases any specified; 2  
(accept 'amylase')
- (ii) post-translational / post-transcriptional modification is required / described;  
carbohydrate group would be added (to the protein) by the Golgi body;  
(Golgi) not present in bacterial cells; 2 max
- Total 5

**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/AVN;  
then through conduction fibres/bundle of His/Purkyne fibres; 3
- Total 5

**Question 6**

- (a) (i) lactose; 1
- (ii) cellulose/chitin; 1
- (b) they are not digested / hydrolysed / broken down in digestive system;  
as humans lack cellulase / the appropriate enzymes;  
not absorbed / passes straight through gut / energy not available; 2 max
- Total 4

**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; 1  
(ignore wrong ref. to name)
- (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

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**Question 8**

- (a) Two marks for correct answer of  $0.0052 / 5.2 \times 10^{-3}$ ;

48.1 – 30.9 / 3 300 = 1 mark;  
(if answer is 5.2 - allow 1 mark)

2

- (b) (i) high rate of respiration;  
ATP / energy requirement is high;  
active transport / synthesis of hormones / oestrogen / progesterone / hCG;  
example of substance transported – glucose / amino acids / ions / antibodies; 3 max

- (ii) 1. growth of breasts / milk-producing glands / uterus / endometrium;  
2. increased active transport in kidneys;  
3. increased heart rate / increased cardiac output;  
4. increased cooling mechanisms / heat dissipation / sweating / vasodilation;  
5. increased cost of locomotion;  
6. increased activity in digestive system;  
7. contractions of uterus;  
(ignore refs. to processes in fetus)

4 max

- (c) (chorionic) villi / microvilli / folding;  
difference in concentration / concentration gradient / diffusion gradient;  
low;  
(accept thin)

3

- (d) description – the fetus has a curve above / more saturated;

OR

to the left / at lower  $pO_2$  (c.f. the mother);  
fetal (haemoglobin) has a high(er) affinity for oxygen;  
oxygen moves from mother to fetus;

3

Total 15

**Question 9**

- (a) 1. (calcium transporter proteins) act as antigens;  
2. macrophage/monocyte engulfs protein;  
3. macrophage displays antigen (to B-cells);  
4. B-cells are activated;  
5. by T-cells/cytokines;  
6. division/cloning/mitosis / of B-cells;  
7. producing plasma cells which make antibodies;  
8. antibody is specific to antigen; 5 max
- (b) 1. e.m. gives high resolution;  
2. due to short wavelength of electrons;  
3. antibodies attach specifically to target proteins;  
4. gold particles are electron dense;  
5. electrons must pass through a vacuum;  
6. material must be dead / fixed for e.m.;  
7. cross-bridge cycling requires living cells / metabolism / named aspect-  
e.g. ATP synthesis; 5 max
- (c) 1.  $\text{Ca}^{2+}$  removes blocking molecules / uncovers binding site on actin;  
2. correct references to  $\text{Ca}^{2+}$  binding to troponin / moving tropomyosin;  
3. allows myosin heads to attach to actin filaments;  
4. allows sliding of the actin and myosin filaments;  
5. binding of ATP causes myosin (head) to detach (from actin);  
6. (hydrolysis of) ATP releases energy;  
7. which changes the configuration / cocking of the myosin head; 5 max

Total 15

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