



General Certificate of Education

Human Biology 5413

Specification A

BYA7 The Human Life-Span

Mark Scheme

2007 examination - June series

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Question 1

- (a) Hydrolysis; 1
- Use of water;
To break glycosidic bonds/bonds joining glucose molecules/
condensation bonds; 2
Accept links for bonds. Accept suitable labelled diagram
- (b) (Acid conditions) in stomach denature amylase/ alter tertiary structure/ alter
charge on active site;
Starch (molecule) will not bind with active site/ will not form ES complexes;
As shapes no longer complementary; 2 max
- Total 5

Question 2

- (a) Any **two** from:
Breast development, widening of hips, deepening of voice/enlargement of larynx,
growth of pubic/axillary hair, (onset of) menstruation;
Accept ovulation / development of specified female reproductive organ; 1
- (b) Range shows only highest and lowest values / is affected by outliers;
SD shows dispersion about mean / shows range of values for
majority/two thirds of individuals; 2 max
- (c) Oestrogen concentration falls;
So no inhibition of (pituitary) secretion of FSH; 2
Ignore reference to other hormones
- Total 5

Question 3

- (a) (i) Study involving the same people over a period of time; 1
- (ii) Advantage – uses same individuals throughout / no participant variables /
no variation in results due to genetic differences;
Disadvantage – time consuming / some individuals may be lost from
the study; 2
- (b) (i) 1 year/ 1.8–1.9 years/ 1year 10/11 months / 22-23 months **and** 12 years/
12.4 years/ 12 years 5 months; 1
- (ii) Different height at the two ages; 1
- Total 5

Question 4

- | | | |
|-----|---|---|
| (a) | 1500kJ; | 1 |
| (b) | (i) Increase in core/body temperature;
Sweat more/ vasodilation/ role of hypothalamus; | 2 |
| | (ii) Core temperature still high/ residual evaporation; | 1 |
| | Total | 4 |

Question 5

- | | | |
|-----|--|---|
| (a) | Person should be at rest, <u>plus</u> one other factor from: awake/
thermo-neutral/ environment/ post- absorptive state/ after fasting; | 1 |
| (b) | (i) $\text{kJ m}^{-2} \text{h}^{-1}$ / $\text{kJ kg}^{-1} \text{h}^{-1}$
(allow any SI units of energy, area/ mass and time) | 1 |
| | (ii) Males: $\frac{165.9 - 153.3}{165.9} \times 100$; = 7.59%; | 2 |
| | 7.59 / - 7.59 / 7.6 / - 7.6 however derived = 2 marks
Evidence of correct method of calculation of change in BMR = 1 mark | |
| | (iii) Decrease in nerve conduction velocity/ cardiac output/ filtration rate/
ventilation rate;
<i>Ignore other aspects</i> | 1 |
| | Total | 5 |

Question 6

- | | | |
|-----|--|-------|
| (a) | Anaphase and telophase as cell is shown at metaphase;
Meiosis II as chromosomes not homologous pairs / as chromatids
will be split by this division;
<i>Allow one mark for all correct stages if both points not made</i> | 2 |
| (b) | <u>Hollow</u> ball of cells;
With inner cell mass (at one end);
Secretes hCG;
Stage at which implantation into uterine <u>lining</u> occurs; | 2 max |
| (c) | Only produced by embryo/placenta;
After implantation; | 2 |
| | Total | 6 |

Question 7

- (a) In depolarisation phase:
 (Stimulus) increases permeability of axon membrane to Na^+ / (stimulus) allows more Na^+ to enter/ Na^+ channels open;
 Decreases polarity/electro-negativity of axon membrane/ membrane depolarised;
 Threshold reached;
More Na^+ ion channels opened / large amount of Na^+ enter;
Idea of positive feedback
 In repolarisation phase:
 K^+ channels open/ K^+ leaves/ membrane more permeable to K^+ ;
 Repolarisation; 4 max
- (b) Calcium ions enter presynaptic cell;
 Vesicles containing neurotransmitter move to/ fuse with presynaptic membrane;
 Neurotransmitter released into/ diffuses across (synaptic cleft);
 Binds with receptor on postsynaptic membrane; 3 max
- (c) (i) Summation; (once only)
 (Summation) means cannot distinguish between stimuli from different rod cells linked to same bipolar cell;
 Decreases acuity;
- (ii) (Summation of) sub-threshold stimuli produces threshold stimulation;
 Increases sensitivity;
- Max 2 if changes to acuity and sensitivity not described 4
- (d) 1. Synapses between Q and R and sensory neurone are excitatory;
 2. Stimulation of groups of rods linked to Q and R / groups of rods B and C results in frequent impulses;
 3. Synapses between P and S and sensory neurone are inhibitory;
 4. Output from P and S inhibits initiation of action potentials/nerve impulses in sensory neurone;
 5. Output from all/ PQRS balances or cancels;
 6. As less frequent impulse; 4 max
Second mark in each pair is dependent on first

Total 15

Question 8

- (a) (i) Principle:
A balanced diet supplies all the necessary nutrients in appropriate amounts / no single food type does this / need to eat several of the food types to take in appropriate amounts of all the major nutrients;
two from:
Cereals/legumes lack some vitamins/ converse;
Roots lack vitamins and minerals/ converse;
Fruit and vegetables lack protein and energy/ converse; 3
- (ii) Females lose iron due to (blood loss in) menstruation;
Some/most vegetable foods not good sources of iron;
(Large amounts of) dietary fibre results in more iron being lost;
Iron needed in synthesis of haemoglobin / formation of red blood cells; 3 max
- (b) (i) Active transport of sodium ions reduces concentration in (epithelial) cell / maintains concentration gradient between lumen/ ileum and cell;
Sodium ions continue to pass in;
By facilitated diffusion;
Co-transport of amino acids; 3 max
- (ii) Thick myosin filaments and thin actin filaments;
not interlocked;
wide I bands;
visible / wide H zones; 3 max
- (c) Athlete A;
Has highest proportion of slow twitch fibres/ converse;
Which have high resistance to fatigue / respire aerobically / have (relatively) slow contraction rate / have (relatively) high concentration of myoglobin/ many mitochondria; 3

Total 15

Question 9

- (a) (Quaternary structure) is several tertiary structures/ polypeptides held together;
plus any four other points
 (Primary structure) is chain of amino acids/ many amino acids;
 Joined by peptide bonds;
 (Secondary structure) is α -helix/ β -pleated sheet;
 Held in shape by hydrogen bonds;
 (Tertiary structure) is final shape of polypeptide chain/further folding of
 Secondary structure;
 Held in place by ionic/disulphide/hydrogen bonds; 5 max
- (b) Fetal haemoglobin:
 Dissociation curve is shifted to left;
 Fully saturated with oxygen at low pO_2 / able to bind at low pO_2 ;
 Has higher affinity for oxygen than adult haemoglobin;
 Releases oxygen under very low pO_2 found in tissues;
Allow reverse arguments for adult haemoglobin
 Oxygen transfer from mother across placenta; 4 max
- (c) 1. Activity increases concentration of plasma/blood CO_2 / decreases pH of
 plasma/blood;
 2. Detected by sensors in aorta/carotid artery/medulla;
 3. Impulses to cardiovascular centre/medulla;
 4. (Increased number of) impulses along cardiac nerve/accelerator / sympathetic
 nerves to SA node/ adrenaline in blood to SA node;
 5. Increased number of impulses from SA node;
 6. Heart rate increases;
 7. Cardiac output = heart rate x stroke volume; 4 max
- (d) (Dilation of arterioles) allows increased blood flow/ faster flow;
 Increased oxygen carriage;
 to compensate for decreased saturation of Hb; 2 max

Total 15