ASSESSMENT and QUALIFICATIONS ALLIANCE

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, plus one other factor from: awake/
thermo-neutral/ environment/ post- absorptive state/ after fasting; 1

(b) (i) kJ m^{-2} h^{-1}/ kJ $kg^{-1}h^{-1}$ 1
(allow any SI units of energy, area/ mass and time)

(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; 1
Ignore other aspects

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; 2
Allow one mark for all correct stages if both points not made

(b) Hollow ball of cells;
With inner cell mass (at one end);
Secretes hCG;
Stage at which implantation into uterine lining 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 <u>facilitated</u> 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