ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Biology/Human Biology 5411/5413

Specification A

BYA1 Molecules, Cells and Systems

Mark Scheme

2007 examination - June series

For Confidential Packs

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Question 1

(a)	(i)	COOH;	1
	(ii)	Peptide (bond); *Allow named bond relating to tertiary structure. Reject polypeptide bond.*	1
(b)	(i)	Hydrolysis;	1
	(ii)	Only these substances have the right shape/structure (complementary Ξ shape); To fit/bind with active site/form ES complex with active site; or Only trypsin has right-shaped active site; To bind/fit with substrate/ to form ES complex;	2
(c)	(i)	Run chromatogram then turn through 90°/right angle; With a different solvent;	2
	(ii)	Spreads spots/polypeptides out more/ make sure spot only contains one substance;	1
(d)		Haemoglobins will differ in their amino acids; Different <u>pieces</u> result when cut by enzymes; Different <u>pieces</u> will move to different positions/different distances/ have different Rf	2 max
		Total	10

Question 2

(a)		Nucleus round/kidney shaped/not lobed; *Accept drawings*	1
(b)	(i)	Granulocytes are transparent/colourless/stain shows different structures/ shows nucleus;	1
	(ii)	Measure diameter of field with ruler/other appropriate device; Find proportion taken up by granulocyte; or (Measure length) with (eyepiece) graticule/eyepiece scale; Calibrate with stage micrometer/something of known length/ red blood cell;	2
(c)	(i)	Protein <u>and</u> polysaccharides;	1
	(ii)	Granulocyte is eukaryotic; Granulocyte has (membrane-bound) organelles/ named example; (organelle) surrounded by membrane;	2 max
	(iii)	(More in) plant cell as it has a cell wall; Made of cellulose; (Stores large amount of) starch;	2 max
		Total	9

Question 3

(a) (i) Box enclosing H from one OH group and OH from the other; 1

(ii) C_{12}; $H_{22}O_{11}$; 2

(b) Heat/warm with Benedict's solution;
Turns green/yellow/orange/red; 2
Do not credit use of a water bath unless some indication of temperature provided.

(c) Different number of glucose (units);
(Different proportions of) amylose/amylopectin;
Different number of branches in molecule/ branches in different places 1

Total 6

Question 4

(a) Active site not totally complementary/does not match exactly;
Wraps round substrate/ Enzyme changes shape; 2

(b) (i) Substrate used up/decreases (as time passes); 1

(ii) Heating provides more (kinetic) energy;
Molecules move faster;
More collisions/ES complexes formed; 3

(c) Denaturing of enzyme; *Accept clear description* 1

Total 7

Question 5

(a) (i) They are sections/ cut;
Through different planes/parts of cell/ viewed from a different angle;
Cells also distorted by passage through capillaries; 2 max

(ii) One mark for correct answer of 0.8 – 1.4 μm
One mark for dividing measured length by magnification; 2
Be reasonable about accepting value for minimum diffusion distance. Answers just outside this range should be accepted providing evidence of method used is sufficiently clear.

(b) (i) (Lining of) alveoli moist/surface film of fluid/water;
Evaporates;
Due to warm body temperature; 2 max

(ii) More carbon dioxide <u>and</u> less oxygen; 1
Reference to nitrogen must refer to concentration

Total 7

Question 6

(a) Path marked unambiguously from posterior vena cava to left pulmonary artery; 1

(b) Increase in blood pressure cause them to stretch/ stretch at high pressure;
And recoil; 2
Do not give credit for references to contracting and relaxing.

(c) (i) Sinoatrial node/SAN; 1
Do not give credit to pacemaker in the context of this question.

(ii) Impulse(s); (*only award in context of nerve supply to heart)*
Pass along parasympathetic/vagus nerve;
Lowers rate of impulses/discharge from B/SAN;
Fewer (impulses) along sympathetic/ accelerator; 2 max

Total 6

Question 7

(a) (i) (Group of) cells which have a common origin/ similar;
Ignore references to function. 1

(ii) Gills/mouth/gut; *Reference to lungs negates answer* 1

(b) Water potential of higher/less negative than sea water/surroundings;
Water moves (out) by osmosis;
Ions diffuse (in)/ move from higher concentration (in sea water); 3

(c) Mitochondria provide ATP/ release energy; *Ignore references to making or producing energy*
In respiration;
Higher concentration in sea water/ lower concentration in fish/ movement against concentration gradient; 2 max

(d) Water and oxygen have similar sized molecules/small molecules/ oxygen (slightly) larger than water;
Would expect both to be able to diffuse through skin; 2

(e) 1 Breaks bonds (holding tertiary structure/shape);
2 Such as hydrogen bonds/disulphide bonds;
3 Protein loses shape/tertiary structure;
4 Active site (of enzymes) affected;
5 Substrate no longer able to fit/bind/form ES complex;
6 Receptor/binding sites on carrier proteins lose shape/affected;
7 Therefore unable to move substances by active transport;
8 And facilitated diffusion;
9 (Ion) channel distorted/change shape; 6 max

Total 15

Question 8

(a)		Ventricle contracts/ systole; (Blood enters aorta) through semilunar valves/semilunar valves open;	2
(b)	(i)	Pressure lower (in pulmonary artery);	1
	(ii)	Right ventricle has thinner wall/less muscle/does not contract as strongly;	1
(c)		Two marks for correct answer of 1.13 s One mark for incorrect answer clearly derived from subtracting 0.37 from length of heartbeat;	2
(d)	(i)	Decreases but less steeply with increasing heart rate;	1
	(ii)	Filling time decreases so shorter cardiac cycle/greater heart rate; Emptying time remains the same so (likely to) pump out as much blood/ stroke volume unchanged;	2
(e)		1 Contains no nucleus/ mitochondria/ organelles; 2 Haemoglobin; 3 Biconcave shape/small size; *Allow description* 4 Large surface area to volume; 5 For diffusion; 6 Disc means short distance to “centre” of cell/ no point far from surface; 7 Approx same size/diameter as capillary; 8 Only pass down in “single file”/ slow passage down capillary gives time for diffusion/uptake; 9 (Surface pressed against capillary wall therefore) short distance for oxygen to travel;	6 max
		Total	15