Version 3.0: 0508

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Biology / Human Biology 5411 / 5413

Specification A

BYA1 Molecules, Cells and Systems

Mark Scheme

2008 examination - June series

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Question 1

(a) (i) Box drawn round appropriate H and OH; 1

(ii) Condensation; 1
Accept close versions such as condensing reaction or condensing.

(b) An H atom is at the bottom/an OH is at the top in β glucose;
At the right-hand side of the molecule; 2
Note that this is the lowest acceptable answer. Better candidates might be expected to refer to C[1]. Obviously such answers should gain credit. Reject polymerisation.

(c) Two marks for correct answer of 0.9/0.89 or expressed as fraction $^{8}/_{9}$ / $0.\dot{8}$;;
One mark for incorrect answer such as 1.12(5) or 0.8 derived from correct values;
One mark for 0.9 with no working; 2 max

(d) (i) Left hand side marked; 1

(ii) Separates amino acids/spots/B and C more; 1

Total 8

Question 2

(a)

Feature	**Cell**			
	Red blood cell	Leaf cell	Bacterium	Epithelial cell from alveolus
Nucleus	**X**	✓	**X**	✓
Plasma membrane surrounding cell	✓	✓	✓	✓
Cell wall	**X**	✓	✓	**X**

Allow one mark for each correct column;;;; 4
Do not accept hybrid tick/crosses or blank spaces.
If no crosses at all accept blank as equivalent to a cross

(b) (i) Site of enzyme/protein synthesis; 1

(ii) Release/transfer/make available energy/ATP/site of respiration;
For synthesising/making/secreting proteins/enzymes; 2
Ignore references to making/producing energy.

(c) Blue/blue-black/purple/black with iodine;
Reference to use of microscope; 2

Total 9

Question 3

(a) Amino acids; 1

(b) More (kinetic) energy;
Increased movement (of molecules);
More collisions between enzymes and substrates/more ES complexes formed; 3

(c) (i) Made up of different amino acids/different order of amino acids/different amino acids in different positions/ different number of amino acids; 1

(ii) Proteins have different primary/tertiary structure/made up from different amino acids;
Molecule has different shapes/is not complementary (from other proteins);
Will not all fit active site of enzyme/will not form enzyme-substrate complex;
Or
Enzyme has specifically shaped active site;
Will only bind with/fit/ form enzyme-substrate complex with correct protein/substrate;
Proteins have different primary/tertiary structure/made up from different amino acids; 3

Total 8

Question 4

(a) (i) E; 1

(ii) Right atrium; 1

(b) Surge/high pressure causes stretching;
Recoil; 2
Accept equivalent terms.
Do not accept such terms as contracting or relaxing.

(c) Muscle contracts; *Note:must be in correct context*
Vasoconstriction/narrows arteriole/narrows vessel/narrows lumen;
Reduces blood flow to particular capillaries/organs/parts of body;
Accept converse 2 max

(d) Large(r) number of capillaries;
Total cross-sectional area greater/more wall in contact;
Friction from walls; 2 max

Total 8

Question 5

(a) Facilitated diffusion down/with concentration gradient and active transport up /against concentration gradient;
Facilitated diffusion does not require energy from ATP/respiration and active transport does/diffusion is passive and active transport is active/ not passive; 2
Only accept point if like is compared with like. Do not allow vague references to requiring or not requiring energy, since diffusion requires energy.

(b) (i) The rate of uptake increases as the concentration of glucose increases/ positive correlation/directly proportional; 1

(ii) The (number of) carriers;
Idea of all working at maximum rate/limiting; 2
Accept unambiguous alternatives for carriers and accounts based on molecules queuing up.

(c) (Buffer) keeps pH constant/acidity the same;
pH will affect binding of/shape of carriers (to glucose)/ pH will denature carriers; 2
First mark for what a buffer does; the second for its role in this case.

Total 7

Question 6

(a) (Diagram flattens/goes down and) increases volume;
Reduces pressure;
Air enters down pressure gradient/from high to low pressure; 2 max

(b) Lower concentration in alveoli because it is diffusing (into blood); 1

(c) Evaporation (from surface);
Diffusion/osmosis (from blood to lumen/from blood to surface);
Hydrostatic pressure (forces water out); 2 max

Total 5

Question 7

(a)	(i)	Allows comparison (with other mammals); Will not all be the same/may differ in size/mass;	2
	(ii)	Two marks for correct answer of 3.2;; One mark for incorrect answer, derived in some way from 2 and 1.6;	2
(b)	(i)	Principles 1. SAN → AVN → Bundle of His/Purkyne tissue; 2. Involving electrical activity/impulse; *Do not accept nerve impulse in this context* Detail 3. (SAN) myogenic; 4. Impulse (spreads over atria and) produces atrial contraction; 5. Delay at AVN; 6. Allowing atria to empty before ventricles contract; 7. Impulse to base of ventricles; 8. Contraction of ventricles from base up;	6 max
	(ii)	Impulse(s) down vagus/parasympathetic / No/fewer impulses down sympathetic nerve; SAN sends impulses/signals less frequently;	2
(c)	(i)	Less blood to skin and skeletal muscles; *Assume unqualified answers refer to the seal*.	1
	(ii)	Oxygen (in blood) will last longer/less oxygen used; Only supplied to essential organs/heart/brain/not supplied to skeletal muscles/skin/intestines/organs listed; Can stay underwater longer/don't have to breathe as often; Less blood to skin so less heat lost; *Accept references to other appropriate underwater activities as equivalent to third point.*	2
		Total	15

Question 8

(a) 50; 1

(b) Read off value where initial length divided by final length = 1; 1

(c) Strip does not shrink any more;
Because of cell walls; 2

(d) Only tests one variable/makes sure only one experimental variable is changed/
temperature may also affect percentage of eggs hatching/the results; 1

(e) (i) Decreases as solute concentration increases;
Reference to change in gradient, for example, less steep as solute concentration increases; 2

(ii) (At low solute concentrations) water potential higher/less negative outside than inside egg;
Water enters by osmosis;
Pressure (bursts) egg shell; 2 max

(f) Fick's law as
(Rate of) diffusion proportional to

$$\frac{\text{SA x diff in conc/conc grad}}{\text{Thickness of (exchange surface/membrane/distance)}}$$

1. and 2. Allow 2 marks for correct expression;;
One mark only for a single error;
Must have SA, diff in conc and thickness in right position to gain any credit.
Withold one mark for
Fick's Law instead of diffusion
Equals instead of proportional to
Conc instead of conc dif in conc gradient
3. Many (small) alveoli;
4. Many capillaries;
5. Exchange surface consists of squamous/pavement epithelium/epithelial cells flat;
6. Short diffusion pathway (between lumen and blood)/thin for diffusion;
7. (Concentration difference maintained by) circulating blood;
8. (Concentration difference maintained by) ventilation/breathing; 6 max

Total 15