



*Rewarding Learning*

ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
2011

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## **Biology**

Assessment Unit AS 1

*assessing*

Molecules and Cells

**[AB111]**

**MONDAY 13 JUNE, AFTERNOON**

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# **MARK SCHEME**

/ denotes alternative points  
 ; denotes separate points  
 Comments on mark values are given in **bold**  
 Comments on marking points are given in *italics*

**Section A**

- |   |            |                 |
|---|------------|-----------------|
| <p><b>1</b> Prophase I;<br/>         anaphase II;<br/>         telophase II;<br/>         prophase I;<br/> <i>Must refer to relevant I and II divisions</i></p>   | <p>[4]</p> | <p><b>4</b></p> |
| <p><b>2 (a)</b> In both: cytoplasm, mitochondria, endoplasmic reticulum, nucleus<br/> <b>[Accept any 3];</b><br/>         in plant only: vacuole, cell wall;<br/>         in animal only: glycogen granules;</p>  | <p>[3]</p> |                 |
| <p><b>(b)</b> The cell wall is made from chitin/the cell is multinucleated<br/>         (lacks dividing membranes)/cells contained within hyphae;</p>   | <p>[1]</p> | <p><b>4</b></p> |
| <p><b>3</b> A: Cellulose;<br/>         B: starch;<br/>         C: sucrose;<br/>         D: maltose;<br/>         E: glucose;</p>  | <p>[5]</p> | <p><b>5</b></p> |
| <p><b>4 (a)</b> A: Muscularis mucosa [<i>NOT just muscle</i>];<br/>         B: crypt Lieberkühn/Paneth cells/stem cells;<br/>         C: goblet cell;<br/>         D: columnar epithelium [<i>NOT just epithelium</i>];<br/>         E: mucosa [<i>NOT villus</i>];</p> | <p>[5]</p> |                 |
| <p><b>(b)</b> This is a surface view of a villus/section of epithelium layer<br/>         (surrounding villi are shown sectioned);</p>  | <p>[1]</p> |                 |
| <p><b>(c)</b> The lacteal absorbs lipids/fatty acids and glycerol;</p>  | <p>[1]</p> | <p><b>7</b></p> |

- 5 (a) Nucleotide;  
 [Accept deoxyribose nucleotide, but NOT ribonucleotide] [1]
- (b) (i) One intermediate band after one generation;  
 two bands, one light and one intermediate after two generations; [2]
- (ii) Semi-conservative replication of the DNA/each (heavy) strand  
 acts as a template;  
 produces DNA with one heavy chain and one light chain; [2] 5  
 [allow by means of a diagram]
- 6 (a) Any two from
- adsorption on glass, alginate beads or matrix (enzyme is attached to outside of an inert material)
  - entrapment (enzyme is trapped inside insoluble beads or microspheres, e.g. calcium (or sodium) alginate beads)
  - cross-linkage (enzyme is bonded covalently to a matrix by a chemical reaction).
  - encapsulation/enmeshment (inside a selectively permeable membrane e.g. nylon)
- [Descriptions in brackets accepted only with detail included] [2]
- (b) (i) Values from graph: 35 and 30;  
 division by maximum:  $5 \div 35$ ;  
 percentage:  $(5 \div 35) \times 100 = 14.3$ ; [3]
- (ii) Fewer collisions between enzyme and substrate/fewer enzyme-substrate complexes formed;  
 enzyme not free to move around/some immobilized enzyme active sites not exposed/available/some of the enzyme denatured/substrate must diffuse through support medium to reach enzymes; [2]
- (iii) Immobilisation increases the range of pH over which the enzyme remains active;  
 prevents enzyme structure being disrupted by pH/increases stability of the enzyme; [2] 9  
 [References to influence of temperature is NOT acceptable]

7 (a) **Any three from**

- more glucose is absorbed by living intestinal cells than arabinose
- similar amounts of glucose and arabinose are absorbed by cyanide-treated cells
- treatment with cyanide causes a (significant) reduction in the rate of absorption of glucose
- similar treatment with cyanide does not affect the rate of arabinose absorption

[3]

(b) Arabinose;

as the rate remains the same in the intestinal cells treated with cyanide;

suggesting that ATP/respiration is not needed for arabinose absorption/it is a passive process [*NOT energy for ATP*];

[3]

(c) Glycogen;

**Any three from**

- contains  $\alpha$ -glucose molecules
- joined by condensation reactions/glycosidic bonds
- both 1–4 and 1–6 bonds are present
- 1–4 bonds create the straight chains/1–6 bonds create branching

[4]

(d) **Any two from**

- an enzyme inhibitor that bears no resemblance to the enzyme's natural substrate/may attach to a part of the enzyme other than the active site/doesn't compete with substrate for the active site
- alters the shape of the active site/permanently binds to (blocks) the active site
- inhibition does not depend on the relative concentration of the inhibitor

[2]

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- 8 (a) (i) There is always some solute in the cell contents/only water with no solutes has a potential of zero; [1]
- (ii) Plasmolysed; [1]
- (b) (i) -490; [2]  
-600;
- (ii) Points accurately plotted; [2]  
line of best fit appropriate;  
**[Including points consequential to those given (i)]**  
*[Line of best fit does not simply join first and last points]*
- (iii) Point of intersection between line plotted and  $x$ -axis (at  $y = 0$ ) [1]
- (c) (i) **Any three from**
- core of potato is cut to a specific length and sliced/the same cork borer is used, for all samples
  - samples are (surface dried and) weighed
  - the samples are immersed in a series of sucrose solutions (0 to 0.5 M sucrose)
  - after 24 hours the samples are surface dried by a standard method and reweighed
  - the percentage change in mass is calculated for each sample **[allow mark transfer from (c) (ii) below]** [3]
- (ii) The percentage change in mass is plotted against the molarity of the sucrose solution/solute potential of the sucrose solution; the water potential is determined by the point where the line of best fit crosses the  $x$ -axis/where there is no % change in mass (% change in mass = 0); [2]
- (iii) The water potential of the potato is equivalent to the solute potential of the bathing solution/ $\psi_{\text{cell}} = \psi_{\text{external}}$ ; *[insist on term "water potential" – do NOT allow reference to "water concentration"]*  
when there is no change in mass/as there is no net movement of water in or out of the tissue; [2]  
**[allow mark transfer from (c) (ii) above, if not already credited in (c) (ii)]**

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Section A

60

## Section B

### 9 Thirteen points, with at least six from each section

Structure:

- the primary structure is the **sequence of amino acids** in a polypeptide chain
- amino acids are linked by **peptide bonds/condensation reactions** (between  $\text{-NH}_2$  and  $\text{-COOH}$  groups)
- the secondary structure is when the polypeptide chain winds into a **alpha helix and beta pleat**
- (the helix is) held in shape by **hydrogen bonds** (between  $\text{-NH}$  and  $\text{-C=O}$  groups)
- the tertiary structure is when the helix folds further into a **globule** (making it more compact)
- this is held in shape by **bonds between neighbouring R-groups**
- such as hydrogen bonds, ionic bonds, disulphide bridges and hydrophobic interactions [**any two**]
- the quaternary structure is when **more than one polypeptide** is present in the protein
- fibrous protein lack a tertiary structure
- conjugated proteins also have a **non-protein part/prosthetic group** [**appropriate example**]

Role in cell-surface membrane:

- proteins stabilize membrane structure
- may act as hydrophilic channels
- that allow polar molecules (e.g. ions) to diffuse through the membrane
- aquaporins are specific protein channels through which water can travel
- some transmembrane proteins may act as carriers that can change shape
- each carrier/channel is specific to one substance (only fits one substance)
- some are used for facilitated diffusion
- others are used for active transport which requires energy expenditure
- membrane bound enzymes
- glycoproteins/lipoproteins act as recognition sites/antigens on the outer surface of a cell
- act as receptors
- act to anchor the cytoskeleton
- other appropriate role

[13]

Quality of written communication:

2 marks: The candidate expresses ideas clearly and fluently through well-linked sentences, which present relationships and not merely list features. Points are generally relevant and well-structured. There are few errors of grammar, punctuation and spelling.

1 mark: The candidate expresses ideas clearly, if not always fluently. The account may stray from the point or may not indicate relationships. There are some errors of grammar, punctuation and spelling.

0 marks: The candidate produces an account that is of doubtful relevance or obscurely presented with little evidence of linking ideas. Errors in grammar, punctuation and spelling are sufficiently intrusive to disrupt the understanding of the account.

[2]

15

**Section B**

**15**

**Total**

**75**