

# GCE 2005

## *January Series*



# Mark Scheme

## Biology Specification A

### BYA8a/9b Synoptic Assessment

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Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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*Dr Michael Cresswell Director General*

**BYA8/W and BYA9/W****Question 1**

- (a) (i) Same sequence of amino acids;  
Therefore bonds (maintaining tertiary structure) always in same place /  
determined by amino acid sequence; 2
- (ii) Made of more than one / four polypeptides; 1
- (b) Molecules do not escape from blood / pass through walls of blood vessels /  
are not excreted / do not have osmotic effect; 1
- (c) (i) In lungs high partial pressure of oxygen;  
Haemoglobin saturated / present as oxyhaemoglobin;  
Tissues with lower partial pressure of oxygen;  
Haemoglobin less saturated therefore some oxygen released; max 3
- (ii) Lower partial pressure of oxygen;  
In lungs / alveoli;  
Therefore haemoglobin not completely saturated;  
No change in partial pressure of oxygen in tissues so less released; max 3
- (d) Increased respiration/metabolism releases heat (so muscle temperature rises);  
Curve displaced to right;  
More oxygen released at same partial pressure;  
Even more released as partial pressure of oxygen in muscle also falls; max 3
- (e) Mother and father both heterozygotes / Tt / carriers;  
Probability of thalassaemia 1/4 and female 1/2;  
Probability of both 1/8; 3
- (f) (i) Cut at same base sequence as same enzyme used;  
Fragments are same length / size / have same charge;  
Only differs by a single base; max 2
- (ii) Single base occurs many times;  
Sequence of 20 unlikely to occur elsewhere; 2  
*Allow one mark for establishing the principle where neither marking point clearly made.*

Total 20 marks

**Question 2**

- (a) (i) Active transport;  
Low to high concentration / against concentration gradient; 2  
*Reject answers relating only to high concentration in cell*
- (ii) Rate of movement / diffusion proportional to concentration gradient/  
difference in concentration; 2  
High concentration of potassium ions inside cell compared to outside;  
*Must mention high concentration. Ignore reference to other factors if  
reasoning is appropriate.*
- (b) (i) 
$$\begin{array}{c} \text{O} \\ || \\ \text{C} - \text{N} \\ | \\ \text{H}; \end{array}$$
 1
- (ii) 10; 1
- (c) Peptide chain digested in gut/by enzymes;  
Cannot be taken orally;  
OR  
Membrane of all organisms similar;  
Will harm host (as well as pathogen);  
OR  
Damage plasma membrane;  
Membrane similar in all organisms; 2
- (d) Action of vanilomycin depends on fluidity of membrane;  
Fluidity reduced / not fluid at low temperatures;  
Pore formed by gramicidin A remains in place / permanent; 3
- (e) Fungi are eukaryotes and bacteria are prokaryotes / not eukaryotes;  
Only eukaryotic membranes contain sterols to which antibiotic binds; 2
- (f) Pore between sterol molecules lined with polyene antibiotic;  
Hydrophobic region next to sterol; 2

Total 15 marks

**General principles for marking the Essay:**

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

**Scientific content** (maximum 16 marks)

| <b>Category</b> | <b>Mark</b> | <b>Descriptor</b>   |
|-----------------|-------------|---|
|                 | 16          |   |
| <b>Good</b>     | 14          | Most of the material of a high standard reflecting a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy. |
|                 | 12          |   |
|                 |             |   |
|                 | 10          |   |
| <b>Average</b>  | 8           | A significant amount of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any fundamental errors. Shows a sound understanding of most of the principles involved.   |
|                 | 6           |   |
|                 |             |   |
|                 | 4           |   |
| <b>Poor</b>     | 2           | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors.  |
|                 | 0           |   |

**Breadth of Knowledge** (maximum 3 marks)

| <b>Mark</b> | <b>Descriptor</b>   |
|-------------|---|
| 3           | A balanced account making reference to most if not all areas that might realistically be covered on an A-level course of study. |
| 2           | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered.         |
| 1           | Unbalanced account with all or almost all material based on a single aspect   |
| 0           | Material entirely irrelevant.   |

**Relevance** (maximum 3 marks)

| <b>Mark</b> | <b>Descriptor</b>  |
|-------------|--|
| 3           | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material |
| 2           | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance.     |
| 1           | Some attempt made to relate material to the title but considerable amounts largely irrelevant.                               |
| 0           | Material entirely irrelevant or too limited in quantity to judge.  |

**Quality of language** (maximum 3 marks)

| <b>Mark</b> | <b>Descriptor</b>   |
|-------------|---|
| 3           | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout.          |
| 2           | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1           | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas.                |
| 0           | Material entirely irrelevant or too limited in quantity to judge.   |

Total 25 marks

**Additional notes on marking Question 3**

Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks to a particular essay are those corresponding to the appropriate descriptors.

Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will.

These notes must therefore be seen merely as guidelines providing an indication of areas of the specification from which suitable factual material might be drawn.

In determining the mark awarded for breadth, content should ideally come from each of the areas specified if maximum credit is to be awarded. Where the content is drawn from two areas, two marks should be awarded and where it is taken only from a single area, one mark should be awarded. However, this should only serve as a guide. This list is not exhaustive and examiners should be prepared to offer credit for the incorporation of relevant material from other areas of study.

**Essay A      Negative feedback and its importance in biology**

| <b>Biology</b>  | <b>Human Biology</b> |
|---|----------------------|
| 15.2 <b>Negative feedback and principles of homeostasis</b>   | 16.11                |
| <b>The nervous system and homeostasis</b>   |                      |
| 15.10      The autonomic nervous system   | 16.10                |
| 15.10      Simple behaviour patterns  |                      |
| 15.2      Temperature control   | 16.11                |
| 10.8      Effects of exercise on circulation and breathing  | 10.8                 |
| <b>The endocrine system and homeostasis</b>   |                      |
| 14.8      The role of hormones in puberty and in during pregnancy and in controlling birth and lactation. | 16.2                 |
| 11.7      The hormonal control of the female sexual cycle   | 16.3                 |
| 15.2      Control of blood glucose  | 16.11                |
| 15.3      Water balance   |                      |

**Essay B      Condensation and hydrolysis and their importance in biology**

| <b>Biology</b>       | <b>Human Biology</b>  |              |
|----------------------|---|--------------|
| 10.4                 | <p><b>Synthesis of proteins, carbohydrates and lipids from monomers</b><br/>Large molecules are important in the structure and functioning of cells</p>   | 10.4         |
| 10.4<br>15.6<br>15.4 | <p><b>Hydrolysis of proteins, carbohydrates and lipids from monomers</b><br/>Large molecules are important in the structure and functioning of cells<br/>Digestion of food<br/>Digestion of cellulose</p> | 10.4<br>16.4 |
| 11.3<br>14.8         | <p><b>Condensation and hydrolysis of other substances</b><br/>DNA, RNA and protein synthesis<br/>The role of ATP</p>  | 12.5<br>14.8 |