

GCE 2004  
*June Series*



# Mark Scheme

## Advanced Extension Award Biology (6811)

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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.

### **Advanced Extension Award (AEA)**

This Mark Scheme covers the Advanced Extension Award that AQA offers on behalf of all awarding bodies

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**Question 1**

- (a) sulphur in R-group rather than selenium; 1
- (b) enzyme involved;  
linking amino acid and tRNA;  
shape of selenocysteine/selenomethionine sufficiently similar;  
to fit active site;  
attach/brought to mRNA; 4  
*Accept converse argument for non-protein amino acid homologues*  
enzyme involved;  
non-protein amino acid does not attach to tRNA;  
shape of homologues not sufficiently similar;  
to fit active site;  
not attached/brought to mRNA;
- (c) active transport;  
synthesis likely to take place in cytoplasm/not likely in vacuole;  
therefore movement against concentration gradient (as stored in vacuole);  
transport protein;  
some initial facilitated diffusion; 3 max
- (d) (enzymes with) weaker bonds holding tertiary structure;  
more prone to denaturation;  
with slight changes in temperature/pH;  
changes balance/relative amounts of products/interferes with metabolic pathways; 3  
*Note this question refers to the incorporation of selenium into plants which are still living. Answers should be set in this context and those relating to extreme changes in pH and temperature should not gain full credit.*
- (e) better competitor on selenium-rich soils/ less successful competitor on soils poor in selenium;  
as proteins/enzymes not adversely affected; 2
- (f) (i) planted then harvested/removed; 1
- (ii) combustion/decomposition will release selenium;  
problems of localisation/transfer/concentration;  
does not remove selenium bound to soil particles;  
soil bound particles may enter solution; 2 max
- (g) (i) diagram showing the following features  
cycle showing uptake, food chain and decomposition;  
selenium in organic form in organisms;  
uptake of inorganic selenium/ions by plants/producers; 3

- (ii) organisms at higher trophic levels eat many/much food from lower levels;  
accumulates in proteins; 2
- (h) factorial design with controls described;  
control consisting of placebo/dummy;  
random assignment to groups;  
(double) blind trial;  
leave for appropriate period of time (ie years); 4  
*These ideas should be covered. It is not necessary to use the specific terms.*
- Total 25
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**Question 2**

- (a) (i) shrinkage with skins; 1
- (ii) all teeth erupted;  
over a certain minimum size;  
teeth demonstrating wear;  
cartilage replaced by bone;  
skull bones fused/no fontanel;  
relative shape of skull; 3 max
- (b) increase in both male and female with increasing latitude;  
increasing sexual dimorphism/difference between male and female with latitude;  
range in males increases with latitude and in females decreases; 2 max
- (c) mean annual temperature decreases with increasing latitude;  
larger animals lose less heat as smaller SA : volume ratio; 2
- (d) (i) prey of tigers generally larger as latitude increases;  
males take larger prey than females;
- (ii) reduces competition;  
allows males and females to exploit different niches;  
and the area to have a greater carrying capacity/support a greater tiger population; 4 max
- (e) tRNA synthesis involves transcription alone while protein synthesis involves transcription and translation;  
*Accept description*  
single base code for tRNA, triplet for proteins; 2 max

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|     |      |  |          |
|-----|------|--|----------|
| (f) | (i)  | a length of DNA where the nucleotide/base sequence varies;   | 1        |
|     | (ii) | few tigers linked to genetic variation;<br>insufficient time for (subsequent) change;  | 2 max    |
|     | (ii) | more likely to find polymorphic sites/difference in number of sites and mammals/cats relatively recently evolved;  | 1        |
| (g) |      | anticodons on mt tRNA pair with a greater number of codons;<br>3rd base possibly even less important than in cytoplasmic mRNA;<br>mitochondria may not use all possible codons/redundant anticodons not produced;<br>still enough to code for all 20/common amino acids;<br>proteins in mitochondria may have fewer types of amino acid; | 2 max    |
| (h) | (i)  | female tigers have a smaller home range than males;<br>P/L ratio higher among females/fewer locations in female but just as active/similar number of photographs;  | 2        |
|     | (ii) | valid approach outlined.<br>e.g. idea of being used as basis of mark-release-recapture/trapping out;<br>individual pattern allows individual animals to be recognised as having been trapped before;<br>explanation of how data collected would enable population to be estimated;   | 3        |
|     |      |  | Total 25 |

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**Sections C and D****General principles for marking questions in these sections**

Four skill areas will be marked: Biological content (C)  
 Scope of knowledge (S)  
 Relevance (R)  
 Quality of written communication (Q)

These skill areas will be marked independently of each other. Providing that there is sufficient evidence and the subject content is relevant to the question answered, it is possible for candidates to obtain maximum credit for skill areas S, R and Q even if they gain few marks for the biological content.

The following descriptors will form the basis for marking.

**Biological content** (maximum 16 marks)

| <b>Mark</b> | <b>Descriptor</b>  |
|-------------|--|
| <b>16</b>   | Material accurate and of a high standard throughout, reflecting a comprehensive understanding of the principles involved, and a knowledge of factual detail fully in keeping with a programme of A-level study. In addition, a significant amount of the content involves material which indicates greater depth of study.   |
| 14          |  |
| <b>12</b>   | Some minor errors which detract from the overall accuracy. Content reflects understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. In addition, occasional significant references to material which indicates a greater depth of study.  |
| 10          |  |
| <b>8</b>    | Generally accurate and free from fundamental errors. Content reflects understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. No significant reference to material which indicates a greater depth of study.  |
| 6           |  |
| <b>4</b>    | Material largely superficial and either fails to reflect understanding of the principles involved or fails to show a knowledge of factual detail in keeping with a programme of A-level study. If greater depth of knowledge is demonstrated, then there are a number of fundamental inaccuracies. No indication of material which indicates a greater depth of study. |
| 2           |  |
| <b>0</b>    | Material superficial and inaccurate seldom reflecting the depth expected from a programme of A-level study.  |

**Note:** Only marks 0, 2, 4 etc are awarded. This limits the number of categories and improves consistency of marking

Marks intermediate between descriptors may be awarded.

**Scope of knowledge** (maximum 3 marks)

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

**Relevance** (maximum 3 marks)

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

**Quality of written communication** (maximum 3 marks)

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