



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Education

Biology 6811

Mark Scheme

2006 examination - June series

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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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AEA Biology

Question 1

- (a) Low body temperature linked to low metabolic rate;
Low metabolism linked to low food requirement when little available;
Low body temperature results in lower temperature gradient/less heat lost; 2 max
- (b) Subcutaneous storage/storage under skin important in insulation/insulator preventing excessive heat loss;
High yield of energy compared to mass/compared to carbohydrate;
Associated with high proportion of hydrogen/low proportion of oxygen;
Metabolic water important as animal not drinking/compared to carbohydrate; 3 max
- (c) Enables heart to use lipid as respiratory substrate/for respiration/for ATP production; 1
- (d) (i) Particles with less kinetic energy therefore slower diffusion;
Membrane less fluid/molecules not moving so much;
Slows movement of particles passing through phospholipids/bilayer/of small/fat-soluble molecules;
ATP production limited;
As rate of reaction of enzymes/respiration slows;
Limits rate of active transport; 4 max
- (ii) Unsaturated fatty acids with double bonds;
Produce 'kinks' in hydrocarbon chain;
Leading to more open arrangement; 2 max
- (e) Reduced breathing leads to lower pO_2 /oxygen concentration in alveoli/lungs;
Haemoglobin able to load more oxygen at low pO_2 ; 2
- (f) (i) Heat readily transferred to major blood vessels/heart/aorta and transferred to rest of body;
Rapid warming of nervous system controlling many of the changes associated with arousal; 2
- (ii) Supplies oxygen for respiration; 1
- (g) (i) Reduced coenzymes/NAD source of hydrogen/electrons/protons;
Electrons passed along series of electron acceptors;
Energy used to transport H^+ ions/protons across inner membrane;
Release energy to produce ATP as they pass through ATPase/stalked particles (in membrane); 3
- (ii) Opens new channels in/forms another way for membrane/ H^+ ions/protons to return;
Not associated with ATPase/do not produce ATP so all energy released as heat; 2

- (h) Handling increases heart rate;
Likely to stimulate arousal/thermogenesis/metabolic rate;
Fat stores will be used up/(and) cannot be replenished; 3

Question 2

- (a) (i) Ice⁻ strain will compete with Ice⁺;
Reducing number of Ice⁺; 2
- (ii) Could colonise/affect weeds;
Weeds would then be less susceptible to frost damage;
(Increased) competition with crop plants; 3
- (b) (i) Plants treated the same but sprayed only with carrier solution; 1
- (ii) Enables a large range of numbers to be plotted/growth is exponential/
can plot both small and large numbers on the same scale; 1
- (iii) The greater the SD, the greater the variation in the sample;
Data unreliable;
Greater the variation in sample size, the less likely it is that any
differences are significant/cannot conclude that a difference exists
between samples/more likely to be due to chance; 2
- (c) (i) Accept valid explanations related to survival time or number e.g.
relatively short survival time/survival only about 6 weeks (so not likely to
spread); 1
- (ii) Period of investigation:
Only sprayed in June/spring/not sprayed in winter;
Damage only when there is frost/cold conditions/winter;
Don't know whether bacteria grow in winter/rate of growth may be slow;
- Numbers:
Large number of Ice⁻ bacteria so could be effective;
Overall low percentage/relative population of Ice⁻ so may not be effective;
- Other points:
Investigations on one crop/potatoes; 4 max
- (d) Ensures that bacteria are likely to be metabolically active;
Relevant consequence of metabolic activity e.g. plasmid formation/conjugation;
Larger number of bacteria will result from addition of nutrients;
Increases likelihood of encounter (between recipients and donors); 2 max
- (e) Removes competitors so greater number of *Bacillus spp*/
Any contact between species will be between these two and no others; 1
-

- (f) Genes for antibiotic resistance on plasmids;
Reference to use of antibiotics taken orally favouring selection of resistant varieties;
Favourable conditions produced by nutrients/from digested food;
Warm conditions favour rapid multiplication;
Large population so greater probability of transfer; 3 max
- (g) More plants closer to another variety, the more the opportunity for the transfer of pollen; 1
- (h) Maize grown in large fields so less "contact" with other species;
Herbicides likely to remove weeds growing among crop plants;
Kale and cabbage same species so interbreed freely;
Weeds different species to crop plants;
Likely to be barriers to breeding so would be fewer hybrids;
Heavy pollen (of kale/cabbage) may not spread far; 4 max

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)

Mark	Descriptor
16	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	
12	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	
8	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	
4	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	
0	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)

Mark	Descriptor
3	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
2	A number of aspects covered but a lack of balance. Some topics essential to treatment at this level not covered.
1	Unbalanced account with all or almost all material based on a single aspect
0	Material mostly irrelevant

Relevance (maximum 3 marks)

Mark	Descriptor
3	All material presented is clearly related to the title. Allowance should be made for judicious use of introductory material
2	Material generally selected in support of the title but some of the main content of the essay is of 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 written communication (maximum 3 marks)

Mark	Descriptor
3	Material is organised and presented clearly and logically. Technical terminology has been used effectively and accurately throughout.
2	Most of the material is organised and presented clearly and logically. Technical terminology has usually been used effectively and accurately.
1	The essay 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