



# General Certificate of Education

## Biology 6416 *Specification B*

*BYB5/W The Environment*

# Mark Scheme

*2006 examination – June series*

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.

## General Guidance for the Mark Scheme

The following conventions are used in the mark scheme:

- A semicolon (;) separates each mark point
- An oblique stroke (/) separates alternatives within a mark point
- Underlining of a word or phrase means that the term must be used by candidates
- Brackets are used to indicate contexts for which a mark point is valid, but which may just be implied by a candidate's answer
- '*Accept*' and '*reject*' show answers which should be allowed or not allowed.
- Additional instructions may be shown in *italics*

The scheme shows the minimum acceptable answer(s) for each mark point - better, more detailed, or more advanced answers are always accepted, provided that they cover the same key ideas. Occasionally, a candidate will give a biologically correct answer that has not come up at standardising. If it is equivalent in standard to the mark scheme answers, it may be credited.

In some cases a mark may be awarded for understanding of a general principle, even though the detailed mark points on the scheme have not been made. This will be indicated on the mark scheme.

All mark points are awarded independently, unless a link between points is specified in the scheme.

Converse answers are normally acceptable, unless the wording of the question rules this out.

### Disqualifiers

A correct point is disqualified when the candidate contradicts it in the same answer.

### The list rule

When a question asks for a specific number of points, and the candidate gives more, any wrong answer cancels a correct answer. For example, if a question asks for two points and three answers are given, two correct and one clearly wrong, the mark awarded is one, whatever the order of the answers.

Valid points from **diagrams** are credited, if they are not duplicated in the text.

Where a question asks for **differences** between X and Y, the mark may be awarded for a feature of X without the converse for Y, if it is absolutely clear which is being referred to.

---

## BYB5/W The Environment

**Question 1**

- (a) (i) nitrogen-fixing;
- (ii) nitrifying; 2  
*(names neutral, name only no mark)*
- (b) (i) growing legumes/ named legume;  
 ploughed in/allowed to decompose/nitrogen-fixing (bacteria in nodules);

*OR*

allow cattle/named species/(farm) animals (to graze);  
 add dung/urine;

*OR*

spread/add manure/slurry;  
 decomposed to release nitrates/ammonia/nitrites; 2

- (ii) bare soil/fallow in winter/hedge removal;  
 leaching (of nitrates)/soil erosion;

*OR*

uptake of nitrates/ammonium compounds by crop;  
 harvesting crop/named crop which would be harvested;

*OR*

(farm) animals eat plants (in field);  
 (then) animals removed; 2

**Total 6****Question 2**

- (a) cultivation of single species/variety of crop/named crop / one crop grown over a large area; 1
- (b) (i) more space for crop;  
 easier to use machines/named machine;  
 removes habitat for pests;  
 lower labour costs in maintenance;  
 less competition with (crop) plants for named resource; 2 max
- (ii) more habitats/niches/food sources/more animal/insect/mammal/  
 bird species present/more species diversity/larger food webs/  
 more food chains; 2

- (c) food source killed by pesticide;  
insufficient food (for survival)/lack of alternative sources/specialist feeder;

OR

pesticide passed through food chain;  
biomagnification/bioaccumulation/concentration higher in top carnivores;

OR

stored in fat;  
released over time;

OR

run off/leached into rivers;  
kills aquatic life;  
(animals eat pests containing the pesticide gains 1 mark)

2

**Total 7**

### **Question 3**

- (a) breakdown of organic matter/sewage by enzymes from bacteria;  
nitrates/ammonia used by algae to make amino acids/proteins;  
algae photosynthesise;  
bacterial respiration uses O<sub>2</sub> /produces CO<sub>2</sub> for algae;  
(respiration) allows for reproduction/growth of bacteria;

4

- (b) sufficient light penetration for photosynthesis (of algae);  
warm leads to faster enzyme activity;  
faster bacterial respiration/decomposition;  
faster photosynthesis;  
increased growth/reproduction of bacteria/algae;

4

**Total 8**

### **Question 4**

- (a) secondary – algae → limpet → starfish

OR

plant plankton → mussel → starfish,  
tertiary – plant plankton → animal plankton → barnacle

OR

mussel → starfish;

1

- (b) use of random numbers;  
large number of quadrats;  
count number of dead and live mussels in unit area;

3

- |     |      |   |                |
|-----|------|---|----------------|
| (c) | (i)  | different size organisms/different composition (of carbohydrate/fat/protein)/<br>low digestability/not all eaten; | 1              |
|     | (ii) | 14;   | 1              |
|     |      |   | <b>Total 6</b> |

**Question 5**

- |     |  |  |                |
|-----|--|--|----------------|
| (a) | principle of intraspecific competition;<br>for amount of food available;<br>more energy needed to find food/less energy to produce eggs; |  |                |
|     | <i>OR</i>  |  |                |
|     | number of territories;<br>more energy spent fighting/defending territory;  |  |                |
|     | <i>OR</i>  |  |                |
|     | availability as prey;<br>predators spend less time searching for nests;  | 2 max  |                |
| (b) | (i)  | age of bird – young or old birds produce fewer eggs;<br>time of breeding – early or late breeding less food available/temperature effect;<br>genotype – variation in genetic ability to produce eggs;<br>quality of territory – description of some relevant resource in territory;<br><i>(reject food as resource in territory if given in (a))</i><br>predation of eggs – lays more to replace eaten eggs; | 1 max          |
|     | (ii)   | when high number of eggs, each individual young will receive less food;<br>reference to mortality rates to disease/predators for low numbers of eggs;<br>so in <b>both</b> cases low number of offspring will reach maturity/survive;<br>so less likely to pass on genes/alleles;  | 3              |
|     |  |  | <b>Total 6</b> |

**Question 6**

- |     |  |   |   |
|-----|--|---|---|
| (a) | (i)  | change in community over time;<br>either due to change environmental/abiotic factors / change is due to species<br>present; | 2 |
|     | (ii)   | stable community/no further succession/final community;   | 1 |
| (b) | (increased) <u>interspecific</u> competition;<br>for light/nutrients/named nutrient/water; |   | 2 |

- (c) fewer leaves/lower surface area/shading of leaves;  
less photosynthesis to produce new biomass/glucose/growth;  
competition with other species for nitrates/named nutrient;  
reduced synthesis of protein or named compound;  
ratio of leaves to woody parts and roots decreases;  
so higher respiration relative to photosynthesis; 3 max

**Total 8**

**Question 7**

- (a) 1. 4 year cycles;  
2. predator/stoat peaks after prey/lemming;  
3. lemmings increase due to low numbers of stoats/available food;  
4. more food for stoats so numbers increase;  
5. increased predation reduces number of lemmings;  
6. number of stoats decreases due to lack of food/starvation; 6
- (b) smaller populations have fewer different alleles/more homozygosity/less heterozygosity/smaller gene pool/lower genetic variability;  
migrants bring in new alleles/increase gene pool; 2
- (c) geographical isolation of populations;  
variation present in population(s);  
different environmental conditions;  
different selection pressures/different phenotypes selected;  
change in genetic constitution of populations/gene pools/allele frequency;  
(two populations) so unable (to breed) to produce fertile offspring; 4 max

**Total 12**

**Question 8**

- (a) less nitrate taken up;  
less amino acid/protein synthesis;
- OR*
- parts of plant higher in protein die;  
higher proportion of cellulose/non-protein components in diet; 2
- (b) (wildebeest) selective feeders/only some species/parts of plant eaten;  
choose to eat species/part of plant with high protein content; 2

- (c) named protein;  
consequences of lack of protein related to failure to escape from predators;

examples:

myosin/actin;  
(skeletal) muscles weak/less muscular tissue so slower movement;

OR

relevant named enzyme;  
why deficiency of enzyme increases chance of being caught;

OR

haemoglobin;  
insufficient oxygen for muscle contraction;

2

- (d) 1. protein digested by endopeptidase/named endopeptidase;  
2. to form peptides/shorter polypeptides or break bonds in middle of chain;  
3. exopeptidases/dipeptidase/named exopeptidase;  
4. amino acids/dipeptides formed/bonds at end of chain broken;  
5. dipeptidases in membrane of epithelial cells;  
6. uptake of amino acids/dipeptides by facilitated diffusion/active transport;  
7. by carrier proteins;  
8. across large surface area of villi/microvilli (of small intestine);

6 max

*(if endo- and exopeptidases have not been mentioned a maximum of two marks may be awarded for discussion of role of proteases in protein digestion as follows:-  
protease;  
role of protease – protein to (poly)peptides or (poly)peptides to amino acids/dipeptides; (i.e. some recognition of a two stage process))*

**Total 12**

**QWC 1**