



## **General Certificate of Education**

# **Biology 6416**

## *Specification B*

**BYB6/A Applied Ecology**

# **Mark Scheme**

*2008 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.

Further copies of this Mark Scheme are available to download from the AQA Website: [www.aqa.org.uk](http://www.aqa.org.uk)

Copyright © 2008 AQA and its licensors. All rights reserved.

#### COPYRIGHT

AQA retains the copyright on all its publications. However, registered centres for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Set and published by the Assessment and Qualifications Alliance.

**Question 1**

- (a)
- | Factors that have a density-dependent effect. | Factors that have a density-independent effect. |
|---|---|
| e.g.<br>Food availability<br>Predation        | e.g.<br>Rainfall<br>Temperature<br>pH           |
- ;; 2
- (b) Number of individuals of each species;  
Total number of individuals (*Simpson's Index*) or number of species (*Margalef Index*); 2
- Total 4**

**Question 2**

- (a) Consequence and explanation;;
- e.g.  
Decrease in otter prey;  
So less food;
- Oil blocks light;  
So reduced photosynthesis / less photosynthetic species growth; 2
- (b) Indicator species found in specific conditions / example given;  
Compare species present with reference species / species known to be present in different water qualities;  
High pollution = low oxygen concentration or high BOD; 2 max  
(Accept converse)
- Total 4**

**Question 3**

- (a) (New cells produced by) mitosis / asexual reproduction;  
Chromosomes / DNA / genes copied (and passed to daughter cells);  
No recombination / reassortment; 2 max
- (b) (Systemic herbicide):  
(Is) absorbed / transported (through the tissues of the plant);  
Kills whole plant / all parts of plant / underground stems; 2 max  
Less affected by light / rain;  
(Accept converse argument: not transported; only kills part of plant)
- (c) Only affects target species;  
Can survive in conditions of use;  
Works on a large scale;  
The species can be produced on a large scale; 2 max

**Total 6**

**Question 4**

(a) Suitable advantage;

- e.g.  
 Consistent standard / quality / taste / size;  
 Regular supply;  
 Optimal / controlled growth (rates);  
 Supply not affected by external conditions;

1 max

(b) Difference with comparison;;

e.g.

Closed (1 mark )	Open (1 mark )
controlled conditions / cages	as near natural conditions / ponds
prepared food / pellets used	fertilisers used to promote growth of natural foods
day length may be controlled	natural day length
breeding stock separate from harvested	all fish / stock in together

;; 2 max

*(Need comparison of same point, if not 1 mark max)*

- (c) (i)
- 1 Isolate donor gene(s);
  - 2 That code for enzymes needed;
  - 3 Using restriction enzyme / endonuclease / reverse transcriptase on mRNA / gene sequencing;
  - 4 Sticky ends (however formed);
  - 5 Suitable named vector e.g. virus / plasmid;
  - 6 Use ligase correctly;
  - 7 Method of introducing vector;

4 max

- (ii) (Microorganisms) may not absorb beta-carotene;  
 May not be able to transfer all three genes / gene not expressed / enzyme not produced (by same microorganism);  
 Intermediates may be broken down / digested (by microorganisms' enzymes);  
 Astaxanthin / intermediates may be toxic (to microorganisms);  
*(Reject may not take up DNA / enzyme not present)*

2 max

**Total 9**

**Question 5**

- (a) (i) Blocks stomata (on upper surface) / waterproofs the leaf / reduces light or heat hitting the leaf; 1
- (ii) Uses carrier proteins in plasma membrane;  
By active transport;  
Using ATP / energy from respiration; 2 max
- (b) (Position of leaves means):  
Edge / sideways on to sun at hottest part of the day / midday;  
Smaller surface / area of leaf exposed to the sun / less light hits leaf surface;  
Less heating of leaves;  
Stomata (partially) close;  
Less transpiration / evaporation of water; 3 max
- (c) Carbon dioxide does not combine directly with ribulose bisphosphate / binds with PEP;  
Produces a 4-C compound / 4-C acid / oxaloacetate formed;  
Different enzyme / PEP carboxylase used to fix carbon dioxide;  
Occurs in bundle sheath cells / not in stroma; 2 max

**Total 8****Question 6**

- (a) (i) (Fencing):  
Rhinos come into contact more often;  
Spread of infectious disease / leading to infection / more likely to suffer injury;
- (Captive breeding):  
(Inbreeding) may pass on harmful genes / reduces genetic variation (can die of the same diseases);  
(Artificial environment means) young rhinos don't learn survival strategies; 4
- (ii) More food available to support larger population / less spread of disease but poaching / hunting is still problem; 1
- (b) Variation in resistance (to disease);  
Individuals with resistance more likely to survive;  
Pass on alleles / genes;  
Causes a change in allele(s) frequency / higher frequency of allele(s) for resistance; 3 max

**Total 8**

---

**Question 7**

- (a) 1 Sample a standard area of sea bed / use a quadrat;  
2 Method of random / systematic positioning of sample; (e.g. random number table)  
3 Repeat sampling;  
4 Repeat at time intervals;  
5 Scale up count to give estimate for whole area;  
6 Use appropriate stats method; 4 max
- (b) Two regulations;;  
  
e.g.  
Impose "quotas";  
Create "no harvesting zones";  
Have "closed seasons";  
Restrict removal of immature stocks; 2 max
- (c) (i) Ventilation / water flow in relation to a gas;  
Respiration in relation to a gas;  
Circulation / blood flow in relation to a gas;  
Countercurrent / description; 3 max
- (ii) Folding;  
Thin (lamellae) wall / epithelium;  
Many lamellae / filaments;  
Large number of capillaries; 2 max  
*(Reject "good blood supply" and consequences of structural adaptations)*

**Total 11**