



General Certificate of Education

Biology 6416

Specification B

BYB6/A Applied Ecology

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.

BYB6/A Applied Ecology

Question 1

- (a) e.g. increase size of mesh/holes to allow young to escape (so they go on to breed);
closed season to allow breeding;
quotas/reduce fishing effort/total allowable catch to reduce overall numbers caught;
exclusion zones to allow populations to recover;
restrict net sizes to ensure smaller catches;
square mesh which does not collapse when trawled allows small fish to escape; 2 max
- (b) reduced/low effort leads to less of the catch being young/more being older;
young fish left to grow to maturity/breeding size;
maintains stocks / does not lead to depletion; 2 max
(reference to growth/biomass neutral)

Total 4

Question 2

- (a) contain nitrogen-fixing bacteria in roots/nodules (so don't need fertiliser);
nitrogen containing compounds added to the soil when plant dies/after harvest of crop; 2
- (b) increase in yield up to 500-600 kg ha⁻¹;
at 500- 600 kg ha⁻¹ rate of increase slows/ no significant increase (with extra fertiliser); 2
- (c) low(er)/more negative water potential in soil (than in the plant);
prevents roots from taking up water (from the soil);
plants still lose water by transpiration;
plants lose water to soil by osmosis; 2 max

Total 6

Question 3

- (a) suitable method of capture;
mark individuals and release;
count percentage recaptured/use Lincoln index/equation; 2 max
- (b) $\frac{282 \times 281}{25384} = 3.12$; 2
(accept 3.1/3.122)
- (c) decrease in total numbers of butterflies;
(reject population)
change in proportion of species/example(s);
increase in diversity in logged forest/ calculation (4.01); 2 max

Total 6

Question 4

- (a) absorbed/taken up by the plant;
kills potato plants/harmful to humans; 2
- (b) decreases ion regulation;
e.g. Na⁺ lost through fish gills;
- precipitates phosphates;
reducing plant growth;
- interferes with calcium uptake/reduces calcium content of water;
so crustaceans absent/have poor exoskeletons/snails absent/poor shells;
- increases aluminium;
increase mucus on fish gills/decrease oxygen uptake by haemoglobin/prevents
fish eggs hatching;
- denatures enzymes/takes enzymes out of optimum pH range;
substrate no longer fits (active site)/specific example;
- increase in lead/cadmium;
non-competitive enzyme inhibitor; 4 max

Total 6

Question 5

- (a) (i) longer loop of Henle; 1
- (ii) (long loop of Henle produces) lower/ more negative water potential
in medulla/interstitial cells;
water leaves (the loop of Henle) by osmosis/from high to low water potential;
out of descending limb (of the loop of Henle);
(ignore references to collecting duct)
salts/sodium pumped out of /leaves ascending limb (of the loop of Henle);
more water reabsorbed / less water lost in urine;
(accept correct references to effects of ADH for 1 mark) 4 max
- (b) E (no mark) produces most concentrated urine;
loses least volume of water/more water reabsorbed;
for same mass of solutes; 2 max

Total 7

Question 6

- (a) (accumulates) in (fatty) tissue/ is not excreted/ not metabolised/broken down; becomes concentrated higher up the food chain/ bioaccumulation/ biomagnification; 2
- (b) prevents disease/pest organisms from reaching crop plants/prevents herbicides from reaching hedgerow/enables machinery to manoeuvre without damaging crop/hedgerow; 1
- (c) some weeds provide habitats/niche for (beneficial) insects/animals:
allow (insect) pest predators to survive;
conserve (common) weed plants;
weeds are producers in food chains/food source; 2 max
- (d) decomposers/saprophyte/ bacteria/ fungi /micro organisms;
(organisms) excrete/ produce nitrogenous waste/ e.g.;
bacteria convert to nitrate/nitrifying bacteria;
(increased) nitrates (in soil) taken up/used by plants;
release of phosphate/potassium;
organisms respire and produce carbon dioxide;
used by plants in photosynthesis; 4 max
- Total 9**

Question 7

- (a) shallow roots enable rapid uptake of rainfall (in **X** and/or **Z**);
widespread/shallow roots allow collection of larger volume water/over a larger area/rapid uptake of water (in **Z**);
swollen stem for water storage (in **X**);
deep roots for accessing deep groundwater (in **Y**);
small/ no leaves so little transpiration; 3
- (b) **Z**;
wide spread of roots for rapid water absorption; 2
(accept **X**; if linked to leaves channelling water to roots)
(ignore references to water storage abilities)
(accept other responses if justified)
- (c) split by light/photolysis/in light-dependant reaction;
into oxygen and electrons/H⁺
(reject hydrogen);
electrons replace those lost from chlorophyll/H⁺ used to form NADPH;
NADPH used in light-independent reaction;
oxygen given off/used in respiration; 3 max

- (d) test with Benedict's to show not a reducing sugar;
add acid and neutralise;
heat with Benedict's solution;
brick red/orange precipitate; 4
(if omit initial test with Benedict's max 1 for principle if 2 marks awarded)

Total 12