



ASSESSMENT and  
QUALIFICATIONS  
ALLIANCE

# Mark scheme

# June 2003

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## GCE

## Biology B

### Unit BYB5/W

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**Question 1**

- (a) (i) 63 (kJ m<sup>-2</sup> day<sup>-1</sup>); 1
- (ii)  $\frac{125}{5150} \times (100)$ ; (*principle – divide products by radiation*)  
2.43/2.4%; (*correct answer award 2 marks*) 2
- (b) some light reflected/ not absorbed/refracted (if qualified) back into atmosphere;  
some light misses chloroplasts/chlorophyll;  
only certain wavelengths of light used (in photosynthesis); 2 max
- (c) 20/21 – 27/28 °C;  
greatest difference between photosynthesis and respiration; 2
- Total 7
- 

**Question 2**

- (a) stickleback and dragonfly nymphs; 1
- (b) (i) shape – at least 4 levels – early summer (correct shape) 2<sup>nd</sup> level widest,  
autumn – correct pyramidal shape;  
shows 5 levels – labels producer, primary consumer,  
secondary consumer; 2
- (ii) mass unit per unit volume or unit area/mass, e.g. kg dm<sup>-3</sup> or kg m<sup>-2</sup>; 1
- (d) some energy lost at each stage in the food chain / transfer of energy not 100%  
efficient / lost in respiration;  
only a limited amount of energy is available / each stage less available for next  
stage / little energy left a top of food chain; 2
- Total 6
-

**Question 3**

- |     |      |  |         |
|-----|------|--|---------|
| (a) | (i)  | climax (community);  | 1       |
|     | (ii) | growth of large trees / tall producers;<br>better competitors for light/mineral ions / idea of shading out;<br>reduced range of niches/habitat;<br>fewer/smaller herbaceous plants can grow;   | 2 max   |
| (a) |      | dry/lack of water/saline / doesn't hold water / water drains through;<br><i>plus 2 of:</i><br><u>reduced</u> rate of transpiration / evaporation / diffusion;<br>reduced SA;<br>decrease in water potential gradient / humid air trapped/<br>reducing diffusion / air movement / increase diffusion pathway; | 3 max   |
|     |      |  | Total 6 |
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**Question 4**

- |     |      |  |         |
|-----|------|--|---------|
| (a) | (i)  | 850 years or over;<br>more species/types of plant;<br>greater variety of food sources / more niches / variety of habitats;   | 3       |
|     | (ii) | variety of predators;<br>feed on crop pests/or named pest;   | 2       |
| (b) | (i)  | use of graph to obtain number over 1000 i.e. $9 \times 4 = 36 / \frac{36}{227} \times 100$ ;<br><i>correct answer award 2 marks</i> 15.86/15.9%;   | 2       |
|     | (ii) | reduced competition for named resource e.g. light/nutrients/water, therefore<br>increase in crop growth/reduced fertiliser use/ increased photosynthesis;<br>increased land for growing crops;<br>larger fields/more room, more efficient use of machinery/ease of<br>ploughing/harvesting;<br>removal of harbourer of potential pests, less crop damaged/diseased/eaten;<br>no hedge maintenance, less time wasted / labour intensive/ less money spent/<br>economic advantage; | 2 max   |
|     |      |  | Total 9 |
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**Question 5**

(a)	continuous, range of areas visible / not discrete sizes / many different sizes;	1
(b)	(i) (a measure of) the spread (of variation) about the mean;	1
	(ii) difference is due to factors other than chance; can reject the null hypothesis	1
(c)	pH with meter/indicator; temperature with an electronic thermometer/ probe/ soil thermometer; valid method for moisture (e.g. cobalt chloride or dry to a constant mass); named ion concentration test strip; oxygen concentration measured with a probe;	2 max
	<b>Total</b>	<b>5</b>

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**Question 6**

(a)	have coexisted for several years; reds disappeared before the greys arrived; reds in coniferous woodland, greys in broad-leaved woodland/ different niches / different diet;	2 max
(b)	red squirrel doesn't secrete/produce the enzymes required to hydrolyse/ breakdown/digest acorns; unable to absorb the products of digestion; toxins in the acorns to which they have no resistance; inability to break open acorn/starch grains; acorns lack vital/named nutrient / nutrient needed by red squirrels; energy to digest acorns greater than energy obtained from digested acorns;	2 max
(c)	limited supply of food / competition for food; greys better competitors;	2
	<b>Total</b>	<b>6</b>

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**Question 7**

- (a) secrete/release enzymes/extracellular digestion;  
starch is digested first and cellulose, lignin later / starch is 'easier' to digest;  
different enzymes secreted / different fungi present; 3
- (b) starch/cellulose broken down;  
maltose/glucose produced/source of glucose; 2
- (c) (carbon dioxide) enters/diffuses into plant leaves/ via stomata;  
photosynthesis/fixes;  
glucose produced;  
sucrose;  
actively loaded;  
into phloem/ translocated/mass flow;  
starch produced; 4 max
- (d) some decomposers have enzymes with low optimum pH;  
caused by mutation;  
survive (in peat bogs) to reproduce;  
pass on favourable alleles; 3 max
- Total 12
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**Question 8**

- (a) (*max 2 marks for each consequence of shortage and its effect on growth*)  
reduced/lack of/unable to synthesise protein/amino acids; }  
lack of enzymes for metabolism / named metabolic process; }  
reduced/lack of/unable to synthesise DNA/nucleic acids/organic bases; }  
mitosis/cell division reduced; }  
reduced NADP/ less chlorophyll; }  
reduced photosynthesis; }  
reduced levels / less NAD; }  
reduced respiration; } 4 max
- (b) (i) water potential of soil reduced/more negative/reduced water potential gradient;  
less water moves into roots/water moves out of roots by osmosis; 2
- (ii) nitrate washed/runs off /leached from fields;  
algal bloom / increase in algal growth;  
reduced light to other producers;  
death of algae/producers;  
increase in decomposers/decomposition;  
aerobic respiration/requirement O<sub>2</sub> / increased BOD; 5 max
- (c) uptake by active transport;  
oxidative phosphorylation/electron transport chain stops/slows down /  
glycolysis only occurs;  
Krebs cycle provides reduced NAD/FAD produces ATP;  
less ATP; 3 max
- Total 14
- QWC (See guidance) 1