ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme June 2003

GCE

Biology B

Unit BYB5/W

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Question 1

(a) (i) 63 (kJ m^{-2} day^{-1}); 1

(ii) 125 × (100); (*principle – divide products by radiation*)
5150
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) 2nd 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^{-3} or kg m^{-2}; 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;
better competitors for light/mineral ions / idea of shading out;
reduced range of niches/habitat;
fewer/smaller herbaceous plants can grow; 2 max

(a) dry/lack of water/saline / doesn't hold water / water drains through;
plus 2 of:
reduced rate of transpiration / evaporation / diffusion;
reduced SA;
decrease in water potential gradient / humid air trapped/
reducing diffusion / air movement / increase diffusion pathway; 3 max

Total 6

Question 4

(a) (i) 850 years or over;
more species/types of plant;
greater variety of food sources / more niches / variety of habitats; 3

(ii) variety of predators;
feed on crop pests/or named pest; 2

(b) (i) use of graph to obtain number over 1000 i.e. $9 \times 4 = 36$ / $\frac{36}{227} \times 100$;
correct answer award 2 marks 15.86/15.9%; 2

(ii) reduced competition for named resource e.g. light/nutrients/water, therefore increase in crop growth/reduced fertiliser use/ increased photosynthesis;
increased land for growing crops;
larger fields/more room, more efficient use of machinery/ease of ploughing/harvesting;
removal of harbourer of potential pests, less crop damaged/diseased/eaten;
no hedge maintenance, less time wasted / labour intensive/ less money spent/ economic advantage; 2 max

Total 9

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
		Total	5

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
		Total	6

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/fixed;
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

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; } 4 max
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; }

(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_2 / 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