



## **General Certificate of Education**

# **Biology 6416**

## *Specification B*

**BYB5/W Environment**

# **Mark Scheme**

*2007 examination - January series*

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**Question 1**

- (a) Climax community; 1
- (b) *One method with explanation e.g.*  
Regular grazing / cutting – young shoots eaten / prevents succession;  
Herbicides – kills herbaceous plants;  
Ploughing / burning - destroys seedlings / plants; 1 max
- (c) Rapid process;  
Large number produced;  
Only one plant required;  
No variation linked to advantageous characteristics; 3
- Total 5**

**Question 2**

- (a)  $\text{kJ m}^{-2} \text{yr}^{-1}$ ;  
(all 3 units needed, accept J, any area, any time) 1
- (b) (i) 0.64 / 0.636 (%); 1
- (ii) Heat / respiration; (*Reject respiration uses energy*)  
Movement / muscle contraction;  
Faeces / indigestible material / food not eaten;  
Excretion; 1 max
- (c) (i) Some light reflected / not absorbed / refracted;  
Some light misses chloroplasts / chlorophyll;  
Only certain wavelengths of light used; 1 max
- (ii) Excites electrons from chlorophyll;  
Electrons passes down carriers;  
Energy released during transfer;  
ADP + P forms ATP; 3 max
- Total 7**

**Question 3**

- (a) Decrease in pH linked to decrease in population; 1
- (b) Use of pH meter / indicator / pH probe;  
(*Reject litmus*) 1
- (c) Quadrats;  
Large number / random sampling;  
Calculate the mean; 3

- 
- |     |      |   |       |
|-----|------|---|-------|
| (d) | (i)  | Provides oxygen for (aerobic) respiration;<br>(by) bacteria / microorganisms;   | 2     |
|     | (ii) | Fewer bacteria / decomposers;<br>Acid conditions inhibit enzymes / enzymes denatured;<br>(H <sup>+</sup> ions) affects enzymes active site; | 2 max |

**Total 9****Question 4**

- |     |  |       |
|-----|--|-------|
| (a) | More niches / habitats;<br>Variety of food sources;<br>Different insects at different times of year; | 3     |
| (b) | Predators of pests (of crop plants);<br>Pollination of crops;  | 1 max |
| (c) | <i>One mark for each feature <u>and</u> explanation, e.g.</i>  |       |

Small leaves

Reduced surface area (for water loss);

Thick / waterproof cuticle

Increases diffusion distance;

Inrolling of leaf

Reduces water potential gradient / air movement across stomata / traps air which becomes saturated / moist / humid / reduces surface area;

Sunken stomata

Reduces water potential gradient / air movement across stomata / traps air which becomes saturated / moist / humid / reduces surface area / diffusion distance;

Hairs

Traps air which becomes saturated / moist / humid;

No stomata on upper surface

Reduces surface area for evaporation;

Succulent / swollen stem

Water storage;

Deep / long roots

Absorb water deeper in soil;

Shallower roots

Absorb surface water;

Extensive root system

Large surface area for water absorption;

*(Three features without any valid explanation – allow one mark)*

3 max

- 
- |     |      |  |                 |
|-----|------|--|-----------------|
| (d) | (i)  | (Is the degree) of spread from the mean;   | 1               |
|     | (ii) | Yarrow has a higher <u>mean</u> survival rate / higher survival rate at more sites;<br>Buckwheat has a wider variation in survival rate; | 2               |
|     |      |  | <b>Total 10</b> |

**Question 5**

- |     |  |                |
|-----|--|----------------|
| (a) | Breed (among themselves);<br>To produce fertile offspring;   |                |
|     | <i>OR</i>  |                |
|     | Have same niche;<br>Not shared with any other species;   | 2 max          |
| (b) | High stability with greater number of species / converse;<br>When number of species is high stability levels out;<br>More species linked to more food chains / food web;<br>If one species dies others available as food / converse; | 3 max          |
|     |  | <b>Total 5</b> |

**Question 6**

- |     |  |                |
|-----|--|----------------|
| (a) | Pesticide not biodegradable / broken down;<br><u>Stored</u> in tissues / fat;<br>Animals higher up the food chain eating larger numbers of organisms lower down;               | 2 max          |
| (b) | Acetylcholine is not broken down;<br>Acetylcholine continues to depolarise the membrane / generates action potentials / more impulses disrupting coordination / muscle action; | 2              |
| (c) | $2.35 \text{ mg dm}^{-3} \text{ minute}^{-1}$  | 1              |
| (d) | Higher enzyme concentration / more enzyme and substrate collisions / no time delay for parathion to enter bacterium / time to secrete enzyme;                                  | 1              |
| (e) | Different <u>shaped</u> molecules;<br>Do not fit active sites of enzymes (produced by decomposers);  | 2              |
|     |  | <b>Total 8</b> |
-

**Question 7**

- (a) Low nutrient / ion / mineral content of soil;  
Deforestation removes nutrients;  
Soil erosion more likely; 2 max
- (b) 1. Protein into ammonium compounds;  
2. Deamination;  
3. By saprobionts / decomposers / bacteria / fungi;  
4. Ammonium into nitrite;  
5. Nitrite into nitrate;  
6. By nitrifying bacteria / named example;  
7. Nitrogen fixing forms ammonium compounds; 5 max
- (c) Active transport;  
Uses ATP;  
Against a concentration gradient;  
Reference to carrier proteins; 3 max

**Total 10****Question 8**

- (a) Interspecific competition; 1
- (b) (i) Population declines (as experimental area has higher number than control area / reference to Figure 1); 1
- (ii) Population not affected (as number is similar in both areas / in Figure 2); 1
- (c) Large population decrease / increase for canyon lizard / in Figure 2; 1
- (d) (More) intraspecific competition / high density linked to competition; 1
- (e) 1. Hypothalamus (contains the thermoregulatory centre);  
2. Receptors which respond to temperature changes of blood;  
3. Impulses from receptors in skin;  
4. Nerve impulses transmitted (from hypothalamus);  
5. Vasoconstriction / constriction of arterioles;  
6. Diversion of blood away from surface / to core / appropriate specified organ;  
7. Muscular contraction (shivering) generates heat via respiration;  
8. Raised hairs providing insulation;  
9. Release of thyroxine / adrenaline;  
10. Increase in metabolic rate / respiration;  
11. Correct behavioural response; 6 max

**Total 11****QWC 1**