

# **MARKSCHEME**

**November 2001**

**BIOLOGY**

**Standard Level**

**Paper 2**

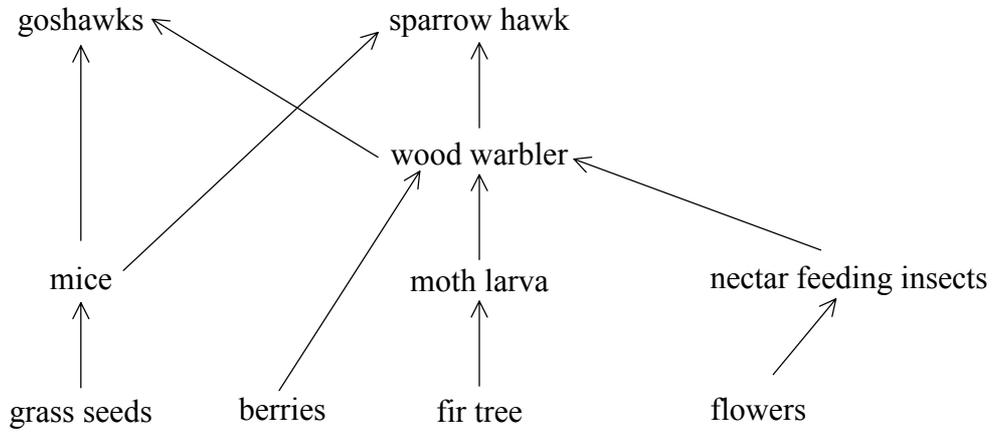
**SECTION A**

1. (a) electrical charge;  
molecular weight; [2]
- (b) two (or more) proteins with some charge / mass could merge to form large spots;  
more than one copy of some proteins could be present in a subunit; [1 max]
- (c) there are more types of proteins in the large subunit;  
proteins in large subunits show greater range in molecular mass; [2 max]
- (d) 441 ( $\pm 6$ );  
147 amino acids ( $\pm 2$ )  $\times$  3 bases per codon; [2]
- (e) more than one base triplet will code for an amino acid / degeneracy; [1]
- (f) (i) thymine  $\rightarrow$  adenine; [1]  
(ii) GUA and GUG [1]
2. (a) protein / histones; [1]
- (b) meiosis; [1]
- (c) (i) 6; [1]  
(ii) haploid because reduction divisions occurs in stage three; [1]  
(iii) plant because of the cell walls / no centrioles / no asters [1]

3. (a) secondary consumer;

[1]

(b) (Award [1] for every three new links, with arrows in the correct direction; [2 max])



[2 max]

(c) the zone / portion of Earth that has life;  
sum of all planet's communities / ecosystems;  
includes life in water, in and on soil, lower atmosphere;

[2 max]

**SECTION B**

*(Remember, up to TWO 'quality of construction' marks per essay)*

4. (a) phospholipid bilayer;  
cholesterol;  
glycoproteins;  
glycolipids  
intrinsic protein / integral protein penetrating whole membrane / both phospholipid layers;  
extrinsic protein / peripheral protein penetrating one / neither phospholipid layer; **[5 max]**
- (b) phospholipid molecule has a polar end / hydrophilic end;  
and a nonpolar / hydrophobic end;  
cell membrane has phospholipid bilayer  
each layer has a polar / hydrophilic side and a nonpolar / hydrophobic side;  
because phospholipid molecules line up in same direction in each layer;  
inside and outside of cell membranes there is a watery fluid;  
polar / hydrophilic sides of bilayer must face inside and outside of membrane;  
to allow water to contact membrane;  
and push on membrane from each side;  
nonpolar / hydrophobic sides face each other in middle of bilayer;  
since hydrophobic sides are attracted to each other;  
the bilayer stays pushed together;  
results in barrier between inside and outside of membrane;  
since water cannot penetrate nonpolar / hydrophobic middle region; **[8 max]**
- (c) *(N.B. for each idea, active transport must be clearly contrasted with passive transport. Do not accept unconnected statements.)*
- energy required for active but not passive transport;  
ATP used in active but not in passive transport;  
active transport involves carriers but passive does not / may involve channels;  
active against concentration gradient but passive down it;  
active transport is selective whereas passive transport is (sometimes) non-selective;  
example of each; **[5 max]**

(Remember, up to TWO 'quality of construction' marks per essay)

5. (a) Lincoln index named;

based on formula where population size =  $\frac{n_1 \times n_2}{n_3}$ ;

- $n_1$  = number of animals originally caught, marked and released;
- $n_2$  = number of animals originally caught in the second sampling;
- $n_3$  = number of animals originally caught in the second sampling which were marked;
- accuracy depends on a bounded population;
- assumes no births, deaths;
- no immigration or emigration;
- enough time must exist between capture and recapture for random mixing;

[5 max]

(b) (N.B. for each idea, exponential growth must be contrasted to the plateau phase.)

	<u>exponential growth phase</u>	<u>plateau phase</u>	
Food supply	unlimited	limited	
living space	unlimited	limited	
disease	none / little	some / much	
birth rate	maximum for species	equalled by death rate	
carrying capacity	not reached	reached	
population growth	fastest rate possible	zero population growth	[5 max]

(c) sexual reproduction produces variation in the genotypes of individual offspring;  
 variation of genotypes can result in variation of phenotypes;  
 populations tend to produce more offspring than the environment can support;  
 causing competition;  
 environments can change at any time;  
 some individuals are adapted because of their phenotypes;  
 will out compete other individuals less favourably adapted;  
 enables greater survival rate for those better adapted;  
 process called natural selection / selective advantage;  
 increased survival can result in reproduction advantage;  
 favouring the advancement of alleles relating to better adapted phenotypes;  
 causes changes in gene pool over time;  
 resulting in evolution of species;

[8 max]

*(Remember, up to TWO 'quality of construction' marks per essay)*

6. (a) alveoli have thin walls / single cell thickness;  
alveolar walls have moist surface area;  
allowing gases to dissolve / escape;  
moist surface contains surfactants which;  
prevent collapse of alveoli by surface tension;  
large numbers of alveoli hence high surface area;  
maximises exchange of gases;  
blood capillaries adjacent; **[5 max]**
- (b) homeostasis is maintaining a steady internal environment in an animal;  
body temperature is detected by thermoreceptors;  
located in the skin;  
located in the hypothalamus;  
a cold body can be warmed (counteracted) by different responses;  
vasoconstriction (of arterioles leading to skin capillaries);  
increased cell metabolism;  
shivering;  
a warm body can be cooled (counteracted) by different responses;  
vasodilation (of arterioles leading to skin capillaries);  
sweating where heat is lost;  
through heat of vaporisation;  
decreased cellular metabolism; **[8 max]**
- (c) exercise can lower blood pH;  
chemosensors / specialised neurones detect change;  
send impulses rapidly;  
to brain / central nervous system;  
information processed in breathing centre;  
impulses then relayed to diaphragm;  
and intercostal muscles;  
via peripheral nerves;  
to increase / decrease rate of breathing;  
under involuntary control; **[5 max]**
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