



# **MARKSCHEME**

**November 1999**

**BIOLOGY**

**Standard Level**

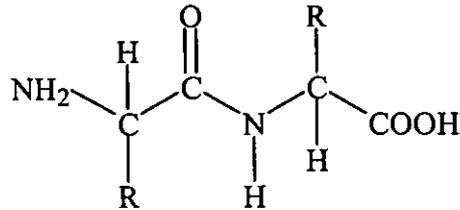
**Paper 2**

**SECTION A**

1. (a) *(Award [1 mark] for the following; up to [2 marks] max)*  
T<sub>b</sub> is higher than T<sub>a</sub>;  
T<sub>b</sub> remains (nearly) constant whereas T<sub>a</sub> falls; [2]
- (b) *(Award [1 mark] for the following; up to [2 marks] max)*  
shivering / chemical reactions in the body / metabolism / respiration / releases heat;  
heat taken in from the surroundings / environment; [2]
- (c) *(Award [1 mark] for the following; up to [1 mark] max)*  
darkness because high body temperature needed for activity;  
darkness because activity generates heat by respiration; [1 max]
- (d) (i) *(Award [1 mark] for the following; up to [2 marks] max)*  
higher heart rate at higher body temperature;  
exponential increase / (more than) doubles for each 10 °C rise; [2]
- (ii) *(Award [1 mark] for the following; up to [1 mark] max)*  
enzymes involved in heart (muscle) contraction work faster at higher temperature;  
higher metabolic rate at higher temperatures so heart must supply more materials; [1 max]
- (e) *(Award [1 mark] for the following; up to [1 mark] max)*  
reduce energy use; [1]
- (f) *(Award [1 mark] for the following; up to [1 mark] max)*  
low external temperatures;  
food shortage; [1 max]
2. (a) (i) *(Award [1 mark] for the following; up to [1 mark] max)*  
ingestion of disease causing organisms;  
presents antigen to B-lymphocytes; [1 max]
- (ii) *(Award [1 mark] for the following; up to [2 marks] max)*  
in the blood;  
in the tissues / at sites of infection / in a named tissue; [2]
- (b) *(Award [1 mark] for the following; up to [2 marks] max)*  
each is specific to / recognises one antigen;  
many different antigens exist; [2]

3. (a) (Award [1 mark] for the following; up to [1 mark] max)  
radical / variable part / part specific to each amino acid; [1]
- (b) (Award [1 mark] for the following; up to [2 marks] max)  
peptide linkage shown correctly; [1]  
remainder of the molecule shown correctly [1]

e.g.



- (c) (Award [1 mark] for the following; up to [2 marks] max)  
ribosomes in both;  
free ribosomes in prokaryotes but ribosomes (often) on the RER in eukaryotes;  
larger ribosomes in eukaryotes than in prokaryotes / 80S versus 70S; [2 max]  
(do not award marks if genuine comparisons are not made)

**SECTION B**

*Remember, up to TWO 'quality of construction' marks for the essay*

4. (a) *(Award [1 mark] for the following; up to [3 marks] max)*  
catalyst;  
biological / made by living organisms / protein;  
**globular protein;** **[3]**
- (b) *(Award [1 mark] for the following; up to [7 marks] max)*  
enzymes show substrate specificity;  
enzyme has an active site;  
active site has a distinctive shape;  
active site has distinctive chemical properties / example of chemical properties;  
substrate's shape fits the active site / vice versa;  
substrate's chemical properties fit the active site / vice versa;  
substrate binds to the active site / enzyme-substrate complex formed;  
other substances do not fit and cannot bind;  
active site is the lock and substrate is the key;  
product does not fit the active site so dissociates;  
diagram showing substrate fitting active site;  
substrate no longer fits if the enzyme is denatured; **[7]**  
*(penalise once if enzyme rather than active site described)*
- (c) *(Award [1 mark] for the following; up to [8 marks] max)*  
*Use the following mark scheme for each of the two examples:*  
name of use;  
source of the enzyme(s);  
chemical reaction catalysed by the enzyme;  
advantage of using the enzyme; **[8]**

*For example:*

*yoghurt making;*

*Lactobacillus makes the enzymes;*

*lactose in milk converted to lactic acid;*

*acidity prevents other microbes from growing in the yoghurt so preserving it;*

**[Quality: 2 marks max]**

*Remember, up to TWO 'quality of construction' marks for the essay*

5. (a) *(Award [1 mark] for the following; up to [3 marks] max)*  
length of chromosome;  
structure of the chromosome / position of the centromere;  
banding;  
chromosomes must be stained to appear banded; [3]
- (b) *(Award [1 mark] for the following; up to [8 marks] max)*  
reduction of number of chromosomes happens in meiosis I;  
cell / nucleus is diploid at start of meiosis;  
two of each chromosome type present;  
chromosomes condense / shorten and thicken;  
chromosomes form pairs;  
paired chromosomes are homologous;  
one chromosome in each pair becomes attached to each pole;  
paired chromosomes are pulled to opposite poles;  
nuclear membranes reform / cell divides;  
cells / nuclei formed are haploid;  
DNA replicated once but cell divides twice; [8]
- (c) *(Award [1 mark] for the following; up to [7 marks] max)*  
Down's Syndrome is caused by having an extra chromosome 21;  
both (homologous) chromosomes go to the same pole (in division 1);  
called non-disjunction;  
frequency increases with mother's / father's / parent's age;  
or both chromosomes / chromatids go to the same pole in division 2;  
both chromosomes attached to the same pole by fibres / microtubules;  
gamete / egg produced with extra chromosome 21;  
or sperm produced with extra chromosome 21;  
fusion with a gamete with one chromosome 21;  
zygote produced with three instead of two chromosome 21;  
trisomy;  
mitosis so every body cell has three of chromosome 21;  
*(Penalise once only if wrong chromosome number stated.)* [7]

[Quality: 2 marks max]

*Remember, up to TWO 'quality of construction' marks for the essay*

6. (a) *(Award [1 mark] for the following; up to [5 marks] max)*  
carbon dioxide;  
from fossil fuel burning;  
CFCs;  
from solvent use / propellants / aerosols;  
nitrogen oxides;  
from fossil fuel burning / vehicle exhausts / fertilisers;  
methane;  
from ruminants / paddy fields / biomass burning / waste dumps; [5]  
*(do not award a mark for a source if the name of the gas has not been given)*
- (b) *(Award [1 mark] for the following; up to [6 marks] max)*  
reduced burning of fossil fuels;  
increased use of other energy sources / example of alternative source of energy;  
reduced use of energy;  
example of how energy use could be reduced;  
reduced burning of forests;  
planting of forests / crops to absorb carbon dioxide;  
eating meat from non-ruminants / vegetarianism; [6]
- (c) *(Award [1 mark] for the following; up to [7 marks] max)*  
graph showing effect of carbon dioxide as limiting factor;  
more photosynthesis with higher carbon dioxide levels;  
increased temperatures therefore faster photosynthesis;  
but increased temperature therefore faster transpiration;  
stomata have to close so (possibly) less carbon dioxide absorbed;  
no effect from carbon dioxide / temperature if light intensity is limiting;  
overall effect on plants is hard to predict;  
more growth of plants (probably);  
more food for first consumers;  
more growth of first consumers;  
and so on for second and third and other consumers;  
length of food chain might increase;  
number of species at each trophic level might increase;  
flooding might destroy food webs in low lying areas; [7]  
*(Award a maximum of 5 marks] if no reference is made to alternative hypotheses  
or uncertainties about the effects)*

[Quality: 2 marks max]

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