



# **MARKSCHEME**

**November 2004**

**BIOLOGY**

**Standard Level**

**Paper 2**

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## General Marking Instructions

### Subject Details:      **Biology SL Paper 2 Markscheme**

#### Mark Allocation

Candidates are required to answer **ALL** questions in Section A total **[30 marks]** and **ONE** question in Section B **[20 marks]**. Maximum total = **[50 marks]**.

#### General

A markscheme often has more specific points worthy of a mark than the total allows. This is intentional. Do not award more than the maximum marks allowed for part of a question.

When deciding upon alternative answers by candidates to those given in the markscheme, consider the following points:

- ◆ Each marking point has a separate line and the end is signified by means of a semicolon (;).
- ◆ An alternative answer or wording is indicated in the markscheme by a “/”; either wording can be accepted.
- ◆ Words in (...) in the markscheme are not necessary to gain the mark.
- ◆ The order of points does not have to be as written (unless stated otherwise).
- ◆ If the candidate’s answer has the same “meaning” or can be clearly interpreted as being the same as that in the mark scheme then award the mark.
- ◆ Mark positively. Give candidates credit for what they have achieved, and for what they have got correct, rather than penalising them for what they have not achieved or what they have got wrong.
- ◆ Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.
- ◆ Occasionally, a part of a question may require a calculation whose answer is required for subsequent parts. If an error is made in the first part then it should be penalized. However, if the incorrect answer is used correctly in subsequent parts then **follow through** marks should be awarded.
- ◆ Units should always be given where appropriate. Omission of units should only be penalized once. Ignore this, if marks for units are already specified in the markscheme.
- ◆ Do not penalize candidates for errors in significant figures, unless it is specifically referred to in the markscheme.

## Section B

### Extended response questions - quality of construction

- ♦ Extended response questions for SL P2 carry a mark total of **[20]**. Of these marks, **[18]** are awarded for content and **[2]** for the quality of construction of the answer.
- ♦ Two aspects are considered:
  - expression of relevant ideas with clarity
  - structure of the answers.
- ♦ **[1]** quality mark is to be awarded when the candidate satisfies **EACH** of the following criteria. Thus **[2]** quality marks are awarded when a candidate satisfies **BOTH** criteria.

#### Clarity of expression:

*The candidate has made a serious and full attempt to answer all parts of the question and the answers are expressed clearly enough to be understood with little or no re-reading.*

#### Structure of answer:

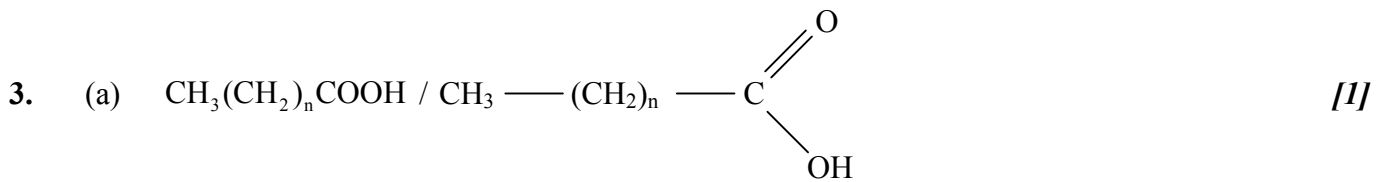
*The candidate has linked relevant ideas to form a logical sequence in at least two parts [(a), (b), etc.] of the question.*

- ♦ It is important to judge this on the overall answer, taking into account the answers to all parts of the question. Although, the part with the largest number of marks is likely to provide the most evidence.
- ♦ Candidates that score very highly on the content marks need not necessarily automatically gain **[2]** marks for the quality of construction (and vice versa).

**SECTION A**

1. (a) bird species: 660;  
tree species: 180; [1]  
*Both needed for [1].*
- (b) both increase in number from north to south / both decrease from south to north;  
tree species and bird species more concentrated in south-west Canada;  
higher total number of bird species than tree species;  
more bird species further north than tree species / more bird species where more tree species;  
similar (angled or tilted) pattern of distribution for birds and trees, west to east;  
both bird and tree species go to zero at northern tip of Canada; [2 max]
- (c) a group of organisms (with same characteristics) that can (interbreed and) produce fertile offspring [1]
- (d) growing season is too short / less sunlight / insufficient (constant) sunlight;  
poor soil conditions;  
temperatures are too low / extremely cold climate;  
water is frozen / too dry;  
layer of permafrost restricts root growth; [2 max]
- (e) (i) *A. menziesii* [1]  
(ii) *P. menziesii* [1]
- (f) (i) 3 [1]  
(ii) 10 [1]
- (g) competition;  
different adaptations / specialization / different needs for moisture / optimal climate;  
*e.g.* fibrous versus tap root / needle leaves versus broad leaves;  
different niches;  
limited resources / nutrient availability; [2 max]

2. (a) genes found on the sex chromosomes / X / Y chromosome [1]  
*Characteristics or traits are unacceptable replacement for genes.*
- (b) parent genotypes ( $X^CY$  and  $X^CX^c$ ) / same genotypes using alternative symbols / four offspring genotypes ( $X^CX^c$ ,  $X^cX^c$ ,  $X^cY$ ,  $X^CY$ );  
 Punnett square showing cross / other acceptable working;  
 all/100 % daughters normal colour vision (phenotype);  
 half/50 % the sons normal and half/50 % are colour blind (phenotype); [3 max]  
*Award [0] for autosomal analysis.*
- (c) law of segregation states that one half of the alleles enter one gamete and the other half enter the other gamete;  
 meiosis reduces the chromosome number by half / diploid to haploid;  
 homologues carrying alleles separate (in anaphase I);  
 end result is four cells, half with one allele/homologue and the other half with the other allele; [3 max]
- (d) plant cells lack centrioles / animals cells have centrioles;  
 plants form a cell plate / new cell wall to divide cells / animal cells from a cleavage furrow; [2]



- (b) condensation;  
 involves the removal of water to join monosaccharides together / equation to show this;  
 catalysed by enzymes;  
 consists of many monosaccharides linked (glycosidic) to make polysaccharide; [2 max]
- (c) as substrate concentration increases enzyme activity increases;  
 at high substrate concentration enzyme reaches maximum activity;  
 active sites saturated;  
 labelled sketch-graph showing above relationship; [3 max]

(d)

| <i>RNA</i>                 | <i>DNA</i>       |
|----------------------------|------------------|
| ribose                     | deoxyribose;     |
| (normally) single stranded | double stranded; |
| uracil                     | thymine;         |
| no double helix            | helix;           |

[3 max]

**N.B.** *Histone proteins are only in eukaryotic DNA not prokayotic.*

**SECTION B**

4. (a) *Award [1] for each of the following structures clearly drawn and labelled correctly in a diagram of a plasma membrane.*  
phospholipid bilayer;  
protein channels / integral (intrinsic) membrane proteins;  
peripheral (extrinsic) proteins associated with the membrane;  
cholesterol embedded in the membrane;  
glycoproteins / receptor proteins on the outside;  
hydrophobic and hydrophilic portions of membrane indicated; *(both needed for [1])* [5 max]
- (b) passive transport requires no energy;  
molecules move down a concentration gradient;  
water moves by osmosis;  
from lower solute concentration to higher solute concentration / high water concentration to low water;  
small uncharged molecules move by diffusion;  
between phospholipid molecules;  
charged molecules move by facilitated diffusion;  
requires a protein channel; [5 max]
- (c) *Responses must include reference to coolant, transport and habitat to receive full marks.*  
*coolant:*  
lots of energy required to heat water / water has a high specific heat capacity / hydrogen bonding of water molecules;  
when water evaporates energy is used;  
cools organism;  
*e.g.* sweating / panting / transpiration;  
*transport:*  
water is polar / universal solvent;  
dissolves many organic / inorganic substances;  
movement of water carries substances around organism;  
*e.g.* blood / phloem / xylem / adhesion / cohesion;  
medium for external transport (*e.g.* gametes);  
*habitat:*  
water is transparent;  
allows light through for photosynthetic organisms;  
organisms live in / on water / surface tension for surface creatures / buoyancy;  
contains dissolved gases;  
fish / aquatic organisms survive under ice at surface; [8 max]

*(Plus up to [2] for quality)*

5. (a) *Award [1] for each of the following structures clearly drawn and labelled correctly in a diagram of a generalized prokaryotic cell.*  
size stated: 1 to 10  $\mu\text{m}$ ;  
cell wall;  
cytoplasm;  
flagella / flagellum;  
mesosome;  
plasma membrane;  
ribosomes;  
nucleoid region / DNA not enclosed in nuclear membrane;  
plasmid;  
pili;  
capsule / slime layer; **[6 max]**  
*Deduct [1] for each eukaryotic feature included, up to [3 max].*
- (b) *To receive full marks, responses must have two answers for each.*  
*skin:*  
lower pH / acid to keep bacteria from growing / chemical barrier;  
fatty acids / waxes antimicrobial;  
physical barrier to prevent entry / dry skin inhibits bacterial growths;  
bacteria on skin / mucous membranes prevent other bacteria from growing;  
antimicrobial / lysozyme in sweat and saliva (mucous membrane) to keep bacterial growth in check;  
  
*mucous membranes:*  
mucous traps bacteria / sticky / mucus slightly acidic *i.e.* vagina ;  
cilia sweep mucous up to be swallowed to kill bacteria;  
contain macrophages / phagocytes; **[4 max]**
- (c) *Responses must include reference to cause, transmission and social implications to receive full marks.*  
*cause:*  
human immunodeficiency virus / HIV / HIV 1 and HIV 2;  
retrovirus / RNA to DNA;  
enters T-helper cells;  
immune system becomes disabled / weakened;  
greater chance for opportunistic infections;  
  
*transmission:*  
sexually transmitted;  
can be transmitted from man to woman / man to man contact / woman to man /  
mother to fetus;  
breast milk / saliva and other body fluids;  
use of dirty needles;  
blood transfusions;  
  
*social implications of AIDS:*  
many orphaned children;  
social stigma / discrimination;  
problems obtaining employment / life insurance;  
impact/costs on health systems of treating people;  
early death reduces number of adults / reduces workforce / reduces family income;  
drug treatment expensive;  
reduces promiscuity / encourages use of condoms; **[8 max]**

*(Plus up to [2] for quality)*



6. (a) *Award [1] for each of the following structures clearly drawn and labelled correctly in a diagram of the heart.*  
left and right ventricle;  
left and right atria;  
atrioventricular valves / bicuspid / mitral and tricuspid valves;  
semilunar valves;  
aorta and vena cava;  
pulmonary artery and pulmonary vein;  
ventricle wall thicker than atria;  
left ventricle wall thicker than right ventricle wall; **[6 max]**  
*Do not award marks for a diagram with only the ventricles **or** atria. However, it is not necessary to show the cordae tendinae.*
- (b) thermoreceptors/sensory input  
hypothalamus acts as a thermostat;  
metabolic rate increases;  
shivering /goose bumps / hairs raising / sweat glands inactive;  
vasoconstriction of skin arterioles;  
blood flow from extremities is reduced / blood flow to internal organs is increased;  
increased activity;  
heat is transferred in blood; **[4 max]**
- (c) draws fresh air / oxygen into the lungs;  
removal / excretion of CO<sub>2</sub>;  
maintains concentration gradient of O<sub>2</sub> / CO<sub>2</sub> / respiratory gases;  
diaphragm contracts;  
(external) intercostal muscles contract;  
increased volume (of thorax / thoracic cavity);  
decreasing air pressure in lungs;  
air rushes in down air pressure gradient;  
converse of the above causes exhalation;  
abdominal muscles contract during active exhalation;  
elastic recoil of lungs helps exhalation; **[8 max]**

*(Plus up to [2] for quality)*

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