



MARKSCHEME

May 2008

BIOLOGY

Standard Level

Paper 2

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

Mark Allocation

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

1. A markscheme often has more marking points than the total allows. This is intentional. Do **not** award more than the maximum marks allowed for part of a question.
2. Each marking point has a separate line and the end is signified by means of a semicolon (;).
3. An alternative answer or wording is indicated in the markscheme by a slash (/) – either wording can be accepted.
4. Words in brackets () in the markscheme are not necessary to gain the mark.
5. Words that are underlined are essential for the mark.
6. The order of marking points does not have to be as in the markscheme, unless stated otherwise.
7. If the candidate's answer has the same "meaning" or can be clearly interpreted as being of equivalent significance, detail and validity as that in the markscheme then award the mark. Where this point is considered to be particularly relevant in a question it is emphasized by writing **OWTTE** (or words to that effect).
8. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.
9. Occasionally, a part of a question may require an answer that is required for subsequent marking points. If an error is made in the first marking point then it should be penalized. However, if the incorrect answer is used correctly in subsequent marking points then **follow through** marks should be awarded. Indicate this with **ECF** (error carried forward).
10. Only consider units at the end of a calculation. Unless directed otherwise in the mark scheme, unit errors should only be penalized once in the paper. Indicate this by writing **-1(U)** at the first point it occurs and **U** on the cover sheet.

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 **within** at least two parts of the **same question** (e.g. within part a and within part b, or within part a and within part c etc. but **not between** part a and part b or between part a and part c etc.).*

- ◆ 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*).
- ◆ The important point is to be consistent in the awarding of the quality points. For **sample scripts for moderation** the reason why quality marks have been awarded should be stated.
- ◆ Indicate the award of quality marks by writing **Q2, Q1** or **Q0** in **red** at the end of the answer.

SECTION A

1. (a) female [1]
- (b) *Laticauda colubrina* / *L. colubrina* / *colubrina* [1]
- (c) females / *L. colubrina* / *Laticauda colubrina* / female *colubrina* [1]
- (d) $25.5(\pm 0.1) - 20.0(\pm 0.1) = 5.5(\pm 0.2)$ (arbitrary units) [1]
Calculation must be shown.
- (e) (i) (slightly) more *L. laticaudata* / less difference at start/5 seconds;
at 40 seconds both species hold on equally;
more *L. colubrina* after 120 seconds / *L. colubrina* better able to cling to the cliff;
difference between species greater at end than beginning; [2 max]
- (ii) *colubrina* are stronger / strong snakes (cling better);
smaller snakes grip crevices/coral better;
L. laticaudata are heavier / vice versa; [2 max]
Accept anatomical features such as shape of snake, type of scales on belly or other reasonable suggestions.
- (f) advantages: [2 max]
higher mass better able to compete for nesting sites / other reproduction points;
better able to compete for food;
females have more resources for reproduction;
(more mass) reduces threat from predator;
greater ability to capture prey;
Award credit for additional reasonable arguments.
- disadvantages: [2 max]
higher mass less able to climb coral cliffs;
therefore inhibits breeding;
slower moving; [3 max]
Award credit for additional reasonable arguments.

2. (a) *resolution*: separate points / focus clearly / greater detail / clarity;
magnification: size of image / view / picture; [2]
- (b) I: membrane / (nuclear) envelope;
II: mitochondrion / mitochondria; [2]
- (c) aerobic respiration;
correct specific reaction / pathway occurring in mitochondria / ATP production; [1 max]
Do not accept “energy production” alone.
- (d) eukaryotic, internal membranes / membrane bound organelles / presence of
mitochondria / double nuclear membrane; [1 max]
3. (a) maximum density at 4°C so allows life beneath the ice;
hydrogen bonding between molecules / cohesion;
solvent for chemicals / reactions;
transparency allows light penetration (into cells / aquatic habitats);
high boiling point / rarely boils in natural habitats;
latent heat allows cooling/evaporation;
high heat capacity (important in maintaining constant temperature);
surface tension allows organisms to move on surface of rivers / lakes / pools; [3 max]
- (b) water;
carbon dioxide;
ATP; [2 max]
- (c) water [1]

4. (a) meiosis;
random fertilization;
half the genetic information comes from each parent;
independent assortment / crossing over; *[2 max]*
- (b) (i) kingdom;
(ii) class;
(iii) order;
(iv) genus; *[2 max]*
Award [2] if all four are correct [1] if three correct and [0] if only two or one correct.
- (c) cells specialize;
all carry the same genetic information;
some genes are expressed/switched on;
other genes are suppressed/switched off/not expressed;
follow a developmental pathway;
position of the cell in the developing organism determines the type of cell it
differentiates into; *[3 max]*

SECTION B

Remember, up to TWO “quality of construction” marks per essay.

5. (a) Award [1] for each feature clearly drawn and correctly labelled.
(phospho)lipid bilayer;
hydrophobic tails and hydrophilic heads;
integral protein;
peripheral protein;
cholesterol; (*any shape different from lipid bilayer representation*)
glycoprotein;
indication of size; [5 max]
- (b) *active transport:*
lower to higher (solute) concentration / against concentration gradient;
uses energy / ATP;
protein pumps/channels;
gives a cell control;
protein pumps transport specific substances;
phagocytosis / pinocytosis;
example of active transport;
- passive transport:*
diffusion;
from high to low concentration;
low to high; (*but must be in context of random movement of particles*)
partial/selective permeability of membrane;
example of simple diffusion;
facilitated diffusion;
protein channels;
example of facilitated diffusion; [8 max]
Award [4 max] for an account that deals with only one of active or passive transport.
- (c) large surface area (to lung);
single cell wall / layer;
moist lining;
dense network of capillaries;
single cell wall to capillary;
short distance (for gases to travel); [5 max]

(Plus up to [2] for quality)

6. (a) *artery*:
narrow lumen;
thick(er) wall;
thick(er) layer of muscle fibres;
layer of collagen / elastin / elastic fibres;
- vein*:
valves;
larger lumen;
thin(ner) wall;
less muscle/elastic fibres;
- capillary*:
single cell wall / endothelium with pores;
very small/narrow lumen; [5 max]
- Award [4 max] if only two types of vessel are discussed and [3 max] if only one type of vessel is discussed.*
Annotated diagrams are acceptable.
- (b) present in the blood;
leave capillaries / go into body tissues;
concentrate at sites of infection;
identify/attracted to pathogens;
(macrophages) present antigens;
response to antibodies;
endocytosis;
lysosomes;
kill/digest pathogen; [5 max]
- (c) (mutation) creates advantageous variation;
fewer die from malaria;
as adapted to environment;
as (sickled) red blood cells do not support malaria protozoan/Plasmodium;
more likely to survive childhood/longer;
increases chance of successful reproduction;
mutation is inheritable;
definition of mutation / mutation is change in the (DNA) base sequence;
definition of natural selection/survival of the fittest;
process represents evolution;
malaria acts as selection pressure;
(sickle cell anaemia) occurs in malarial areas;
heterozygotes are resistant to malaria;
homozygotes die early; [8 max]

(Plus up to [2] for quality)

7. (a) *specificity*:
 (active site works as a) lock and (substrate as a) key;
 (enzyme has) a specific shape;
 active site;
 (substrate has) a specific/complementary shape;
 (active site) fits substrate molecule/part of molecule / enzyme-substrate complex formed;
 activation energy lowered;

substrate concentration:
 lower/medium concentration activity increases;
 directly proportional to concentration of substrate;
 random collisions more frequent;
 activity levels off / plateau;
 high concentration no change in activity;
 as all active sites fully utilised;

[8 max]

Award [6 max] if only specificity or substrate concentration aspects addressed.

- (b) *restriction enzyme*:
 bacteria/*E. coli* has plasmids;
 plasmids/DNA cleaved/cut by enzyme;
 at specific points;
 leaving sticky ends;
 other species DNA cleaved/cut out by enzyme at same base sequence;
 suitable example;

ligase:
 DNA added to plasmid/other DNA;
 spliced to plasmid/other DNA by enzyme;
 at sticky ends;
 recombinant plasmids/DNA inserted into (new) host cells;
 (new) host cells may be cloned;

[6 max]

Award [4 max] if only restriction enzyme or ligase aspects addressed.

(c)

Type / Specific example	Substrate	Product
<i>e.g.</i> amylase / salivary amylase;	starch;	maltose;
<i>e.g.</i> protease / pepsin;	proteins;	polypeptides / short peptide chains;
<i>e.g.</i> lipase / pancreatic lipase;	lipid;	glycerol and fatty acids;

[4 max]

Award [2 max] for all three parts correct for one enzyme and [1 max] for correct enzyme and substrate or enzyme and product.

(Plus up to [2] for quality)