



MARKSCHEME

November 2008

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 [**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. 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.
9. 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.

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.).*

SECTION A

1. (a) no significant change / minor fluctuations / small rise / stays below or up to 3 ng ml^{-1} [1]
Do not accept “increases” without further qualification.
- (b) (increase) of 84% (allow answers in the range of 74% to 103%) [1]
Apply $-1(U)$ if no percentage unit, answer should be consistent with work that must be shown since answer not readily apparent through inspection etc.
- (c) (both) increased concentration of stress hormone;
 both lipid-poor diets caused same maximum effect / 13 ng ml^{-1} to 14 ng ml^{-1} ;
 lipid-poor 200 kJ day^{-1} diet caused immediate increase/slower decrease of stress hormone concentration;
 lipid-poor 300 kJ day^{-1} diet for the first five days was unchanged/almost the same as either of the lipid-rich diets;
 kittiwakes are adapting to lipid-poor diet since (peak) hormone levels fall before end of diet; [3 max]
- (d) lipid-rich diets (provide energy for daily needs and) allow for gain in mass;
 lipid-poor diets may require burning reserves for survival;
 lipid-poor 300 kJ day^{-1} diet is adequate for daily energy needs but not enough to allow significant increase in body mass;
 lipid-poor 200 kJ day^{-1} diet means inadequate energy for daily needs and growth / loss in body mass/starvation; [2 max]
- (e) kittiwakes on a lipid-rich diet always performed better than those on a lipid-poor diet;
 kittiwakes on a lipid-rich diet improved in trial 2 and their performance stayed similar over the other trials / numerical values given;
 kittiwakes on a lipid-poor diet showed no significant improvement;
 data incomplete since percent of white dishes opened is not given;
 kittiwakes on a lipid-rich diet showed retention of learning from trial 3 to trial 4/ after one week of time / learning gain in lipid-poor diet is not significant from trial 3 to trial 4 ; [3 max]
- (f) to test whether the kittiwakes could remember (that brown color means fish) [1]
- (g) changes in climate/water temperature/water currents/water salinity reduce the lipid-rich fish available to adult kittiwakes;
 lipid-poor fish fed to growing chicks impairs their brain development/produces small weak adults;
 when these kittiwakes leave the nest they cannot associate ocean signals with fish/feed effectively;
 their survival is reduced because they do not eat as well/starvation occurs;
 less kittiwakes return to the islands to breed;
 kittiwakes migrate to other areas (away from Pribilof Islands) where lipid-rich fish can be found; [3 max]

2. (a) (i) cell plate/cell wall forming/new [1]
Do not accept "membrane" or "cell wall" by itself.
- (ii) cytokinesis / (late) telophase in plant cell [1]
Do not accept mitosis.
- (b) (i) *both male alleles shown: X^bY ;
both female alleles shown: $X^B X^b$;
 X and Y notation required to show sex-linkage. Accept other letters as superscripts for color blindness, but same alphabetical letter should be used throughout, dominant form should appear as upper case letter and recessive as lower case letter.*
- grid with four completed boxes showing correct progeny; $\left. \begin{array}{l} \textit{use of ECF may} \\ \textit{apply} \end{array} \right\}$ [3]
- (ii) ratio of 1:1:1:1 of female colour blind, normal female, male colour blind, normal male [1]
Apply ECF if correct interpretation of incorrect Punnett square.
3. (a) glycerol and fatty acid;
formation through condensation / breakdown through hydrolysis;
 H_2O gain/loss;
recognition that up to three fatty acids may attach to glycerol;
ester bond; [3 max]
Accept any of the above points if clearly explained in a diagram.
- (b) (interaction between) living organisms/biotic/species/populations/community and their nonliving/abiotic environment [1]
- (c) break down/digest dead organic matter; (*do not accept "feed"*)
unlock/produce inorganic nutrients/soluble compounds/ions;
(inorganic nutrients) assimilated by living organisms / an example of this;
bacteria/fungi/saprotrophs; [2 max]

4. (a) *Accept any two of the following.*
solvent / wide temperature range as liquid / high heat capacity / cohesion between molecules **[1]**
Do not accept “thermal properties” as it is too vague.
- (b) removal of (toxic) metabolic wastes **[1]**
- (c) during inhalation the diaphragm contracts/lowers/flattens;
causing increase in volume of thorax;
during exhalation diaphragm relaxes/moves up/becomes dome-shaped;
causing decrease in volume of thorax; **[2 max]**

SECTION B

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

5. (a) protein pumps/ATPases;
protein channels/porins;
electron carriers;
glycoproteins / light-absorbing proteins;
hormone binding sites;
enzymes; **[4 max]**
- (b) genes contain information/directions for making polypeptides;
genes also contain instructions to make mRNA/tRNA/rRNA;
stored as code/nucleotide/DNA/base/codon sequence;
genetic information is transcribed to mRNA;
mRNA needed to carry coded/genetic message out of nucleus (into cytoplasm);
ribosomes are sites for polypeptide synthesis/translation;
mRNA, tRNA and ribosomes essential for translation;
translation links amino acids to make polypeptide;
genes can be mutated;
mutations can result in synthesis of wrong polypeptide;
universality of genetic code means all organisms show same relationship between
polypeptides and genes;
relationship is evidence for common ancestry/evolution; **[8 max]**
- (c) protein digestion begins in the stomach;
acid environment (denatures proteins);
stomach contains gastric glands;
gastric glands release digestive juices;
juice contains (inactive enzyme) pepsin/protease;
pepsin/protease activated in acid environment (of stomach);
pepsin is a protein-splitting enzyme/catalyzes the hydrolysis of proteins;
hydrolysis breaks large proteins into smaller molecules/shorter polypeptides;
mechanical action of stomach promotes digestive process/mixing/churning; **[6 max]**

(Plus up to [2] for quality)

6. (a) *Award [1] for each structure clearly drawn and correctly labelled.*
nucleus – surrounded by double membrane with pores;
mitochondrion – surrounded by double membrane, inner membrane has infoldings;
rough endoplasmic reticulum – multi-folded membrane with dots/small circles on surface;
smooth endoplasmic reticulum – multi-folded membrane without dots;
golgi apparatus – stacks of flattened membranes with evidence of vesicle formation;
ribosomes – attached to rER and free ribosomes in cytoplasm;
lysosome/centriole;
plasma membrane; [5 max]
Award [0] if a plant cell is drawn. Award [3 max] if any plant cell structure (such as the cell wall) is present.
- (b) reduction division occurs during meiosis;
(sets of replicated) homologous chromosomes pair up (in middle of cell);
each chromosome in homologous pair came from maternal or paternal parent;
maternal and paternal chromosome in each pair is randomly oriented to either side of cell;
(sets of replicated) homologous chromosomes separate / each moves to opposite pole/ side of cell;
cell undergoes first division/meiosis I/cytokinesis;
(sets of replicated) chromosomes separate again;
two cells from first division undergo second division/meiosis II/cytokinesis;
one cell has given rise to four cells;
diploid number/2n becomes haploid number/n;
haploid cell contains only one chromosome from each original homologous pair;
different haploid cells form because of random orientation during meiosis are basis for first variety;
mixture of maternal and paternal chromosomes in any haploid cell is different; [8 max]
Accept any of the above points if clearly explained in a diagram.
- (c) secreted from the ovary/corpus luteum;
promotes development of secondary sexual characteristics;
growth of ovaries/vagina/uterus / enlargement of breasts / pubic and armpit hair / increased fatty deposits in breasts, thighs and buttocks / greater vascularization of skin;
can inhibit (negative feedback)/stimulate (positive feedback) release of FSH;
can stimulate follicle cells to produce FSH receptors;
it can stimulate (positive feedback) LH;
stimulates thickening of endometrium/uterine lining;
estrogen levels decrease if no fertilized embryo is present;
decreased levels of estrogen causes disintegration of endometrium/menstruation occurs; [5 max]

(Plus up to [2] for quality)

7. (a) *Examples must be based on a realistic ecosystem.*

Award [1] for each of the following clearly drawn and correctly labelled.

a chain (*not in a web or pyramid*) which includes the names of four organisms and three linkages in a logical feeding order/sequence; each linkage symbolized by an arrow (→) showing the direction of energy flow; autotroph/producer and consumer labels correctly associated with organism; all three additional consumer labels correctly associated: primary, secondary and tertiary;

[4 max]

- (b) *diagram:*

curve is sigmoid (s-shaped) and labelled with population/size/number on y-axis and time on x-axis; three regions/phases labelled exponential (could include curvature at start), transitional, plateau;

explanation:

exponential region/phase: [2 max]

exponential region is where population is growing very rapidly; natality rate exceeds mortality / immigration rate exceeds emigration; food/space/resources abundant/diseases/predators at minimum/no limiting factors;

transitional region/phase: [2 max]

population growing at a slower rate; natality falling/mortality rising / immigration falling/emigration rising; natality rate still higher than mortality; limitations caused by reduced food/space/resources / more disease/more predation begin to take effect;

plateau region/phase: [2 max]

population size is (more or less) constant / rate of increase is zero; combination of natality and immigration rates balanced by combination of mortality and emigration rates; food/space/resources/diseases/predators are significant limiting factors;

[8 max]

(c) Award [1] for each correctly matched comparison up to [6 max].

<i>skin</i>	<i>mucous membrane</i>
mechanical barrier	mechanical barrier;
thick/tough/strong	thin/soft/weak;
surface cells tend to be dead	surface cells tend to be alive;
defends exposed external areas/outer body surface	defends internal areas/cavities/tubes leading to outside (nose/trachea/vagina/urethra);
contains biochemical defences <i>Accept any reasonable example of a biochemical defence such as secretions by glands.</i>	contains biochemical defences; <i>Accept any reasonable example of a biochemical defence such as secretions by glands.</i>
skin is relatively dry	moist as tears/saliva/mucous can wash away pathogens;
pathogens can penetrate breaks	pathogens can penetrate breaks;
never ciliated	sometimes ciliated;

[6 max]

N.B. A well presented table should be considered when awarding quality marks.

(Plus up to [2] for quality)