M10/4/BIOLO/SP2/ENG/TZ1/XX/M+

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MARKSCHEME

May 2010

BIOLOGY

Standard Level

Paper 2

13 pages

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 <u>underlined</u> 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. Unit errors can only be penalized once in the paper. Place ticks for all correct marking points and use the "**U**" stamp from the annotations at the appropriate place. The unit error (**–1**) mark then shows in the "whole paper" section of the right hand box and the mark is automatically deducted from the whole 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 <u>relevant</u> 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.

  <u>Clarity of expression</u>:
  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.

  <u>Structure of answer:</u>
  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) grey partridge numbers/pairs reduced;
buzzard numbers increased;
sparrowhawk numbers no clear trend/no overall rise or fall/constant/stable/ fluctuates; ***[3]***

(b) (i) negative correlation/inverse proportion/bird of prey density falls as partridge density rises ***[1]***

(ii) partridges eaten by birds of prey;
fewer partridges present where more birds of prey present / more partridges present where fewer birds of prey present;
partridges move to areas with fewer birds of prey;
fewer birds of prey enable growth (by reproduction) of grey partridge population; ***[2 max]***

(c) (i) <u>18</u> %/<u>18</u>.1 % *(18 needed but no penalty if significant figure error)* ***[1]***

(ii) birds of prey attracted from outside to shooting areas because of abundant food (grey and released partridges) / birds of prey living in shooting areas increase in numbers because of abundant food;
non-hunting human involvement (food and shelter) influenced the correlation between the densities;
more grey partridges shot than killed by birds of prey / <u>many</u> grey partridges shot in shooting areas;
correlation <u>not</u> only due to birds of prey eating grey partridges/human involvement;
grey partridges compete with released partridges for food and shelter (decreasing the density of grey partridges); ***[3 max]***

(d) limit/ban shooting of grey partridge;
train shooters to recognize difference between grey partridge and other species of partridge;
protect/restore habitat of grey partridge;
promote captive breeding of grey partridge (for release into ecosystem);
remove birds of prey/foxes depending on laws; ***[1 max]***

2. (a) fructose/ribose/deoxyribose/ribulose/other monosaccharides apart from glucose and galactose ***[1]***

(b) (i) disaccharide ***[1]***

(ii) hydrolysis ***[1]***

(c) it allows people who are lactose intolerant/have difficulty digesting lactose to consume milk (products);
galactose and glucose taste sweeter than lactose reducing need for additional sweetener (in flavoured milk products);
galactose and glucose are more soluble than lactose / gives smoother texture / reduces crystalization in ice cream;
(bacteria) ferment glucose and galactose more rapidly (than lactose) shortening production time (of yogurt/cottage cheese); ***[3 max]***

(d) less denaturation / enzymes last longer at lower temperatures;
lower energy costs / less energy to achieve 5° C compared to 48° C;
reduces bacterial growth / reduces (milk) spoilage;
to form products more slowly / to control rate of reaction; ***[2 max]***

3. (a) I: progesterone;
II: estrogen; ***[2]***

(b) FSH stimulates follicle development;
FSH stimulates estrogen secretion (by the follicle/ovary); ***[2]***

(c) high levels of progesterone/estrogen inhibit FSH production (during pregnancy) ***[1]***

4. (a) plasmid ***[1]***

(b) DNA ligase involved; *(*DNA *required to be consistent with syllabus)*
seals gaps/nicks in DNA (strands);
makes sugar-phosphate bonds; ***[2 max]***

(c) named example of DNA source and organism to which it is transferred;
benefit of the example of gene transfer;
possible harm from the example of gene transfer;

Example:
gene transfer details ***[1 max]***
e.g. Bt gene transferred from bacterium/*Bacillus* to maize
specific benefit ***[1 max]***
e.g. corn borer/insect pest killed by Bt toxin increasing crop production;
e.g. less pesticides/fertilizers/chemicals needed so better for environment;
specific harmful effect ***[1 max]***
e.g. non-target insects may be killed as well;
e.g. risk of cross-pollination may introduce gene to unintended species; ***[3 max]***

Examiners may have to consult resources for legitimate alternative examples.

SECTION B

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

5. (a) two genetically identical nuclei/daughter cells formed during mitosis (so hereditary information in DNA can be passed on);
two copies of each chromosome/DNA molecule/chromatid needed;
helicase unwinds the DNA/double helix;
to allow the strands to be separated;
helicase separates the two (complementary) strands of DNA;
by breaking hydrogen bonds between bases; ***[4 max]***

(b) DNA replication is semi-conservative;
DNA is split into two single/template strands;
nucleotides are assembled on/attached to each single/template strand;
by complementary base pairing;
adenine with thymine and cytosine with guanine / A with T and C with G;
strand newly formed on each template strand is identical to other template strand;
DNA polymerase used; ***[5 max]***
Marks may be awarded for any of the above points if clearly presented in a well-annotated diagram.

(c) sequence of stages is prophase → metaphase → anaphase → telophase;
chromosomes condense/supercoil/become shorter and fatter in prophase;
spindle microtubules grow (from poles to equator) in prophase/metaphase;
nuclear membrane breaks down in prophase/metaphase;
spindle microtubules attach to the centromeres/chromosomes in metaphase;
chromosomes line up at equator in metaphase;
centromeres divide / (paired) chromatids separate / chromosomes separate into two chromatids in metaphase/anaphase;
(sister) chromatids/chromosomes pulled to opposite poles in anaphase;
spindle microtubules disappear in telophase;
nuclear membrane reforms around chromosomes/chromatids in telophase;
chromosomes/chromatids decondense in telophase; ***[9 max]***

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

6. (a) atria collect blood from veins (vena cava/pulmonary);
collect blood while ventricles are contracting;
atria pump blood into ventricles/ensure ventricles are full;
ventricles pump blood into arteries/out of the heart;
ventricles pump blood at high pressure because of their thicker, muscular walls;
mention of heart valves working with atria and ventricles to keep blood moving;
left ventricle pumps blood to systems and right ventricle pumps blood to lungs;
Both left and right ventricles with correct function required for mark to be awarded. ***[4 max]***

(b) thick wall to withstand high blood pressures/avoid bursting/leaks;
many muscle fibres to help pump blood;
many elastic fibres to stretch and pump blood after each heart beat;
narrow lumen to maintain high pressure/because blood flows along rapidly;
thick outer layer of collagen to give strength/prevent aneurism;
no valves as pressure is high enough to prevent backflow;
endothelium/smooth inner lining to reduce friction; ***[5 max]***

(c) one gene determines (ABO) blood groups / one gene for ABO blood groups;
genes have different/alternative forms called alleles;
there are three alleles (I^A, I^B and i) of the gene for (ABO) blood groups;
(ABO) blood groups are an example (of the effect of) multiple alleles (in this instance three alleles can result in four phenotypes);
each individual has two alleles of the gene but only one is passed to offspring;
alleles that are codominant both affect the phenotype in a heterozygote;
(alleles) I^A and I^B are codominant;
(alleles) I^A and I^B are dominant over i / i is recessive to I^A and I^B;
(genotypes) $\underline{I^AI^A \text{ and } I^Ai}$ both give blood group A;
(genotypes) $\underline{I^BI^B \text{ and } I^Bi}$ both give blood group B;
(genotype) $\underline{I^AI^B}$ gives blood group AB;
(genotype) $\underline{ii}$/homozygous $\underline{i}$ gives blood group O;
example of a cross involving ABO blood groups; ***[9 max]***

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

7. (a) *At least one characteristic from each group is needed for maximum credit.*
bryophyta have no roots / only have rhizoids;
bryophyta have simple leaves/stems / only a thallus;
bryophyta produce spores in capsule;
byrophyta are nonvascular;
bryophyte exhibit (pronounced) alternation of generations / a significant gametophyte generation;

filicinophyta have roots, stems and leaves;
filicinophyta (often) have divided/pinnate leaves;
filicinophyta produce spores in sporangia/spores on the undersides of leaves;
filicinophyta exhibit alternation of generations;
filicinophyta have primitive vascular tissue / no true xylem and phloem;

coniferophyta have woody stems;
coniferophyta (often) have narrow leaves/needles/scales;
coniferophyta produce seeds in cones/unenclosed seeds;

angiospermophyta have flowers;
angiospermophyta have ovules in ovaries;
angiospermophyta produce seeds (with hard coats) in fruits; ***[9 max]***

(b) starch is a large molecule;
large molecules/starch cannot be absorbed by the intestine/villi/epithelial cells;
glucose produced by digestion of starch can be absorbed;
starch/glucose is a useful source of energy;
starch is not used in humans;
glucose is stored as glycogen not starch;
starch is not soluble/could not be transported by blood; ***[4 max]***

(c) *In the table below, information from both boxes on same line is needed for 1 mark.*
Differences ***[4 max]****:*

Prokaryotic cells	**Eukaryotic cells**
no nucleus	nucleus;
naked DNA	DNA associated with histone/protein;
loop of DNA	strands of DNA;
no mitochondria	mitochondria;
70S/ smaller ribosomes	80S/ larger ribosomes;
no/few internal membranes / no organelles	internal membranes/organelles/ Golgi/ER/lysosomes;
smaller in size (approx. 1-10μm)	larger in size (approx. 10-100μm);
cell wall (glycoprotein) present	sometimes present/not in animal cells;

Similarities: Award 1 mark for any combination of two different items ***[2 max]****.*
cytoplasm/plasma membrane/contains DNA/contains ribosomes ***[5 max]***

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