INTERNATIONAL BACCALAUREATE
BACCALAURÉAT INTERNATIONAL
BACHILLERATO INTERNACIONAL

MARKSCHEME

May 2001

BIOLOGY

Standard Level

Paper 2

11 pages

Section B

Extended response questions - quality of construction

- Extended response questions for SL P2 carry a mark total of 20. Of these marks, 18 marks are awarded for content and 2 marks for the quality of construction of the answer.

- Two aspects are considered:
  expression of **relevant** ideas with clarity
  structure of the answers.

- **ONE** quality mark is to be awarded when the candidate satisfies **EACH** of the following criteria. Thus **TWO** 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 the two points 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) 700 ± 30 (*do not penalise if arbitrary units not quoted*); ***[1]***

(b) increase in concentration means an increase in speed / rate; ***[1]***
levels off after a certain concentration / rate of increase gradually decreases until level; ***[1]***

(c) similar curve; ***[1]***
lower; ***[1]***

(d) enzyme denatured / lower enzyme activity / lower rate of reaction;
(accept no enzyme activity) ***[1]***

(e) osmoregulation / regulation of the amount of water in blood / regulation of amount of salt in blood / production of urine / lowering of toxic compounds in blood / hormone production; ***[1]***

(f) (i) *(Award **[1]** for any of the following:)*
it is fast;
simple;
disease detected early;
easy to handle;
non-invasive technique;
no need for professional knowledge;
can be used with urine so no need for blood sample; ***[1]***

(ii) *(Award **[1]** for any of the following:)*
enzymes are specific;
urease only breaks down urea;
only ammonia is detected; ***[1]***

2. (a) one apparatus labelled / both apparatuses labelled; ***[1]***

(b) greater magnification / more details can be seen / larger image;
greater resolution or resolving power / can resolve points close together / distinguish more clearly;
ability to separate small objects that are close together;
shows position of organelles more clearly; ***[2 max]***

(c) *(Award **[1]** for each of the following, up to **[2]**:)*
breakdown of large / complex molecules;
into small, (soluble) molecules / diffusible molecules;
small molecules can diffuse across membranes;
lowers activation energy;
increase rate of digestion; ***[2 max]***

3. (a) arrow from CO_2 in atmosphere to C compounds in plants labelled 'photosynthesis';
arrow from C compounds in plants to C compounds in animals labelled 'feeding';
arrow from plants **and** animals to CO_2 in atmosphere labelled 'respiration';
arrow from animals / plants to fossil fuels labelled 'fossilisation';
arrow from fossil fuels to atmosphere labelled 'combustion'; ***[3 max]***

(b) any named carbohydrate, protein, fat or nucleic acid; ***[1]***

(c) *(Award **[1]** for each of the following, up to **[2]**:)*
feed on dead organic remains of plants and animals;
removal of organic refuse by decomposition;
return vital chemical elements from dead bodies to living ones / return elements to environment in inorganic form;
extracellular digestion; ***[2 max]***

SECTION B

4. (a) stain and spread / squash chromosomes on microscope slide;
examine cells carrying out mitosis;
photograph a cell with chromosomes clearly visible / stained / spread;
arrange the chromosome in pairs / sort into chromosome types;
banding of chromosomes helps to distinguish them;
structure of chromosomes helps to distinguish them;

(one of the following is needed for maximum marks)
used for sex determination / XX in females and XY in males;
used to diagnose Down's syndrome / trisomy of chromosome 21;
other example of diagnosis of chromosome mutation *e.g.* Turner's syndrome / Kleinfelter's syndrome / translocation / inversions;
diagnosing chromosome defects; ***[5 max]***

(b) *(accept alternative genotype notation without use of 'i')*
multiple alleles / three alleles / I^A , I^B and i / A, B and O;
dominance of A and B alleles;
O / i / allele for group O is recessive;
codominance of I^A and I^B / alleles for group A and group B / codominance of A and B;
six possible genotypes shown with the blood group of each;
example of a cross / crosses with all four blood groups in the offspring; ***[5 max]***

(c) Law of segregation states 'separation of parental factors such that one factor is present in each gamete';
two alleles of each gene are present;
two chomosomes of each type / two homologous chromosomes are present;

only one allele is passed on in a gamete / to offspring;
meiosis results in a halving of the chromosome number / diploid to haploid;

alleles segregate / separate so are not inherited together;
homologous chromosomes move to opposite poles in meiosis;

each homologous chromosome carries one allele;
segregation of alleles therefore due to separation of homologous chromosomes in meiosis;

diagram showing separation of homologous chromosomes in meiosis;
alleles (*e.g.* H and h) shown on the chromosomes in the diagram;

monohybrid cross shown with alleles in a heterozygote segregating;
two gametes shown with different alleles in the monohybrid cross;

e.g.	parents	Hh	×	Hh
	gametes	H h		H h
	F1 offspring	HH Hh		hH hh

[8 max]

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

5. (a) most light absorbed by chlorophyll;
light absorbed by carotenoids;
light (energy) converted to chemical energy;
red light absorbed well / efficiently;
blue light absorbed well / efficiently;
green light mostly reflected;
sketch of absorption spectrum;
pigments in chloroplasts / thylakoids / photosystems;
electrons excited / raised to higher energy levels;
excited electrons enter electron transport chain;
coupled to photophosphorylation / ATP production;
photolysis of water; ***[5 max]***

(b) little / no photosynthesis in low light intensity;
rate of photosynthesis increases as light intensity rises;
linear increase at moderate light intensities;
smaller increases at higher light intensities;
light saturation / no further increases at highest light intensities;
some other factor becomes limiting (such as CO_2 uptake);
graph with axes correctly labelled and linear increase and plateau phases; ***[5 max]***

(c) (*No details expected*.)
simple equation for photosynthesis / statement of reactants and products of photosynthesis;
measure production of O_2;
measured by counting bubbles;
measuring volume produced;
measure uptake of CO_2;
measured by radioactive CO_2;
measure change in pH (due to gases);
measured using pH indicator / pH meter;
increase in biomass;
dry the plant tissue before finding mass;
measured as mass before and after photosynthesis;
different batches of plants for each mass determination;
colour change of dye / DCPIP (due to transfer of electrons); ***[8]***

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

6. (a) phagocytic leucocytes attack disease-causing organisms / foreign bodies / antigens;
in blood or in body tissues;
leucocyte moves towards pathogen / chemotaxis;
pseudopodia wrap around pathogen / food vacuole formed;
lysosome releases hydrolytic enzymes (into food vacuole / phagosome);
digestion and absorption by leucocyte; ***[4 max]***

(b) chromosomes replicate by duplication / synthesis of DNA in interphases phase;
(metaphase) chromosomes visible in equator;
movement by microtubules / spindle fibres (anaphase);
chromosomes migrate;
nucleus reforms at each pole (telophase);
cell division (cytokinesis);
each daughter has full / diploid set of chromosomes located at each pole;
each daughter cell identical to mother cell / two identical daughter cells / no genetic variation;
B lymphocytes can be produced through mitosis (proliferation); ***[6 max]***

(c) genes are a segment of DNA / chromosomes;
polypeptide is a chain of amino acids;
one gene codes for / carries instructions for making **one** polypeptide;
processes of transcription and translation produce polypeptide chairs;
DNA transcribed to mRNA;
mRNA translated to polypeptide / protein;
genes are needed to make antibodies;
antibody made by combining polypeptides together;
several genes therefore needed;
particular genes switched on to make particular antibody;
polypeptide has an antigen binding site;
antigen binding site is specific to antigen; ***[8 max]***

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