

**MARK SCHEME for the October/November 2010 question paper  
for the guidance of teachers**

**5090 BIOLOGY**

**5090/21**

Paper 2 (Theory), maximum raw mark 80

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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### Section A

- 1 (a) filament correctly labelled;  
sepal correctly labelled;  
(A on either Fig.) [2]
- (b) Any two from: large petals, smell, nectar(y), colour (I pollen);; [2]
- (c) (i) anthers + statement relevant to the process;  
stigma + statement relevant to the process;  
ripen at different times;  
(therefore) no transfer of pollen within the flower; [max. 4]
- (ii) insect / bee lands (sits / flower);  
reaches for / to get the nectar;  
hits stamens / anthers;  
pollen onto its back AW / carries pollen / ref. flower of same species;  
hits style / stigma;  
stigma collects pollen from bee's back;  
correct ref. older / younger flowers / ref. cross pollination / to other flower; [max. 5]
- [Total: 13]
- 2 (a) water; [1]
- (b) cell walls / cellulose / undigested grass; [1]
- (c) protein (A in how it is converted);  
decomposition AW (A digests);  
by bacteria / fungi / saprotrophs (or named);  
to amino acids;  
to ammonia/um (salts);  
nitrites ;  
nitrification ; [7]
- (d) larger range of / more ions AW / more water;  
urea / nitrogenous – or named;  
easier / quicker to convert to nitrate AW; [max. 2]
- [Total: 11]

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3 (a) C – oesophagus / gullet;  
D – rectum; [2]

(b) (i) line to duodenum beyond entrance of pancreatic duct;  
(and before the point at which it crosses the colon) [1]

(ii) lipase / enzyme for fat digestion;  
not present until then / not present + in mouth / stomach;  
released from pancreas / duodenal walls / in intestinal juice;  
bile (salts);  
released from gall bladder / bile duct / liver;  
ref. correct pH / emulsification AW; [max. 4]

(c) wall protected by mucus;  
wall (or stomach) made of protein;  
protease / enzyme digests stomach wall ;  
acid in contact with wall; [max. 2]

[Total: 9]

4 (a) incomplete / codominance; [1]

(b) child 6;  
ref. to the group O parent unable to supply the  $I^A$  allele / there is no  $I^A$  in either parent  
AW; [2]

(c)  $I^B I^O$  ×  $I^B I^O$ ;  
 $I^B, I^O,$   $I^B, I^O$ ;  
 $I^B I^B$   $I^B I^O$   $I^O I^O$ ;  
group B group O; [4]  
(failure to use prefix I, penalise first mark only. Allow gametes and genotypes of  
children if correct for wrong parents)

[Total: 7]

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- 5 (a) 15 cm<sup>3</sup> per hour; [1]
- (b) (i) root hair (cells); [1]  
guard cells (Ignore mesophyll) (R stomatal cells); [1]
- (c) (i) any 3 from: solvent, transport medium, turgidity AW,  
medium for enzyme action AW, hydrolysis / reactant AW,  
elongation (R growth unqualified);; [3]
- (ii) (in either order) photosynthesis;  
cooling / transpiration / any from (i) not mentioned; [2]
- (d) loss of turgor AW;  
wilting;  
closing of stomata;  
more transpiration / water loss than uptake / ref. overheating; [max. 2]

[Total: 10]

[Total for Section A: 50]

### Section B

- 6 (a) made of DNA;  
carries genes;  
responsible for characteristics AW (A traits / enzymes);  
(A named character or condition – e.g. eye colour / Down's syndrome)  
passed from one generation to the next AW ;  
during reproduction / ref. fertilisation;  
correct ref. to chromosomes during cell (nuclear) division ;  
sexual + variation / asexual + no variation; [max. 5]
- (b) each person has unique set of genes AW;  
genes make proteins;  
therefore proteins different in different people;  
relatives share genes / have common genes;  
relatives have similar proteins;  
relatives have similar tissues;  
blood groups / types must be the same;  
white blood cells / lymphocytes;  
make antibodies;  
against foreign protein / antigens;  
greater chance of rejection AW if not related / less chance if related; [max. 5]

[Total: 10]

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7 (a) receptor or correct e.g.;  
 (converts) stimulus;  
 to impulse / electric pulse;  
 sensory + neurone / nerve fibre or cell;  
 synapse;  
 CNS / spinal cord (R brain);  
 (N.b. If brain directs the response i.e. any idea of a decision being made – stop marking)  
 relay neurone;  
 motor neurone;  
 flexor or named muscle;  
 effector;

[max. 7]

(b) adrenaline;  
 in blood to heart;  
 defence mechanism / fright / prepare for action – or described;  
 (e.g. muscular action)  
 faster circulation of blood / faster delivery of O<sub>2</sub> or glucose;

[max. 3]

**[Total: 10]**

8E (a) Photosynthesis is a process requires several (factors) AW;  
 the one in the shortest supply;  
 controls the rate at which the process occurs;  
 even though others are plentiful;  
 2 marks for three factors mentioned (CO<sub>2</sub>, water, light, temp.); (one for two mentioned)  
 (Accept points on an annotated graph / equation);

[max. 5]

(b) (in the dark) from atmosphere / environment;  
 by diffusion (anywhere);  
 through intercellular spaces / stomata / mesophyll ;  
 (in the light) from photosynthesis;  
 in cell / chloroplasts;  
 ref. leaves / stems;  
 (at all times) from the soil;  
 via the roots;

[max. 5]

**[Total: 10]**

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**80 (a)** a unit of life;  
 can undergo / are formed by division;  
 means of transferring genetic information;  
 often incapable of independent existence;  
 can be modified to do many different jobs / e.g. of two different cells;  
 nucleus + cytoplasm + membrane;  
 ref. to their significance in any metabolic process; [max. 3]  
 (R just a list of metabolic processes)

**(b)** muscle tissue;  
 in artery walls;  
 to maintain blood pressure;  
 continual contraction in heart / pumping / beating;  
 to keep blood moving AW;  
 nerve / nervous tissue;  
 in heart to control rate (or any correct ref.);  
 blood as a tissue;  
 transport medium / any e.g. of transportation;  
 epithelial tissue AW;  
 to reduce damage to b.v. walls;  
 any two *organs identified* (heart, artery / vein / or named);;  
 blood vessel are tubes for blood; [max. 7]

**[Total: 10]**

**[Total for Section B = 30]**