

**MARK SCHEME for the May/June 2011 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.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

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Section A

- 1 (a) small plant/alga/phytoplankton;
- (b) 20; [1]
- (c) small plants/animals absorb/contain mercury;  
eaten by small fish  
(Only mark available if no ref to mercury in the answer);  
(mercury) passes from small fish to large fish;  
each time many organisms eaten/higher organism gets large dose/intensifies,  
increases;  
is not excreted;  
cannot be broken down [\* or in (d)];  
stored in body AW; [max 5]
- (d) fish form diet of fishermen;  
concentration of mercury would be even higher in fishermen AW;  
mercury poisonous/harmful/toxic AW R affects;  
mercury affects nervous system/brain;  
cannot be broken down [\* or in (c)]; [max 2]
- [Total: 9]
- 2 (a) moves towards plant/upwards;  
as water is used for photosynthesis;  
lost during transpiration/evaporation from leaves;  
ref. transpiration pull; [max 3]
- (b) (i) over period of time/gradually;  
(bubble) slows down;  
(might) stop; [max 2]
- (ii) vapour builds up around/stays close to leaf;  
cover prevents air current/wind reaching leaf;  
increased humidity;  
slower rate of water loss/transpiration/evaporation;  
diffusion gradient less steep AW;  
photosynthesis stops;  
stomata close;  
less water used by shoot; [max 6]
- [Total: 11]
- 3 (a) fertilisation;  
oviduct / Fallopian tube; [2]
- (b) mitosis; [1]

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(c) any 2 *genetic* similarities  
(e.g. sex/eye colour/blood groups/shape of ears/nose etc.)/same genes\* once only/  
R look alike/same age/same chromosomes;;  
characters caused by genes only;  
have both inherited identical/same genes\* once only;  
they both arise from the same zygote/one sperm + one egg; [max 4]

(d) any two *environmentally affected* characters (e.g. size/weight/hair colour)  
R different traits unqualified/intelligence;;  
ref. to environment/genes only partly responsible;  
named relevant environmental factor e.g. amount of sun light/lack of food etc.; [4]

[Total: 11]

4 (a) (i) pollination; [1]

(ii) insect (or named);

any two from: large petals/stigma not feathery/stigma protected/  
large or rough pollen grains  
(If self pollination – no marks);; [3]  
(If 'wind' given for (ii) – no mark, but allow 'no nectary' for *one* mark)  
(If cross pollination/pollen transferred from anther to stigma given for (ii)  
allow two reason marks A no anthers for a valid reason )

(b) pollen tube drawn down style and entering ovule;  
through micropyle;  
(female) nucleus drawn and labelled in ovule/embryo sac;  
(male) nucleus shown in bottom half of pollen tube and labelled;  
female and male nucleus identified correctly; [max 3]

(c) D, E, G (and H) – 3 for 2 marks, 2 for 1 mark;;  
F;  
I; [4]

[Total: 11]

5 (a) K – ileum/jejunum R small intestine;  
L – colon/large intestine; [2]

(b) digestion or enzyme activity stops/amylase doesn't work;  
pH incorrect/too acidic;  
no suitable amylase produced;  
in the stomach; [4]

(c) no starch;  
all digested/only water absorption in colon; [2]

[Total: 8]

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Section B

6 (a) hepatic artery;  
carries oxygen;  
hormones/insulin/adrenalin;  
hepatic portal vein;  
from gut/villi/small intestine;  
glucose (A with ref to artery) R refs glucose – glycogen;  
amino acids (A with ref to artery);  
hepatic vein;  
removes carbon dioxide;  
urea;  
any named other product of the liver; [max 8]

(b) thin walls/one cell thick;  
allow diffusion;  
short distance (to diffuse)/close to cells;  
of urea/salts etc. into kidneys;  
of carbon dioxide into alveoli/lungs;  
oxygen to excretory tissues; [max 2]

[Total: 10]

7 (a) carbon dioxide A on equation;  
combines with water A on equation;  
during photosynthesis;  
to make named carbohydrate/protein;  
eaten by/passed to consumers/animals;  
  
respiration;  
in any 2 *named* groups of different types of organism;  
releases carbon dioxide A with ref to combustion;  
leaves decomposed/decay/ refs to methane/fossil fuels  
A refs to decomposition in animals/faeces etc if phs mark scored; [max 7]

(b) another named requirement (CO<sub>2</sub>/temperature);  
in short supply AW;  
use of syllabus term limiting factor; [3]

[Total: 10]

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Section C

8 (a) selectively permeable AW;  
osmosis/diffusion;  
active transport;  
against conc. gradient;  
uses energy;  
only required substances enter/controls passage of substances;  
manufactured substances exported A named examples;  
holds/forms boundary for cytoplasm; [max 5]

(b) water enters;  
osmosis/diffusion;  
ref. concentration gradient/more concentrated cell sap;  
pressure within cell/turgor;  
cell wall tough/flexible/made of cellulose;  
prevents cell bursting/membrane tearing;  
supplies support to plant/stem/leaves;  
gives shape/rigidity/support to cell; [max 5]

[Total: 10]

9 (a) impulses anywhere;  
Accept specific examples for next 6 mps  
(sensory) from sense organ/receptor;  
to CNS/spinal cord/brain;  
(relay) within CNS;  
connecting sensory to motor neurones;  
(motor) from CNS/spinal cord/brain;  
to effector/muscle/gland; [max 5]

(b) sound + stimulus;  
ears AW;  
one correct reference to a neurone;  
brain;  
gland/adrenal/suprarenal;  
adrenaline/epinephrine;  
blood;  
heart muscles;  
ref. fight/flight/fright etc. response – or described; [max 5]

[Total: 10]