UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2011 question paper for the guidance of teachers

5090 BIOLOGY

5090/22 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.

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International Examinations

Abbreviations

Mark schemes will use these abbreviations:

;	separates marking points
/	alternatives for the same making point
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	accept Alternative Wording (where responses vary more than usual)
underline	actual word given must be used by candidate (grammatical variants derived from the same stem are excepted – e.g. excretion and excretory)
max	indicates the maximum number of marks that can be given
+	statements on both sides of the + are needed for that mark

Section A

1 **(a)** nucleus;
chloroplasts;
(cell) membrane; [3]

(b) vacuole / ribosomes / starch grains / mitochondria / tonoplast; [1]

(c) water leaves;
by osmosis / diffusion;
ref. water potential (A any ref. to differential in concentration);
cell / cytoplasm / protoplasm / model shrinks (R ref. vacuole);
ref. decreased pressure / turgidity / firmness / flaccidity;
tubing pulls away from permeable membrane OR cytoplasm or cell membrane pulls away from (cell) wall;
ref. plasmolysis;
no sugar leaves cell / enters space between tubing and permeable membrane OR between cell membrane and wall; [max 6]

[Total: 10]

2 **(a)** DNA; [1]

(b) **(i)** meiosis (R if a 't' appears in the word) / reduction division; [1]

(ii) 23; [1]

(c) female;
2 similar sex, 23rd or final (pair) / 2 X / no Y / only X [chromosome(s)]; [2]

(d) Down's syndrome / polysomy;
1 extra (chromosome) / 47 (chromosomes) / 3 / trisomy;
ref. chromosome no. 21; [3]

(e) chromosomes / genes (R mention of alleles);
do not match / pair / are different / different number of;
unable to produce gametes / meiosis not possible; [max 2]

[Total: 10]

3 **(a)** **(i)** **H**, **E**, **I** (or **I**, **E**), **A**, **F**, **C** all correct = 2, 3 in correct consecutive sequence =1 (Ignore any other '**E**'s);; [2]

(ii) **A**, **E**, **J**, **F**, **G**, **B** (Ignore any other **E**'s); [1]

(iii) **H**, **E**, **I** (or **I**, **E**), **A**, **F**, **C**, **D**, **G** (**B**) (4 in correct consecutive sequence = 1) (Ignore any other '**E**'s) (which can include the final **B**);; [2]

(b) reflex / involuntary / unintentional (R *spinal* reflex);
voluntary / deliberate / intentional; [2]

(c) faster / fast v. slow;
electrical / impulses v. chemical / blood;
neurones v. blood / chemical;
(R nerves)
muscles v. glands / organs;
temporary AW v. more lasting AW;
sometimes deliberate AW v. less controlled AW;
specific organs v more general effect; [max 3]

[Total: 10]

4 **(a)** **K** – ovary (wall);
L – style;
M – filament; [3]

(b) (any TWO from) sepals / calyx, petals / corolla, nectaries;; [2]

(c) **X** to / in / on stigma; [1]

(d) **(i)** insect [If 'wind', 0 marks, but see **(ii)** for the **one** possible ecf mark]; [1]
[If 'cross', Ignore, but continue to mark **(ii)**]
[R 'self' – NO marks then available in **(ii)**]

(ii) (in any order) 2 from: nectar(y) or nectar guides or honey guides / scent / colour / large petals / large or sticky pollen grains ;; [2]
(E.C.F. – if wind pollinated in **(i)**, allow ref. to small petals / dull; 1)

[Total: 9]

5 **(a)** peristalsis; [1]

(b) fat / oil / lipid / fatty acid; [1]

(c) **(i)** bile;
emulsification AW;
ref. lipase;
digestion / hydrolysis / breakdown of fats;
from pancreas / duodenum wall / intestinal juice AW; [max 3]

(ii) absorption / pass through / diffuse into;
lacteals / lymph vessels or capillaries / lymph;
villi; [max 2]

(d) (i) absorbed by capillaries / blood; [1]

(ii) change in pH;
ref. bile / pancreatic salts;
protease (or named) (R 'pepsin');
digestion or breakdown of protein / (poly)peptides / peptones; [max 3]

[Total: 11]

Section B

6 (a) in palisade*;
spongy*;
(*or for ONE mark, mesophyll)
none in epidermis / transparent epidermis;
near leaf surface / (sun)light / to absorb more or most sunlight (A exposed to);
chloroplasts able to move within cell to be nearer to leaf surface AW;
rapid AW rate of photosynthesis (A with ref. either distribution or number);
guard cells;
controlling stomata; [max 4]

(b) allow *CO_2 in (to leaf) (R cells);
*O_2 out;
(*Allow ONE mark only for ref. gas exchange)
for photosynthesis / to make CHOs;
allow water vapour out / transpiration;
to bring water / salts to leaves / cool leaf / plant; [max 3]

(c) in centre of root;
round outer part of / in a circle in stems;
ref. distribution in leaves (depending on mono /dicot);
xylem + strengthened / lignified;
support AW / resist bending ;
resists pulling in root / anchorage / reduces compression; [max 3]

[Total: 10]

7 (a) valves;
prevent backflow;
muscular + contraction;
ventricles + thick walls / thick muscles / powerful contraction (A if there is ref. only to left ventricle);
pump / push / squeeze;
(creates) pressure in blood system;
never tires or suffers from cramp / rhythmic; [max 4]

(b) always carrying blood away from heart / under pressure;
thick walled;
muscular;
narrow lumen AW;
allows recoil / maintains pulse beat (A elasticity);
link to capillaries / veins; [max 3]

(c) return to heart / low pressure / large lumen;
have valves;
at intervals along their length;
prevent backflow;
thin-walled;
allows (skeletal) muscular contraction to 'knead' the blood AW (R ref. to muscular walls); [max 3]

[Total: 10]

Section C

8 **(a)** (Accept reverse argument or mix and match answers. A points on equations – identified – either words or symbols – correctly balanced)
lactic acid / $CH_3CHOHCOOH$ produced;
no alcohol / ethanol / C_2H_5OH produced;
no carbon dioxide / CO_2 produced; [max 3]

(b) produce mucus;
to trap dust;
and bacteria / pathogens (R germs);
cilia;
to move mucus + up AW;
moisten air / warm air; [max 3]

(c) cilia paralysed / destroyed / killed AW;
airways blocked with mucus / mucus builds up / excess mucus produced (A mucus not removed);
narrower airways / breathing difficulty / breathlessness;
(smoker's) cough;
pathogens not removed / enter lungs / bacteria proliferate;
tendency to infection / disease or named caused by pathogen;
lung / tracheal cancer / emphysema;
ref. to the effect of decreased oxygen uptake; [max 4]

[Total: 10]

9 **(a)** from sun / light + plants / producers;
(used for) <u>photosynthesis</u>;
to make *carbohydrates (or named);
*containing chemical energy;
*eaten by consumers / herbivore / carnivore / animals or correctly named;
decay / decomposers or named;
ref. non-cyclical / lost in metabolic processes AW (A respiration) (A ref. to ATP); [max 4]
(* These marks available for those who interpret the question with ref. to food flowing through the gut.)

(b) **(i)** respiration;
breaks down carbohydrates (or named);
releases energy (**only if linked** to CHO breakdown or respiration) (A liberates AW, R makes / produces); [max 2]
(R equation alone)

(ii) for growth / repair / cell division;
manufacturing other molecules / chemical substances / ref. anabolic reactions AW (A reasonable ref. to enzyme action, R metabolic reactions);
nervous impulses;
movement / locomotion / muscle contraction;
maintaining body temperature / keeping warm;
active transport / uptake AW; [max 4]

[Total: 10]