UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the May/June 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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Section A

1 **(a)** (Accept plurals or singulars) *(Mark each part of **(a)** and **(b)** separately)*
A – fungus / mould / *Mucor*;
B – virus;
C – bacterium / *Bacillus* (or named); [3]

(b) **(i)** ACB or named ; [1]

(ii) (in either order) A / fungus, C / bacterium;; [2]

(c) N – strand in the bacterium;
P – coat of virus (A either outer coat or inner chain); [2]

(d) C / bacterium or named;
gene;
inserted into bacterial DNA / plasmid / genome / chromosome; [3]

[Total: 11]

2 **(a)** CHO + for energy / respiration;
low fat + avoidance of obesity / vascular disease AW;
no cholesterol + avoidance of vascular disease AW;
vitamin C + wound healing / avoidance of scurvy or described;
contains fibre + effective digestive transit AW;
calcium + for bones / teeth;
iron + for blood / RBCs / haemoglobin;
protein + for growth / repair / enzymes; [max. 4]

(b) not enough protein + for growth / repair or described;
not enough calcium + for bone / tooth development;
(A lacks)
not enough iron + for blood / haemoglobin / RBCs; [3]

(c) (banana) carbohydrate (or named) + energy / respiration;
instant / more readily available / more quickly changed or digested;
(A quick)

glucose (any ref to its presence anywhere or to its production);
(could score with first marking point – for 2 marks)

avocado + high(er) in energy;

fat takes longer to be converted to glucose AW / less readily available; [max. 3]

[Total: 10]

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3 (a) (i) herbivore / named herbivore / consumer / omnivore; [1]

(ii) chemical (energy); [1]

(iii) 2 (%); [1]

(b) respiration; [1]

(c) (i) respiration;

bacteria / fungi / decomposers (N.B. look for idea of organism);
(R the process)
organic or dead matter / organic molecules or named;

energy released + when broken down / decomposed (A acted on by decomposers) / decayed AW / when fossil fuel burnt; [max. 3]

(ii) makes soil warmer / heat released;
for germination;
increases AW rate of enzyme action;
faster AW growth (of radical / plumule); [max. 2]
(R 'for' growth / helps growth)
(R any reference to a seedling / plant)

[Total: 9]

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4 **(a)** either cell or tonoplast membrane labelled (line must end on membrane); [1]

(b) (treated) water enters* (* = or below);
<u>osmosis</u> / <u>diffusion</u> *;
cell swells * ;
bursts [N.B. This mark stands alone and is NOT included in the 4 max. for part **(b)**] ; [1]
(untreated) water enters *;
<u>osmosis</u> / <u>diffusion</u> *;
cell pressure increases / becomes turgid AW;
cell swells * ;
cell wall + withstands pressure / prevents it from bursting AW; [max. 4]

(c) **(i)** <u>mitosis</u>; [1]

(ii) *(Reject any answers relating to fungi or bacteria)*

many plants / greater profit / economic benefit / cheap;
(A higher / greater yield)
identical / clone (R similar, A same);

of known / desired characteristic;

grown under controlled conditions;

greater certainty; [max. 3]
(Ignore references to single parent required)

[Total: 10]

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5 **(a)** 2.5 – 4 + minutes for pulse (A any within range);
3 – 4 + minutes for breathing (A anything within range); [2]

(b) muscles;

For the remaining marks in this part, there must be the use somewhere of a word that indicates enhancement of at least one of the factors (i.e. more / greater, faster etc.).
Thus, for example, 'more oxygen' scores, and so, then, would any ref. to CO_2 removal or energy, even if 'more' is not repeated.

more / faster blood;
more oxygen / glucose;
ref. more CO_2 removed / lactic acid;
more energy (R produced, made, manufactured, etc.); [max. 4]

(c) *(If they do not indicate which student they are talking about, mark up to **2** max.)*

*student F is fitter / exercises regularly AW;

*more efficient muscles / better breakdown of lactic acid;

*more efficient circulation / no or limited cholesterol in blood vessels;

*more efficient lungs / respiratory system;

*exercised less vigorously;

*more haemoglobin / more RBCs;
(*A reverse arguments for Student E)

student E was a smoker, F was not;

student E was obese / overweight AW (R large mass);

emphysema;

suffered from asthma / bronchitis / heart problems / lung infection AW; [max. 4]

[Total: 10]

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Section B

6 (a) (i) loss of water;
as vapour / evaporation;
from leaves / aerial parts of a plant / to the atmosphere;
through stomata (A between or through guard cells); [max. 3]

(ii) brings nitrates;
dissolved in water;
from soil / to combine with carbohydrates; [max. 2]

(b) dye diffuses (R ref. to osmosis);
through permeable (R semi- / partially- / selectively-);
(Ignore refs. to cell membrane)
(cell) wall;

of root (hair) cells;

xylem (any correct ref.);

ref. to travelling upwards (A refs. to transpiration pull / stream capillarity / root pressure AW);
[max. 5]

[Total: 10]

7 (a) excretion (A excretory);
removal of urea ;
salts / ref. osmoregulation / varying amounts of water;
toxins / poisons / hormones (R harmful);
filtration of / removal from + blood / plasma;
forming urine; [max. 4]

(b) ref dialysis;
blood along a partially permeable tube;
washing / bathing fluid (dialysis fluid could score 2 marks);
ref controlled contents of bathing fluid (i.e. concentrations as required in blood)
(Look for more than just a ref. to urea.);
diffusion (any correct ref.);
keeps blood at constant osmotic potential;
washing fluid changed;
temperature regulation;
urea removed;
blood from and to patient ;
kidney transplants / donation;
bubble trap / adding anticoagulants / counter flow / large surface area / pump ; [max. 6]
(A coiled tube)

[Total: 10]

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Section C

8 (a) externally administered or taken;
chemical / substance;
modifies or affects / alters;
metabolism / chemical reactions in the body; [max. 3]

(b) Apply a maximum of 3 marks if drug is un-named
*named drug;
*positive effect on person (i.e. reason for taking it);
tolerance / increased dosage for same effect;
dependence / addiction;
withdrawal symptoms;
crime (e.g. drink driving);
funding the habit / financial implications;
effects on addict's family / *society;
*adverse effects on health of addict from drug or means of taking it; [max. 7]
(R death)
(* These marks are available for answers relating to the misuse of antibiotics.)

[Total: 10]

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9 **(a)** ova / female gametes / eggs + carry X **;
sperms / male gametes + carry either X or Y**;
(** reject if the term alleles / genes is used)

in equal numbers;

(thus equal chances) of XX + girl or XY + boy; [max. 3]
(Punnett Square or genetic diagrams cannot score without explanation)

(b) (They are supposed to know AB blood group – but A any other e.g.)
N.B. There is a mark for each of the terms 'parents', 'gametes' and 'offspring' in the genetic diagram below.

parents / P; $I^AI^B \times I^AI^B$ (no I – penalise once only);
(A mother, father / male, female)

gametes / G; $I^A \quad I^B \quad I^A \quad I^B$;

offspring; $I^AI^A \quad I^AI^B \quad I^AI^B \quad I^BI^B$;
(A F_1 / children)

ratios / numbers of genotypes stated;

ratios / numbers of phenotypes stated;

phenotypes linked with genotypes; [max. 7]

N.B. Award marks up to a Max. 4 if
(i) both parents have at least one codominant allele in their genotypes e.g. I^AI^A or I^BI^o

(ii) if the answer is solely in text with no diagram.

[Total: 10]

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