

**MARK SCHEME for the May/June 2012 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.

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Section A

- 1 (a) (i) photosynthesis;
- (ii) starch stays inside cell / glucose can move R glucose used up;
 does not lower water potential inside cell;
 prevents water gain by cells;
 correct ref. osmosis / diffusion; [2]
- (b) correct ref. active site;
- substrate;
 perfect fit / complementary shape / specificity;
 products / named suitable product / small molecules;
 products leave + active site / enzyme re-useable / unchanged; [3]
- (c) respiration;
root (cells / hairs);
 increased uptake of ions;
 by active transport;
 ref. energy requirement of active transport;
 (increased) chlorophyll production + magnesium;
 (increased) photosynthesis (since more chlorophyll);
 (increased) amino acid / protein production + nitrates; [4]
- [Total: 10]**
- 2 (a) ref. presence / absence hyphae / mycelium;
 ref. reproduction by spores / sporangia / absence of spores / sporangia;
 ref. cell wall composition;
 ref prokaryote / eukaryote OR no true nucleus / true nuclei AW;
 unicellular / multicellular;
 reasonable size ref.;
 vacuole / no vacuole; [3]
- (b) decay / decomposition / rot(ting) / putrefaction; [1]
- (c) (i) mitosis / mitotic /; [1]
- (ii) one parent;
- same / no new combination of genes / alleles; [2]
- (d) oxygen / $6O_2$ + carbon dioxide / $6CO_2$ + water / $6H_2O$; [1]

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- (e) (i) digestion / chemical breakdown qualified (increases);
correct ref. enzymes;
rate of reaction/respiration increases;
more / faster reproduction microorganism(s); [2]
- (ii) (*any two from*)
drying, freezing, cooling, pickling, jamming, vacuum packing, chemical (preservatives) or
any named, canning, radiation,;; [2]

[Total: 12]

3 (a) nucleus / chromosomes; [1]

- (b) (i) Dd + Dd;
correctly shown gametes;
correctly drawn and completed punnett square or gamete linkage; [3]
- (ii) phenotype ratio correctly expressed and identified
(A. ratio / percentage / words); [1]

(c) duodenum / small intestine; [1]

- (d) reduction in enzymes / pancreatic juice entering duodenum;
correct ref. to (reduced) bile action;
less digestion / emulsification AW;
especially of fats;
fewer molecules to absorb / less absorption qualified;
and use for assimilation into larger molecules;
used in growth;
ref. less fat stored /AW; [4]

[Total: 10]

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- 4 (a) rays continue parallel until hit cornea;
 rays converge at cornea;
 rays converge at lens;
 meet before retina + continue to hit retina;
- (b) (i) narrows / decreases in size or diameter / constricts (R contracts); [1]
- (ii) iris + muscles;
 circular + contract; [2]
- (c) (i) fast / rapid / quick;
 reaction / response + (to) stimulus;
 automatic / involuntary / no involvement of conscious thought AW; / cannot be controlled
 R no involvement of brain [2]
- (ii) too much light allowed to enter AW;
 damage to retina / rods / cones / light-sensitive cells; [2]
- [Total: 10]**

- 5 (a) B incisor;
 cutting / biting / nibbling R holding; [2]
- C molar (R pre-molar / wisdom);
 grinding / crushing / chewing R shearing; [2]
- (b) (i) carbon + hydrogen + oxygen (A C H O); [1]
- (ii) (person) E; [1]
 (more frequent meals) allows more sugar build up on teeth;
 no brushing to remove bacteria / sugar / plaque;
 more acid contact with teeth;
 ref. toothpaste is alkaline;
 ref no / less neutralisation of acid; [2]
- [Total: 8]**

[Total: 50]

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Section B

- 6 (a) transport sucrose / sugar / amino acids (R glucose / food);
in solution;
ref. direction of movement (A around the plant); [2]
- (b) osmosis;
through cell membrane;
of root hair;
ref. movement from cell to cell;
ref. movement through or between cell walls;
enters xylem;
transpiration pull / stream / capillarity / molecular cohesion / root pressure;
evaporation / ref. water vapour;
from mesophyll cells / into air spaces;
ref. water potential gradient;
diffusion;
through stomata; [8]
- [Total: 10]**
- 7 (a) (i) carries urine (R just urea) in male and female;
carries semen / sperms / gametes AW in male; [2]
- (ii) ref. size comparison;
ref. qualified numbers comparison;
ref. mobility comparison; [3]
- (b) (*advantages*)
only needs to be undergone once AW (e.g. less trouble);
high reliability / effectiveness AW; [2]
- (*disadvantages*)
does not protect against sexually transmitted diseases;
ref. risks of surgery / anaesthetic;
not a temporary solution;
difficult / expensive to reverse;
need access to medical services AW; [4 max]
- [Total: 10]**

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Section C

- 8 (a) ref. use of manures / compost;
 prevent animal sewage entering water source;
 prevention of run-off from fields;
 any ref. controlled use of fertilizers / nitrates or other named;
 example of control method (e.g. only on growing crops, not when rain forecast, no disposal of waste into water sources, use crop rotation);
 use degradable pesticides;
 use biological pest control;
 grow crops genetically modified to be pest resistant; [5]

- (b) making (scarce) resources last longer;
 paper + reduction in deforestation;
 glass / metal + requires less energy than new production;
 plastics + reduction in fossil fuel use;
 reduces need for waste disposal / landfill;
 ref. non-biodegradability of plastics / glass;

 specific e.g. of reuse (as a method of recycling)
 (carrier bags, glass bottles, paper, clothes);

 ref. to composting / producing animal feed from food waste
 + a valid reason; [5]

[Total: 10]

- 9 (a) diaphragm + relaxes;
 and moves up / assumes domed shape;
 intercostal (if named must be external) muscles relax / internal intercostal muscles contract;
 ribs move down / inwards;
volume of thorax / lungs / chest cavity decreases;
 pressure in thorax increases; [5]

- (b) nitrogen unchanged (A percentage if given 78 – 80%);
 (A. 79% in air breathed in + reduced percentage in air breathed out)
 not used / produced (in the body / cells / metabolism);
 oxygen reduces (A %s from 19 / 20 / 21% to 16% +/-);
 carbon dioxide increases (A %s - from 0.03 / 0.04% to 4%);
 correct ref. aerobic respiration / O₂ / CO₂ diffuse into / out of blood;

 ref. water vapour comparison + explanation;
 (R waste product of respiration)

 ref. temperature comparison + explanation;

 ref. comparison of cleanliness of air; [5]

[Total: 10]