

**MARK SCHEME for the May/June 2007 question paper**

**5090 BIOLOGY**

**5090/02**

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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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- 1 (a) sepal(s) / calyx (R petal, A labels on diagram) ; [1]
- (b) A / left hand flower + stamen(s) / anthers / pollen / androecium  
(A negatives ref. female parts named) ; [1]
- (c) (i) insect (no marks for (ii) if wrong, but mark (ii) if 'animal' or blank.)  
(if they say self- or cross-pollination, A one mark max. for reasons which  
must refer to named sexual part) ;
- mark the first, one per line – any **two** from:  
filaments or stamens or anthers + short or protected AW,  
stigma protected AW, large petals, (nectar) guides, stigma + lumpy /  
compact AW / not feathery AW, (landing) platform AW ; [3]
- (ii) mtf,opl, any two from : scent AW, colour / bright AW, nectar,  
pollen grains rough or sticky ; [2]
- (d) cross-pollination or explanation ;
- alleles / genes + (2) parents / plants ;
- variation (in offspring) ;
- colonisation of different habitats / wider distribution /  
prevents overcrowding / less competition ;
- adaptation / natural selection / evolution or described or named e.g.  
(e.g. resistance) (R references to new species) ; [max 3]
- 2 (a) large surface area (to volume ratio) / long / thin ; [1]
- (b) **D** villus/i (R microvillus) ; [1]  
(or fats for one mark)
- mtf,opl, any **two** from: amino acids, fatty acids, glycerol, glucose,  
ions AW (or named e.g.), drugs/toxins, water, vitamins (or named e.g.), ; [2]
- E** root hair (cell) ; [1]
- (in either order) water ;
- ions / salts / minerals / named ion / oxygen (R nitrogen) ; [2]

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- (c) (i) feature drawn and labelled (A on extra diagram)  
(R mitochondria / nucleus, but A reasons – see later) ; [1]
- (ii) These must **both** be for the same feature for 2 marks, but if they do not match the label,  
then **0** for label.  
(membrane) living ;  
partially permeable AW ;  
only selected molecules enter ;  
allows osmosis or described (R diffusion ) ;  
active transport ; [max 2]
- OR (ccw) permeable ;  
tough / flexible ;  
helps keep shape of cell ;  
ref. part played in turgor AW ; [max 2]
- OR (cell sap / vacuole / cytoplasm)  
contains concentrated solution / ref. concentration gradient ;  
for water entry ;  
by osmosis / diffusion ; [max 2]
- OR (for cytoplasm / mitochondria)  
ref. respiration / energy release ;  
for active transport ; [2]
- OR (nucleus) – for **one** mark only  
controls cell activities AW ; [1]  
(R e.c.f. for villus)
- 3 (a) (i) more transpiration / water lost from lower surface or v.v. ; [1]
- (ii) (A points anywhere)  
waterproof AW ;  
cuticle / (waxy) layer AW (must be ref. upper) (R skin) ;  
  
correct ref. stomata / pores on upper or lower surface ;  
release of water (vapour) ( A only if stomata ref. has been made) ; [max 4]
- (b) mtfopl, any **two** from:  
paper / slide / leaf surface not properly dry, touched with  
(wet) fingers, damaged vein / xylem in leaf, slow to set up expt.  
after drying, any reasonable *qualified* student error ; [2]
- (c) run the experiment more times / repeat ;  
take an average ;  
perform expt. on another similar leaf (R leaf of different species) ; [max 1]
- (d) Cobalt chloride paper on bench AW ;  
timed (A takes less time to change) ; [2]

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- 4 (a) (i) carbohydrate / sugar / glucose / maltose / sucrose / starch ;
- (ii) protein / amino acids (vitamins / ions etc.) ; [2]
- (b) incubate / oven / suitable location ;  
 optimum / increased / suitable + temperature or stated (25 – 50 °C) ;  
 suitable pH ;  
 correct ref. enzymes ; [max 2]
- (c) (i) H ; [1]
- (ii) bacterium (or suitable, named e.g. *Streptococcus*) ;  
 antibiotics effective against bacteria AW ; [2]
- (d) (A e.c.f. for virus)  
 bacteria or microorganisms mutate ;  
 become resistant to antibiotic (R immune) ;  
 antibiotic too readily prescribed / available ;  
 patients not completing course ; [max 3]
- 5 (a) K oesophagus / gullet ;  
 L duodenum / small intestine ; [2]
- (b) starch – almost the same ;  
 protein – less ;  
 fibre – almost the same ; [3]  
 (A any symbols, but R more than one per line)
- (c) (i) digested / changed / broken down / ref. enzyme action ;  
 to amino acids / (poly)peptides AW ;  
 absorption (available only with ref. amino acids) ; [max 2]
- (ii) colon / rectum / large intestine ;  
 no suitable enzyme / not digested ;  
 ref. cellulose / lignin ;  
 therefore no absorption / egested as faeces / used in peristalsis ;  
 (A all other things, or named substances, are absorbed) ; [max 3]

**[Maximum mark for Section A: 50]**

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- 6 (a) **Q** (A so long as **Q** or **R** are mentioned – if no ref **Q** or **R**, max 2 for each)
- eaten as proteins ;
- ref. urine / faeces AW (I excretion refs. re. faeces) ;
- urea ;
- (ers) ;
- decompos(ition) / decay / putrefaction or described ;
- nitrification or described ;
- correct ref. bacteria / fungi or named ;
- nitrates + proteins + plants ;
- (max 5 marks from above) ;
- R** carbon dioxide ;
- from combustion AW ;
- respiration (R if ref. only to oxygen) ;
- photosynthesis + carbohydrates / named carbohydrate ;
- (A on word equation) ;
- [max 7]
- (b) two from: ;
- an oxide of nitrogen, SO<sub>2</sub>, CO<sub>2</sub>, CO, ;;
- one from: ;
- acid rain (for N<sub>x</sub>O<sub>y</sub> or SO<sub>2</sub> or CO<sub>2</sub>) / global warming or greenhouse ;
- effect AW (for CO<sub>2</sub> or CO) / CO + ref. carboxyhaemoglobin ; [3]
- [Total: 10]
- 7 (a) (R any examples which do not come from the circulatory system, mark the first in a list.)
- (i) blood cell / any correct named e.g. ;
- (ii) muscle or correct named e.g. (A blood / capillary) ;
- (iii) heart / blood vessel or named (R capillary) ; [3]
- (b) hepatic artery (A name, disregard context) ;
- carries more / most oxygen / oxygenated blood ;
- more or ref. to being used or destroyed in the liver + insulin / glucagon / ;
- adrenaline / hormones ;
- hepatic vein (A name, disregard context) ;
- carries carbon dioxide / deoxygenated (A with ref. HPV) ;
- urea / ref. more amino acids in hepatic artery ;
- any reasonable ref. to comparative numbers of RBCs + named blood vessel ;
- (hepatic) portal vein / HPV (A name, disregard context) ;
- #digested foods / any named ;
- #ions / vitamins / water ;
- any correct ref. to glucose levels in hepatic artery / vein ; [max 7]
- (#both marks require a ref. somewhere to direction of blood flow)
- [Total: 10]

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8E (a) externally administered substance AW / chemical ;  
 which modifies / changes / affects ;  
 metabolism / chemical reactions in the body AW ; [max 2]  
 (could be of bacteria)

(b) (alcohol) reduces self-control / removes inhibitions ;  
depressant / ref. nervous system ;  
 slower reaction times or any named effect ;  
 liver damage / cirrhosis / other named condition ;  
 \*expense ;  
 \*social implications / crime ;  
 (heroin) depressant / ref. nervous system ;  
 \*addiction / greater quantities for same effect / habituation / tolerance ;  
 withdrawal symptoms AW ;  
 needle-sharing ;  
 AIDS / hepatitis ; [max 8]  
 (Points marked \* score *either* for alcohol *or* for heroin)

[Total: 10]

8O (a) nicotine ;  
 \*craving / addiction / agglutination or clotting of RBCs / increased  
 blood pressure / increased heart rate / vasoconstriction / increased  
 blood fat / atheroma AW / arteriosclerosis / effect on fetus ;  
 (\*All must be with ref. nicotine)

tar ;  
 decreased O<sub>2</sub> uptake (must be with ref. tar) ;  
 lung or any named correct form of cancer caused by tar ;

CO ;  
 decreased O<sub>2</sub> carriage (must be related to CO) ;

*points not tied to any particular constituent:*  
 emphysema / bronchitis / cough / destruction of cilia ;  
 heart disease / heart attack / stroke / atheroma (if not given above) ;  
 less O<sub>2</sub> to fetus ;  
 miscarriage / small / underweight babies (R underdeveloped) ; [max 8]

(b) smell / eye discomfort ;  
 ref. passive smoking or described ;  
 risk to health of non-smoker / ref. litter ; [max 2]

[Total: 10]