

## MARK SCHEME for the May/June 2008 question paper

<b>5090 BIOLOGY</b>
<b>5090/02</b> 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.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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### Section A

- 1 (a) (i) **A** CO<sub>2</sub> / carbon dioxide / carbon(IV) oxide ;
- (ii) **B** O<sub>2</sub> / oxygen ; [2]
- (iii) arrows same as in Fig. 1.1a for mouse ;  
**A** out of leaf ;  
**B** into leaf ; [3]  
*(NB mark separately from (i) & (ii), insist on recognisable arrow heads)*
- (b) photosynthesis + respiration (**R** if respiration stops) ;  
at same rate / compensation point AW / stomata closed ;  
ref. light intensity (**A** ref. sun rising, etc.) ; [3]
- (c) (i) carbohydrate or named / fats / lipids / protein ;
- (ii) protein / amino acid / vitamins / water / nucleic acid / minerals /  
ions / salts / correctly named salt or ion / CHO / fats ; [2]  
(**R** nitrate / vitamins E & K)
- [Total: 10]**
- 2 (a) DNA ; [1]
- (b) (no requirement for insistence on comparatives)  
(how) ref. tail / no tail ;  
ref. amount of cytoplasm (**R** no cytoplasm for sperm) ;  
ref. to shape / length of cells / head or acrosome in sperm ; (**R** round)  
ref. to position / size / shape of nucleus or nuclei ; (max 3)
- (why) (**A** v.v. for cheek cell where relevant)  
ref. swimming / movement / reaching ovum AW ; (**A** motility / mobility)  
ref. absorption of nutrition from seminal fluid ;  
ref. penetrative function of sperm ;  
(nucleus at front of sperm) since only nucleus enters ovum AW ;  
half the amount of (**A** less) genetic material / haploid ; (max 3) [max 4]
- (c) (i) (**A** v.v. for cheek cell if clear, otherwise first mentioned assumed to be sperm)  
Any two from: ½ the number, fewer or stated number of chromosomes / haploid,  
½ the number of genes / amount of DNA,  
either X or Y or only one sex- chromosome,  
ref. shape / size difference,  
ref. mitosis or mitosis (must be to how the cell is produced), ; ; [2]
- (ii) (**A** v.v. for cheek cell – including negatives where relevant)  
(for sperm) fusion / fertilisation ;  
with another gamete / ovum / egg / nucleus ;  
ref. zygote (production) ;  
restoration of diploid number AW ; [max 3]
- [Total: 10]**

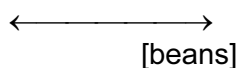
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3 (a) one mark per trophic level in any order

large bird / hawk + spider ;

small / yellow bird + (black) flies ;

greenflies / aphids + butterflies + mouse / mice ;



overall web correct ;

[4]

(b) (i) food web ;

[1]

(ii) in either order:

hawk / large bird ;

spider ;

[2]

(c) (i) correct shape (**A** smooth-sided or stepped pyramid) ;

all three levels correctly labelled ;

(upside-down pyramid with producer at top = 1 mark)

[2]

(ii) correct shape ;

all three levels correctly labelled ;

(**A** for ONE mark, correct shape with no labels OR correct shape with wrong but plausible labels. Correct shape + implausible labels = 0)

[2]

**[Total: 11]**

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4 (a) D glycerol / glycerine ; ] A one word only  
 E fatty acid ; ] per line  
 F maltose / (reducing) sugar / disaccharide ; [3]  
 (R glucose / sucrose)

(b) G amylase / diastase / ptyalin ; [1]

(c) (i) strong heat / ref. high temperature AW / 60 °C or above ;  
 denatures / destroys / damages + enzymes ;  
 would not tenderise the meat AW / gives enzyme time to work AW ; [3]  
 (available only with ref. enzyme damage)

(ii) protease or any named ;  
 acts on / digests / breaks down proteins ;  
 changing them to peptides / peptones / proteoses / polypeptides etc. ;  
 \*smaller or simpler molecules / bonds broken / easier to chew AW ; [max 3]  
 (A softer)  
 (\* this mark available if enzyme chosen was lipase)

[Total: 10]

5 (a) (i) roots / root system (R root hairs) ; [1]

(ii) photosynthesis ; [1]

(b) (i) Any **three** from:  
 water ; for photosynthesis / turgor / transport solvent / hydrolysis / enzyme activity ; (R transpiration)  
 magnesium (ions) ; for chlorophyll manufacture ; (R photosynthesis / chloroplasts)  
 nitrates ; for making amino acids / proteins / enzymes / growth ;  
 calcium (ions) ; for making cell walls / binding cells together AW ;  
 other correct ion ; and correct function ;  
 (e.g. P, K) (P for growth or respiration, K for fruits and guard cell function)  
 \*sucrose / CHO / sugar / amino acids ; and correct function for example; [max 6]

(NB 'salts for growth' = ONE mark for the line, but not available if a named salt / ion has also been given. 'Growth' can score ONCE ONLY on right hand-side.)

(ii) xylem (\* if this mark scored, then xylem + phloem) ; [1]

[Total: 9]

[Section A Total: 50]

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**Section B**

- 6 (a)** #diffusion ;  
epidermis / any layer of correctly named ;  
dermis ;  
#tissue fluid / plasma ;  
#capillary ;  
-----  
venule / vein / vena cava ;  
**A**  
\*R.A + R.V. ;  
-----  
correct ref. pulmonary circulation (either artery or vein) ;  
**B**  
lungs ;  
-----  
\*L.A. + L.V. ;  
**C**  
aorta / artery / arteriole ; [max 7]

(marks for *A*, *B* and *C* can be awarded if individually correct within an otherwise confused account)

(\* or one for heart – also available within a confused account)

(# mark available anywhere so long as in correct context)

- (b)** stimulus / stimulates (**R** detects) ;  
receptor / taste bud / sensor / nerve or sensory endings ;  
sensory neurone (**R** nerve) ;  
impulses (**R** messages) ;  
brain / C.N.S. (ignore refs to spinal cord) ; [max 3]

**[Total: 10]**

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- 7 (a) (i) protection of flower + in bud AW / may attract insects / ref. P/S ;
- (ii) attraction of insects / landing platform for insects / nectar production ;  
(A animals)
- (iii) (manufacture of) pollen / male gametes ;
- (iv) containing ovule / development into fruit / receives pollen ; [4]  
(A egg / ovum / female gamete / nucleus)
- (b) (i) plausible name (A grass, conifers or named) ; [1]  
(R pomegranate, pawpaw / papaya, cotton)
- (ii) (need not be linked to name)  
(anthers) large / long ;  
exposed / outside flower / pendulous / dangling / long filaments ;  
versatile / hinged AW / flexible / loosely attached ;  
(pollen) small / fine ;  
light ;  
dry / powdery / smooth / round ;  
copious AW ; [max 5]  
(ignore refs to wings / air bags)

**[Total: 10]**

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- 8E (a) (i)** (viruses) reproduce only in living cells /  
 contain no normal cell contents – or specified contents ;  
 pathogenic AW / cause harm / parasitic ;  
 size ref. (300 nm or less / ref. electron-microscope) ;  
 protein (coat) ;  
 nucleic acid / DNA / RNA (**A** ref. to both) ; (max 4)
- (ii)** (fungi) ref. hyphae / mycelium ;  
 structural ref. to hypha or mycelium (e.g. coenocytic AW / stores glycogen ) ;  
 nutritional ref. (parasitic / pathogenic AW / saprophytic  
 saprotrophic / heterotrophic / external digestion) ;  
 spores ;  
 chitin ; (max 4) [max 7]

- (b)** dead (animals / plants / organisms) ;  
 breakdown of proteins / amino acids / urea / faeces +  
 to release salts / ions / named ;  
 of carbohydrates + to release CO<sub>2</sub> ;  
 ref. to re-cycling / used up by plants ; [max 3]  
 (**R** energy refs)

[Total: 10]

- 8O (a)** (advantages of fertiliser) increase / maintain soil fertility ;  
 better growth AW ;  
 \*higher yield / greater profit / increased productivity ; (max 2)  
 (disadvantages) provides no soil skeleton AW ;  
 \*greater expense ;  
 into water (courses) or named ;  
 eutrophication or described or any ref. ;  
 death of plants + bacterial proliferation ;  
 depletion of O<sub>2</sub> / oxygen debt ;  
 high N<sub>2</sub> in water + blue babies / death of water animals ; (max 4)  
 (**R** marine life) [max 5]

- (b)** (advantages of insecticides) destruction of (plant) pests AW ;  
 \*better yield / greater profit / increased productivity ;  
 kills vectors of disease ; (max 2)  
 (disadvantages) also harms other / useful insects (or named) ;  
 \*greater expense ;  
 pests may become resistant ;  
 pollution of (human) foodstuffs ;  
 concentration along food chain / non-biodegradable / cannot be metabolised ;  
 effect on other organisms (e.g. birds) ; (max 4) [max 5]  
 (\*only one mark max available – in **(a)** or **(b)**)

[Total: 10]

[Section B Total: 30]