

**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

General Certificate of Education O Level

**MARK SCHEME for the June 2005 question paper**

**5090 BIOLOGY**

**5090/02**

**Paper 2 (Theory), maximum mark 80**

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

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**JUNE 2005**

GCE O Level

**MARK SCHEME**

**MAXIMUM MARK: 80**

**SYLLABUS/COMPONENT: 5090/02**

**BIOLOGY  
Paper 2 (Theory)**

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### Section A

- 1 (a) (i) plants/plausible named plant (R anything obviously not a water plant also R sea weed) ;
- (ii) herbivore/consumer/2<sup>nd</sup> (trophic level) ; [2]  
(R named)
- (b) fertiliser/nitrates/salts/ions/CO<sub>2</sub>/sewage/nutrients/manure ;  
(A minerals, ignore warm water, mark first in list) ;  
used for amino acids ;  
for P/S AW (if CO<sub>2</sub> or HCO<sub>3</sub>) ;  
proteins ;  
rapid AW growth (R growth unqualified) ;  
greater reproductivity AW/population increases ; [max: 4]
- (c) bacteria + decomposition/feed on dead plants or animals ;  
bacterial population increases + plant population decreases ; [2]
- (d) B - C line must rise to begin with ;  
C → line must finish lower than it started and above arrow head ; [2]  
(R line touching or crossing x axis)
- [Total: 10]**
- 2 (a) F, I, J (mark first 3) ;  
G, H (mark first 2) ; [2]
- (b) (i) (H) stigma + to catch pollen/ovary + to hold ovule (A female gamete)/seed ;  
(A carpel/gynoecium/pistil)  
(I) petal/corolla + to attract insect/landing platform ;  
(J) stamen + to produce AW pollen/male gametes ; [3]  
(A pollen sac/anther + filament or androecium)
- (ii) large surface area/sticky/hairy/feathery ;  
maximum AW + collection of pollen ; [2]
- (c) line plus label L pointing to stigma on either F or H ; [1]  
(R more than one line unless both correct,  
A line to J if identified as stigma in (b))
- (d) ('It' = the pollen grain)  
haploid AW/diploid AW/different no. of chromosomes ;  
(correct ref. to) (ignore any stated numbers)  
gamete/male contribution AW/ref. reproduction/meiosis  
or/not involved in reproduction/part of adult plant/mitosis ; [2]
- [Total: 10]**

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- 3 (a) (i) (palisade) 1 cell drawn, correct shape and position and labelled ;
- (ii) (spongy) 1 cell drawn, correct shape and position and labelled ;
- (iii) 2 guard cells drawn in (lower) epidermis and labelled ;  
(R label to stoma)
- (iv) (cuticle) shown as thin acellular layer and labelled ;  
(A cuticle on upper or lower epidermis, R if it crosses stoma)  
(max: 2 marks if no labels) [4]
- (b) xylem correctly indicated on Fig. 3.1 ;  
xylem - the name ( A even if incorrectly labelled) ; [2]
- (c) greater concentration in the atmosphere ;  
water molecules ;  
loss of gradient AW ;  
slow(er)/less evaporation ;  
slow(er)/less diffusion ; [max:3]
- (d) (Mark the first, but ignore waterproof) ;  
make cuticle ;  
protects photosynthesising or otherwise qualified cells ;  
transparent/light entry ; [max: 1]
- [Total: 10]
- 4 (a) (O) WBC/phagocyte AW (R lymphocyte or other BI) ;  
(A polymorph/macrophage/cell membrane) ;  
(P) capillary ; [2]
- (b) ('It' = the blood vessel) ;  
any two from : ;  
walls + very thin/one cell thick ;  
microscopic/narrow/small bore/allow RBCs only in single file ;  
walls leaky/permeable AW/allow substances to pass through ;  
(or named, A phagocytes AW) ;  
slow blood flow ; [max: 2]
- (c) (i) M - WBC/lymphocyte + antibodies ;  
clumping AW (of bacteria) ; [2]
- (ii) N - engulfing/ingesting/phagocytosis (R digesting) ; [1]
- (d) action of platelets ;  
fibrinogen to fibrin ;  
clotting ;  
trapping of RBCs ;  
stopping bleeding ;  
prevention of further bacterial entry ;  
reproduction/growth of skin cells AW ; [max. 4]
- [Total: 11]

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- 5 (a) (i) insulin (if wrong hormone, allow ecf\* for (ii) - 1 mark only) ;
- (ii) pancreas labelled (line must touch or enter gland) ;  
 [+\*] (1 mark max. if more than one organ is named  
 and labelled so long as one is the pancreas)  
pancreas named (A even if incorrectly labelled) ;  
 (A islets of L)
- (iii) any two (allowing ecf from either (i) or (ii) if applicable) from :  
 amylase, protease, lipase, alkali/salts, glucagons/CO<sub>2</sub>  
 (A enzymes, pancreatic juice, but not with  
 named enzyme or juice constituent) ; [5]
- (b) (i) bacterium/E.coli ; [1]
- (ii) gene/sequence AW of bases ;  
 for insulin/hormone production ; [2]
- (c) enzyme or named e.g. endonuclease(s), lingase(s)/catalyst ; [1]
- [Total: 9]

[Maximum mark for Section A: 50]

### Section B

- 6 (a) (ref. to 'It' should be taken to refer to the first in each pair)  
 no energy required in diffusion/diffusion is passive ;  
 energy required in active transport ;  
 ref. down a concentration gradient AW in diffusion ;  
 (R along)  
 ref. against concentration gradient AW in active transport ;  
 ref. respiration/ATP necessary in active transport/carriers ;  
 cell/living membrane in active transport ; [max: 3]
- (b) (excretion) removal via lungs/bladder/skin ;  
 (A kidneys)  
 any two from: toxins, nitrogenous waste, CO<sub>2</sub> ;  
 (A urea/uric acid)  
 metabolic AW + waste AW ;  
 (egestion) removal from alimentary canal/rectum/anus/gut ;  
 undigested/e.g. cellulose/lignin/fibre/roughage/faeces ; [max: 3]
- (c) (breathing) muscular ;  
 to move air/ventilate (R O<sub>2</sub>, CO<sub>2</sub>) ;  
 into and out of lungs/inhale and exhale ;  
 (respiration) in cells/metabolic AW ;  
 \*oxidation/ref. oxygen + of glucose ;  
 \*to release (or accepted alternatives) energy ; [max: 4]  
 (\*available on an equation - balanced if symbols used)
- [Total: 10]

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- 7 (A points on annotated genetic diagrams, and points, where relevant if they use the gene transfer idea in question 5.)
- (a) sheep with better wool ;  
 used for reproduction/are crossed/selective breeding ;  
 gene passed to offspring ;  
 offspring vary ;  
 due to mutation ;  
 different gene combinations ;  
 'artificial selection' ;  
 process repeated ;  
 over many generations ;  
 use of back/test cross the find homozygotes AW ; [max: 6]
- (b) ref. mutation/ref. change in gene of chromosome ;  
 spontaneous/random/sudden/abrupt ;  
 mutagen/named mutagen (A radiation/chemicals) ;  
 meiosis (R spelling if a 't' appears) ;  
 random mating/cross fertilisation/recombination ;  
 ref. environment ;  
 one environmental factor identified ; [max: 4]
- [Total: 10]
- 8 **EITHER**
- (a) protein ;  
 alters/speeds up rate of (chemical) reactions ;  
 in (living) cells/made by cells ;  
 catalyst/not used up/small amounts needed ; [max: 3]
- (b) (i) or (ii) (pH or temperature) ;  
 ref. best/optimum/fastest ;  
 \*rate slower both sides of the optimum ;  
 ref. active site AW ;  
 change in shape (of active site) ;  
 substrate no longer fits enzyme (or v.v.) ;  
 inactive outside range/range specific AW for enzyme ;
- (i) (pH only) ;  
 \*symmetrical curve or described ;
- (ii) (temperature only) ;  
 destruction/denaturation only at high temperatures ;  
 (A 60 °C + if figure given) ;  
 (denaturing) permanent AW ;  
 heat increases rate of molecular movement or v.v./ref. Q<sub>10</sub>/ ;  
 increased frequency of collision AW (or v.v.) ; [max: 7]
- (\* = marks available on graph with axes labelled) [Total: 10]

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8 OR

(a) (i) (chlorophyll)  
 a green chemical/pigment/substance/molecule ;  
 contains magnesium ;  
 traps/harnesses/collects/harvests/absorbs/converts ;  
 light ; [max: 3]

(ii) (chloroplast)  
 structure/organelle ;  
 in plant/leaf + cells or named plant cell ;  
 contains chlorophyll ;  
 contains enzymes for photosynthesis ; [max: 3]  
 for part (a) [max: 4]

(b) (in (i) or (ii)) controlled by limiting factors or described

(i) (temperature)  
 \*rate increases with increased temperature ;  
 faster molecular movement ;  
 photosynthesis is enzyme-controlled ;  
 enzymes work faster with increased temperature ;  
 may cause water loss slowing P/S ;  
 guard cells lose turgidity AW/stomata close (for (b) (i) max 4) ;

(ii) (light intensity)  
 \*higher the light intensity the faster the rate of P/S ;  
 up to a maximum ;  
 more energy/light absorbed AW by chlorophyll/chloroplasts ; [max: 6]

(\*marks available on graphs with axes labelled) [Total: 10]