

**MARK SCHEME for the October/November 2009 question paper  
for the guidance of teachers**

**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, which would have considered the acceptability of alternative answers.

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Page 2	Mark Scheme: Teachers' version	Syllabus
	GCE O LEVEL – October/November 2009	5090

### Section A

- 1 (a) asexual/vegetative ;
- (b) no variation or same genes as parent / no evolution / overcrowding / susceptible to disease / no resistance to environmental change ; [1]
- (c) *one mark per line, mark the first given* :
- no wastage / offspring well established before separating (**R** chancy unqualified) ;
- quick / only one parent needed ;
- offspring of known characteristics / genetically identical AW ;
- more profit AW ; [max 2]
- (d) (**D**) photosynthesis ;
- manufacture CHO or named CHO / amino acids (**R** food) ; [2]
- (**E**) absorb water ;
- ions / salts / minerals (**R** nutrients) ;
- anchorage ; [max 2]
- (**F**) carries / transports AW + \*water / \*salts ;
- before roots develop AW ;
- carries / transports AW + \*sugars (**R** glucose) / \*amino acids ;
- correct functional ref. either xylem or phloem ; [max 3]
- (\* or allow 'nutrients' once only if neither of these marks is otherwise scored)
- [Total: 11]
- 2 (a) *For each letter, if more than one cell labelled, all labels must be correct*
- (i) label line (or otherwise indicated) **J** to / in / on cellulose cell wall  
(**R** label lines that terminate on inner line of cellulose cell wall) ;
- (ii) label line (or otherwise) **K** to cytoplasm ; [2]

Page 3	Mark Scheme: Teachers' version	Syllabus
	GCE O LEVEL – October/November 2009	5090

(b) solution G (A under explanation if solution line blank) ;  
water enters ;  
\*osmosis / diffusion ;  
\*cell sap more concentrated / diffusion or osmotic or water potential gradient ;  
increase in volume AW / pressure / turgor ; [max 4]  
(\* available with wrong or no solution identified)

(c) (i) space between membrane and cell wall shaded on right hand diagram ; [1]  
(ignore shaded cell wall)  
  
(ii) (These marks are available with no or wrong shading if they are in reasonable context)  
cell wall permeable ;  
solution passes in ;  
correct ref. to partial permeability of cell membrane ; [3]

[Total: 11]

3 (a) (L) right + atrium / auricle ;  
(M) pulmonary vein ; [2]

(b) (chemicals) \*glucose ;  
\*oxygen ; [2]  
*(explanation max 2 – each mark available once only either under glucose or oxygen)*

for energy (R production) ;  
during respiration ;  
heart muscle / cells / tissue ; (max 2) [4]

(\*A adrenalin; to stimulate heart muscle; insulin; for glucose absorption by heart cells; Heparin; to stop blood clotting)

(c) valve (if named, must be aortic / semi-lunar) ;  
closes (available with wrongly-named valve) ;  
sending blood through coronary blood vessel / artery(ies) (R vein) ; [3]

[Total: 9]

Page 4	Mark Scheme: Teachers' version	Syllabus
	GCE O LEVEL – October/November 2009	5090

- 4 (a) fruit / pericarp / ovary / testa ;
- (b) wind / moving air ; (1)
- (R any refs. to water dispersal)  
ref parachute / helicopter wing AW ;
- large surface area / light ;
- buoyancy / holds seed in air or floats ; (max 2) [3]
- (c) lack of water AW ;
- lack of O<sub>2</sub> (for whatever reason) ;
- seed not viable / dormancy not complete AW / eaten ; [max 2]
- (d) overcrowding / lack of light ;
- unsuitable temperature ;
- eaten ;
- disease ;
- unsuitable substrate / lack of ions or minerals / wrong pH ;
- (A, here, ref. insufficient nutrients in soil = unsuitable substrate)
- drought AW ; [max 3]
- [Total: 9]
- 5 (a) photosynthesis ; [1]
- (b) (i) 20.00 (hrs) / 8 p.m ; [1]
- (ii) photosynthesis slows down ;
- photosynthesis stops ;
- respiration occurring (R respiration starts) ;
- carbon dioxide released from plant ; [max 3]
- (c) (increased) temperature ; [1]

Page 5	Mark Scheme: Teachers' version	Syllabus
	GCE O LEVEL – October/November 2009	5090

- (d) curve starting below 0 ;
- crossing 20.00 hr line at 0 ;
- finishing above 0 at 24.00 hrs ;
- axis labelled correctly for line drawn (Ignore units) must be on Fig. 5.1 ;

*If line is straight, only crossing and axes marks available.*

**A** curve 'upside down' with axis labels reversed.

*Last point available only on Fig. 5.1, award otherwise what is possible on a graph drawn elsewhere.* [4]

[Total: 10]

[Section A Total: 50]

Page 6	Mark Scheme: Teachers' version	Syllabus
	GCE O LEVEL – October/November 2009	5090

**Section B**

6 (a) chemical (**R** named hormone) ;  
produced by a gland (**R** specific named endocrine gland) ;  
carried + by the blood ;  
affects a target organ (**R** specific target organ) ;  
destroyed by liver ; [max 4]

(b) stimulus or example ;  
receptor / or described (**R** named sense organs) ;  
impulse / electrical pulse AW ;  
sensory neurone or sensory nerve cell (**R** nerve) ;  
correct ref. to CNS for action described ;  
relay / intermediate neurone or nerve cell (**A** 'interneurone') ;  
motor or effector neurone or nerve cell ;  
effector or described (muscle or gland) ;  
correct response for stimulus given / named reflex ; [max 6]

**[Total: 10]**

7 (a) in nucleus / plasmids / chloroplasts / mitochondria ;  
found in chromosomes / genes / contains genetic information ;  
(**R** contains genes)  
can be copied / inherited / ref responsible for characters (characteristics) ;  
controls production of a protein ; [max 3]

(b) mutation (with ref. either sickle cell anemia or Down's) ;  
(sickle cell) genetic or ref. gene / allele / DNA / change in Hb molecule ;  
(Down's syndrome) one extra chromosome / 47 instead of 46 ; [3]

Page 7	Mark Scheme: Teachers' version	Syllabus
	GCE O LEVEL – October/November 2009	5090

- (c) correct plausible genotypes of parents (A A,B,O,I<sup>A</sup>,I<sup>B</sup>,I<sup>O</sup> only) ;  
(if they are linked by lines to the offspring, since they are then gametes and available phenotypes / blood groups of both parents (A 'B' as Group B etc.) ;  
gametes correctly shown – either separated / in circles etc. / punnet square / linked correctly by lines to offspring ;  
offspring correctly identified + with different stated blood group / phenotype ;  
any correct descriptive term (gametes / parents / genotype / children ) ; [max 4]  
(A mother + father)

(Allow all marks on a written description)

[Total: 10]

- 8E (a) soil erosion / washed / blown ;  
loss of humus in soil ;  
desertification / ref. less rainfall / less transpiration ;  
ref. leaching / flooding / loss of soil fertility ;  
loss of species / habitats / qualified effect on food chains ;  
loss of livelihood / resources / agricultural effects ;  
global warming AW / CO<sub>2</sub> increase / climate change AW ; [max 5]

- (b) insecticides + specific undesirable effect ;  
fertilisers / sewage / domestic or nitrogenous waste + specific undesirable effect ;  
heavy metal / inorganic, chemical or radioactive waste + specific undesirable effect ;  
gases from factories, car exhaust (Pb) or fossil fuel / SO<sub>2</sub> / NxOy / soot  
+ specific undesirable effect ;  
CFCs / CO<sub>2</sub> / methane / CO + specific effect ;  
oil (spillage) + effect on wildlife ;  
litter / rubbish / noise / light + effect ; [max 5]

[Total: 10]

Page 8	Mark Scheme: Teachers' version	Syllabus
	GCE O LEVEL – October/November 2009	5090

80 (a) light + producer / green plant AW ;  
each organism uses energy ;  
or loses energy ;  
none returned to producer / sun ; [max 3]

(b) (i) food web is interlinked food chains / ref. many consumers [1]

(ii) producer + plants (or named) ;  
Consumers ;  
herbivores / primary or first order ;  
carnivores / secondary or second order ;  
ref. to relative numbers ;  
ref. to relative biomasses ;  
ref. to each trophic level controlling the numbers in neighbouring trophic levels ;  
ref. to members all being in the same habitat / ecosystem ; [max 6]

**[Total: 10]**