

Mark Scheme (Results) Summer 2007

GCE

GCE O Level Biology (7042/02)

General Principles

Symbols used in the mark scheme

Symbol	Meaning of symbol
; semi colon	Indicates the end of a marking point.
eq	Indicates that credit should be given for other correct alternatives to a word or statement, as discussed in the Standardisation meeting. It is used because it is not always possible to list every alternative answer that a candidate may write that is worthy of credit.
/ oblique	Words or phrases separated by an oblique are alternatives to each other.
{ } curly brackets	Indicate the beginning and end of a list of alternatives (separated by obliques) where necessary to avoid confusion.
() round brackets	Words inside round brackets are to aid understanding of the marking point but are not required to award the point.
[] square brackets	Words inside square brackets are instructions or guidance for examiners.

Crossed out work

If a candidate has crossed out an answer and written new text, the crossed out work can be ignored. If the candidate has crossed out work but written no new text, the crossed out work for that question or part question should be marked, as far as it is possible to do so.

Spelling and clarity

In general, an error made in an early part of a question is penalised when it occurs but not subsequently. The candidate is penalised once only and can gain credit in later parts of the question by correct reasoning from the earlier incorrect answer.

No marks are awarded specifically for quality of language in the written papers, except for the essays in the synoptic paper. Use of English is however taken into account as follows:

- the spelling of technical terms must be sufficiently correct for the answer to be unambiguous
 - e.g. for amylase, 'ammalase' is acceptable whereas 'amylose' is not
 - e.g. for glycogen, 'glicojen' is acceptable whereas 'glucagen' is not
 - e.g. for ileum, 'illeum' is acceptable whereas 'ilium' is not
 - e.g. for mitosis, 'mytosis' is acceptable whereas 'meitosis' is not
- candidates must make their meaning clear to the examiner to gain the mark.
- a correct statement that is contradicted by an incorrect statement in the same part of an answer gains no mark - irrelevant material should be ignored.

1. (a) (i) automatic / involuntary;
 rapid;
 not involving conscious part of brain;
 prevent further damage / protective;

max
(3)

Any three - 1 mark each

(ii) diagram:-
 TS of spinal cord - large;
 nerve pathways correct;
 synapses in grey matter;

(3)

labels:-
 (heat / touch) receptor;

sensory neurone;
 relay neurone;
 motor neurone;

synapse;

effector / (arm) muscle;

grey matter;
 white matter;

max
(5)

Any five - 1 mark each

(b) rays (from distant object) almost parallel;
 lens needs to be stretched / thinner to focus;
 *focus on fovea / retina;

as object moves towards person, rays diverge more;
 more refraction to bring them to focus;
 *focus on fovea / retina;

impulses pass from receptor / retina;
 via optic nerve;
 to brain;

(impulses) from brain to ciliary muscles;
 ciliary muscles contract;
 ligaments slacken;
 lens becomes rounder / more convex / flatter;

max
(9)

Any nine - 1 mark each

* allow this point once only

Total 20 marks

2. (a) (i) exercise/eq requires energy;
released by respiration;

uses oxygen;
level in blood falls;

diffusion;
produces carbon dioxide;
level in blood rises;
- Any four - 1 mark each** max
(4)
- (ii) (carried as) oxyhaemoglobin;

this dissociates / releases oxygen / eq;
in low oxygen concentrations;
oxygen in solution in plasma;

out of capillary / through capillary wall;
by diffusion;
into tissue fluid;
into muscle cell / through cell membrane;
- Any six - 1 mark each** max
(6)
- (b) carotid sinuses / blood supply to the brain;

rise in carbon dioxide level detected;
(impulses) to hypothalamus;
via nerve pathways / neurones;
to medulla;

nerve impulses to rib / diaphragm muscles;
increased rate of breathing;
more loss of carbon dioxide;
- Any six - 1 mark each** max
(6)
- (c) adrenaline; (1)

speeds up heart beat;
increases stroke volume;

redirects blood (from skin) to muscles;

causes glycogen change to glucose;
increased glucose in blood;
- Any three - 1 mark each** max
(3)

Total 20 marks

3. (a) (i) **heterozygous:**
2 different alleles / forms of a gene;
both carry different instructions (for a feature); (2)
- (ii) **codominant:**
in heterozygous state;
both alleles show their effect;
neither dominates over the other; (3)
- (b) symptom only shows during vigorous exercise;
so boy heterozygous / boy identified on diagram;
brother probably homozygous recessive / identified on diagram;
suitable reason given;
- both parents heterozygous / identified on diagrams;
another child has 50% chance of inheriting heterozygous state;
- Any five - 1 mark each** max (5)
- (c) (i) oxygen used up;
in respiration / to release energy;
- oxygen level in blood falls;
sickle shaped cells occur;
- Any two - 1 mark each** max (2)
- (ii) red blood cells in transfused blood are normal;
can carry oxygen as usual;
symptoms less drastic;
need correct blood group (to avoid agglutination);
- Any two - 1 mark each** max (2)
- (iii) if brain deprived of oxygen, death;
less oxygen to organs, damage to cells / cells die;
- distorted red blood cells;
ref. to fibres;
may block capillaries;
- Any two - 1 mark each** max (2)
- (d) (i) change in DNA / gene / structure or number of chromosomes; (1)
- (ii) radiation (ionising) / named example;
carcinogenic chemical e.g. mustard gas / cigarette tar;
must occur in egg / sperm formation before or during fertilisation; (3)

Total 20 marks

4. (a) (i) diagram quality and proportions; (1)
- labels:- *NB if diagram of kidney only, then max 3 for:*
 kidney; *Bowman's capsule*
 ureters; *glomerulus*
 bladder; *kidney tubule*
 sphincter muscle; *collecting duct*
 urethra; *loop of Henlé*
 renal artery / vein
Any four - 1 mark each max (4)
- (ii) pressure filtration / ultrafiltration;
 of blood plasma;
- from glomerulus;
 into Bowman's capsule;
- filtrate flows along nephron / (kidney) tubule;
- reabsorption occurs;
 all glucose;
 water as required / some;
 salts as required / some;
 urea not reabsorbed
- materials not reabsorbed form urine;
- Any eight - 1 mark each** (8)
- (iii) peristalsis in urethra / uterer;
 contraction of muscles of bladder walls;
 relaxation of sphincter muscle;
- Any two - 1 mark each** max (2)
- (b) (i) to prevent dehydration of cells / eq;
 maintain blood pressure / eq;
 chemical reactions in solution / eq;
 problems if enzymes dehydrated / damaged /eq;
 prevents bursting of cells;
- Any three - 1 mark each** max (3)
- (ii) drunk as a liquid / no need for hospital / injections etc;
 made of sugars and salts (in water);
 maintains / restores (osmotic) concentration of blood;
- Any two - 1 mark each** max (2)

Total 20 marks

5. (a) skull:-
cranium / eq;
protects brain;
bones fused together / fixed joints;

jaw bone;
hinge joint with cranium;
teeth to (chew food);
points for attachment of muscles;

eye / ear sockets;
nasal cavity;
bones protect sense organs;

Any seven - 1 mark each

**max
(7)**

(b) rib cage:-
backbone / vertebrae;
sternum / breast bone;
ribs;

articulation with backbone / vertebrae (thoracic);
attachment of intercostal muscles;
for breathing;
movement alters volume of chest cavity;
causes air flow into / out of lungs;

protects heart / lungs;

Any six - 1 mark each

**max
(6)**

(c) pelvis and leg:-
bones of pelvic girdle;
fused together / fixed joints;
attachment for muscles (to hold body upright);

sacrum;
attachment to backbone;

socket for head of femur;
ball and socket joint;
hinge joint at knee;
femur and other bones for walking / support;

Any seven - 1 mark each

**max
(7)**

Total 20 marks

6. (a) (i) endemic:
(disease) always present in a region;
low levels of infection;
- vector:
(organism) that transmits parasite;
unharmd by the disease / parasite; (4)
- (ii) high rainfall / constant water supply;
water needed for breeding;
- stagnant water for larvae / pupae;
hang from water surface / breathe air;
- warm enough for insect to survive / no real resting period
therefore active all time; max
(4)
- Any four - 1 mark each**
- (iii) drainage;
destroys breeding grounds;
- oil on water surface;
larvae / pupae suffocate;
- insecticide use;
kills adults;
- banning open stagnant water;
nowhere to breed;
- introducing guppies / fish;
eat larvae / pupae;
- Any three actions with reason - 2 marks each (6)**
- (b) sleep under mosquito nets / mosquito netting on doors/windows;
adult mosquitoes active at night / cannot reach skin / bite;
- take antimalarial drugs / named drug;
prevents parasite reproducing in human;
- use of repellent cream / spray;
keeps insect away from skin;
- cover exposed areas of body (in evening);
adult mosquitoes active / bite (at night);
- Any three actions with reason - 2 marks each (6)**

Total 20 marks

7. (a) (i) removes contaminants / soil / bacteria;
cold water encourages clotting / reduce blood flow; (2)
- (ii) avoid further infection;
avoid attracting insects;
avoid contamination by chemical / eq;
- Any two - 1 mark each** max (2)
- (b) (i) clotting;
- vitamin K;
platelets;
thrombokinase;
prothrombin;
converted to thrombin;
- causes fibrinogen;
to become fibrin;
- meshwork formed;
red blood cells trapped;
scab formed;
- Any seven - 1 mark each** (7)
- (ii) white blood cells;
activated by antigens;
- lymphocytes (agranulocytes);
manufacture antibodies;
destroy bacteria/pathogens;
- phagocytes (granulocytes);
surround bacteria;
digest them;
- Any six - 1 mark each** (6)
- (c) named example;
chemical;
produced by fungi;
- destroys pathogens / bacteria;
little harm to human cells;
- Any three - 1 mark each** max (3)

Total 20 marks

8. (a) (i) contains possible pathogens;
risk of flies transmitting these to food;
may contaminate water supply;
in waterways raises levels of nitrates / phosphates;
eutrophication can occur;
damage to aquatic life;

Any four - 1 mark each

**max
(4)**

- (ii) down slope from village / houses;
down stream from village / housing;

well away from buildings/wells;

hole deep enough;
but not below water table;

concrete sides to prevent collapse;
concrete platform, burrowing vermin / eq;
can be easily cleaned;

cover / lid;
smell;
exclude insects;

walls/roof;
privacy;
mesh for ventilation;

Any ten - 1 mark each

**max
(10)**

- (b) solid matter settles in first chamber;
scum on surface;
contains anaerobic bacteria;
breakdown solids;

second chamber with broken brick etc;
liquid sprinkled on;
ciliates feed of bacteria from first chamber;
aerobic bacteria;
breakdown chemicals such as urea;

Any six - 1 mark each

**max
(6)**

Total 20 marks

9. (a) release of carbon dioxide;
release of sulphur dioxide;
release of other gases / named gas;

heat pollution;
formation of acid rain;
damage to lakes / eq;
damage to vegetation;
damage to buildings / building materials;

breathing problems;
global warming / greenhouse effect;
flooding / loss of land;
climate change;

Any seven - 1 mark each

**max
(7)**

- (b) deforestation to provide land;
drainage of marginal land;
may alter/change habitats / eq;

ref to problems of monoculture;
pollution as a result of use of herbicides *;
pollution as a result of use of insecticides *;
** 1 mark for pesticides if these are missing*

build-up of insecticide / herbicide in environment;

excessive use of fertilisers;
eutrophication;
algal bloom;
anaerobic conditions;
death of aquatic animals;

Any seven - 1 mark each

**max
(7)**

- (c) increased demands for land / shortage of land;
need for roads;
need for factories / work places / schools / buildings;

deforestation;
land for food supply;
land for growing fuel;
provision of water supply;
need to extract more raw materials;

extra refuse to dispose of;
extra pollution;

Any six - 1 mark each

**max
(6)**

Total 20 marks