

Mark Scheme January 2007

GCE

GCE O Level Human Biology (7042)

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HUMAN BIOLOGY 7042, MARK SCHEME

Symbols used in marking points

- ; indicates separate mark points
/ indicates alternatives
eq means allow any correct equivalent

Paper 1

1. (a) cell membrane; **NOT** cell wall
nucleus; **max**
cytoplasm; **(2)**
- (b) (i) antibodies; **NOT** antitoxins **(1)**
(ii) clump them together / breakdown cell membrane;
NOT kill **(1)**
- (c) (i) respiration; **(1)**
(ii) mitochondria; **(1)**

Total 6 marks

2. incisor;
molar / premolar;
saliva;
amylase / ptyalin / diastase;
starch;
peristalsis;
protein;
acid / acidic / pH2 / pH3 / low pH;
ileum / duodenum / small intestine; **(9)**

Total 9 marks

3. (a) soya; **(1)**
- (b) add iodine solution / iodine in potassium iodide solution;
look for colour change (orange brown) to blue-black / navy blue /
dark blue / blue-purple; **(2)**
- (c) (thermal) insulation / temperature control;
energy reserves;
nerve insulation / myelin sheath;
cell membranes; **max**
protection for kidney / other valid point; **(2)**
- (d) (i) vitamin C; **(1)**
(ii) tomato / blackcurrant / fruit / named vegetable; **(1)**
- (e) minerals / mineral salts;
roughage / fibre; **(2)**

Total 9 marks

4. (a) (i) ball and socket / universal joint; (1)
(ii) shoulder: movement in 3 planes / all directions / 360°;
elbow: movement in 1 plane (NOT 1 direction) only / up to 180°; (2)
- (b) by ligaments; (1)
- (c) synovial fluid;
acts as lubricant;
cartilage;
smooth / slippery;
prevents wearing away of bones; max
friction causes pain; (4)

Total 8 marks

5. (a) (i) *(Each part must be drawn and labelled correctly)*
lens - must be biconvex;
iris - must be in front of lens and linked to choroid;
suspensory ligaments; (3)
(ii) area indicated for position of pupil; (1)
- (b) iris circular muscles relax;
iris radial muscles contract;
widens pupil;
lets in more light;
correct ref. to rods and cones; max
correct ref. to visual purple; (3)
- (c) ciliary muscles relax;
pull on suspensory ligaments / ligaments taut;
lens becomes thinner / less convex / flatter; max
increases focal length / bends light rays less; (3)

Total 10 marks

6. (a)
- | Description | Letter |
|---|------------|
| <i>Receives oxygenated blood from the lungs</i> | F / G; |
| <i>Has the thickest muscular walls</i> | J; |
| <i>Contains semi-lunar valves</i> | D / E / H; |
| <i>Pumps blood to the lungs</i> | A; |
| <i>Stops the backflow of blood into the heart</i> | H; |
- (5)
- (b) increases muscle in heart;
can pump more blood (per beat) / ref. to stroke volume;
blood with glucose / oxygen carried to muscle; max
(oxygen / glucose) for respiration / release of energy; (2)
- (c) contain less cholesterol / saturated fats;
NOT no cholesterol/ saturated fats
which can be deposited in arteries / narrow / blocks arteries;
can increase body mass so heart has to work harder; max
increased risk of heart attack / eq; (3)

Total 10 marks

7. (a) A - penis;
B - sperm duct / vas deferens;
C - prostate (gland);
D - testis;
E - scrotum; (5)
- (b) urine;
seminal fluid / semen; (2)
- (c) in testis / D / seminiferous tubules; (1)
- (d) sperm / semen cannot pass along tube / sperm duct;
cannot reach ovum / be passed to female reach vagina / uterus;
fertilisation impossible; max (2)

Total 10 marks

8. (a)
- | <i>Gas</i> | <i>Amount in inhaled air</i> | <i>Amount in exhaled air</i> |
|-----------------------|------------------------------|------------------------------|
| <i>Carbon dioxide</i> | <i>0.04%</i> | more / 4%; |
| <i>Nitrogen</i> | <i>79%</i> | no change / 79% / 80%; |
| <i>Oxygen</i> | <i>21%</i> | less / 16%; |
- (3)
- (b) diaphragm (muscles);
intercostal (muscles); NOT internal intercostal muscles (2)
- (c) (i) (on swallowing) epiglottis / flap covers entrance of trachea / cough reflex; (1)
- (ii) mucus layer secreted (by lining of trachea);
mucus traps bacteria;
cilia present on lining cells;
beat to push mucus up / towards throat / away from lungs / out of body; NOT "mucus out" unqualified max (3)

Total 9 marks

9. (a) correct cell drawn, reasonable size; (1)
labels
cell body / nucleus + cytoplasm;
axon;
dendrites;
myelin sheath; max
nodes of Ranvier; (3)
- (b) (i) sensory / afferent (neurone); (1)
(ii) relay / association / intermediate / multipolar neurone; (1)
- (c) (i) synapse; (1)
(ii) diffusion; (1)

Total 8 marks

10. (a) 46 / 23 pairs; (1)
- (b) (i) sex chromosomes would be XY (instead of X) / male has Y chromosome; (1)
- (ii) (ovum) has only 23 chromosomes / one from each pair / half the number of chromosomes / haploid; (1)
- (iii) fertilisation; (1)
- (c)
- | | | | | | |
|-----------|--------|------|--------|--------|--|
| | | male | | female | |
| parent | | XY | | XX; | |
| gametes | X | Y | (X) | X; | |
| | female | male | female | male | |
| offspring | XX | XY | (XX) | (XY); | |
- (phenotypes need only be shown for parents or offspring) max
- correct ratio / percentage; (3)

Total 7 marks

11. (a) plotting poliomyelitis;
plotting heart disease;
points linked correctly;
curves labelled; (4)
- (b) population size may vary / more people more actual deaths;
comparison can be made; (2)
- (c) 120 / 3;
40 times more; (2)
- (d) polio
overall drop; (1)
- improved living conditions;
better treatment for patients;
vaccination; max (2)
- heart disease
(gradual) increase; (1)
- change in diet - qualified;
less exercise / use of vehicles;
increase in smoking; max (2)
- ageing population;

Total 14 marks

PAPER TOTAL 100 MARKS

Paper 2

Section A

Answer any THREE questions

Marks can usually be awarded for suitably annotated diagrams.

1. (a) polymers / folded chains / long chains ;
amino acids;
peptide bonds;
active site explained; max
lock and key idea; (4)
- (b) DNA acts as a code / carries instructions ;
DNA in nucleus;
unzips / opens to reveal base codes reject unwinds ;
enzyme involved;
makes mRNA / forms code of RNA;
transcription;
RNA leaves nucleus / travels to ribosomes;
tRNA attaches to specific amino acid;
using 3 base / codon;
ordering done on ribosome / ordered by mRNA / description;
translation; max
formation of peptide bonds; (9)
- (c) named example;
substrate;
products; max
pH level; (4)
- (d) denatures reject killed;
active site destroyed / shape of active site changed ;
cannot catalyse reaction; max
cannot attach to molecules; (3)

Total 20 marks

2. (a) antagonistic muscles;
* attached to bones by tendons;
* at shoulder blade;
* at ulna / radius;
* biceps muscle / flexor;
* triceps muscle / extensor;
biceps contracts;
triceps relaxes;
arm bends at elbow / pulls on lower arm bones;
ref. to hinge joint;

max
(8)

* can be gained on diagram

- (b) protection;
example e.g. skull/orbit/ribcage & indication of what is protected;

support;
example e.g. vertebral column supports skull;

(red) blood cell production;
example e.g. in cavities of long bones / bone marrow / pelvis/
ribs;

ACCEPT ribcage ;
necessary for attachment of breathing muscles ;

(4)

Any two functions and examples - (2) marks each

- (c) protein;
found in meat / beans / milk / fish / eq ;
for new cells / cytoplasm;
lack of protein leads to stunted growth;
vitamin D;
in dairy products;
required for uptake of calcium;
lack of vitamin D leads to rickets;
calcium / phosphate;
forms calcium phosphate / bone tissue;
lack leads to brittle bones / osteoporosis;

max
(8)

Total 20 marks

3. (a) produces hormones;
ductless; max
releases hormones into the blood; (2)
- (b) (i) on top of the kidneys; (1)
- produces adrenaline;
fight, fright and flight hormone;
redirects blood flow from gut / skin;
to muscles;
body more alert;
increased heart rate;
increased metabolism / respiration ;
increases blood pressure;
increases conversion of glycogen to glucose;
dilation of pupil of eye;
increases breathing rate; max
accept one reference to cortisone + effect; (5)
- (ii) below stomach / above ileum / attached to duodenum; (1)
- controls blood sugar / glucose;
produces insulin;
increases permeability of liver cells;
glucose to glycogen;
glycogen stored in liver;
decreases blood sugar / glucose;
produces glucagon;
glycogen to glucose; max
increases blood sugar / glucose; (7)
- (c) occurs as a result of changes in conditioning;
homeostasis;
changes in hormone levels (correctly described);
reduces enzyme / hormone production;
returning system level to normal; max
example; (4)

Total 20 marks

4. (a) (i) liver removes excess amino acids;
 from blood / hepatic portal vein;
 deaminated / broken down;
 amino group removed;
 combined with carbon dioxide;
 forms urea; max
(6)
 rest of amino acid converted into glucose;
- (ii) old red blood cells;
 haemoglobin broken down / iron removed;
 iron stored; max
(3)
 rest becomes bile pigments;
- (iii) many substances toxic if built up;
 e.g. alcohol / drugs; max
(2)
 broken down into harmless products;
- (b) (i) leaves liver in hepatic vein;
 (dissolved) in plasma;
 to heart (right side);
 through valves;
 via pulmonary artery to lungs;
 return via pulmonary vein;
 to heart (left side); max
(5)
 leaves via aorta to renal artery;
- NB** These points must be in the correct order
- (ii) filtration;
 pressure in glomerulus;
 filtrate into nephron;
 (via wall of) Bowman's capsule;
 reabsorption of materials / water / glucose / selective ;
 material not reabsorbed; max
(4)
 becomes urine;

Total 20 marks

5. (a) placenta is site of exchange of materials (between fetus and mother);
disc like (to fit on to uterus wall);
villi / description ;
large surface area (for exchange);
good blood supply;
thin barrier; max
(4)
- (b) soluble / small food molecules;
diffuse through;
down concentration gradient;
explanation of how concentration gradient is achieved;
through thin walls;
example of food;
second example;
from mother's to fetal blood;
oxygen leaves maternal haemoglobin;
passes into fetal haemoglobin; max
(6)
- (c) pelvic girdle cradles fetus;
abdominal wall muscular layer;
amnion;
amniotic fluid;
spreads pressure / has cushioning effect / shock absorber;
mucus plug prevents microbes entering womb;
protection from high pressure of mothers blood; max
(4)
- (d) (i) fetus receives one allele from each parent / mother only has O allele;
father has A or B allele;
at fertilisation;
50 : 50 chance;
O allele recessive to both A and B; max
(4)
- (ii) no chance;
fetus receives one allele from each parent / mother only has O allele / no A or B allele;

Total 20 marks

Section B

Answer any TWO questions

6. (a) microscopic / very small / reference to size;
has a protein coat / capsid / capsomere;
DNA / RNA strand;
some means of attaching itself to another cell;
some means of entering another cell;
any 4 of the above points
- only reproduces when in cell / living organism;
does not carry out all other characteristics of living things;
can appear inert / crystalline;
any 2 of the above points max
(6)
- (b) name of disease;
how enters host;
site of infection; (3)
- (c) (i) provide immunity;
injecting treated / altered / weakened virus;
does not cause disease symptoms;
acts as antigen;
stimulates antibody production;
by white cells;
memory cells formed;
antibodies specific;
produced quicker if further infection occurs;
destroy virus before population builds up;
causing illness; max
(7)
- (ii) if sexually transmitted, avoid multiple partners;
use a condom during intercourse;
don't share needles / sterilize needles;
monitor blood samples at transfusion centres;
avoid crowded places as droplet infection possible;
improve sanitation;
examples of other hygienic measures;
quarantine; max
(4)
improved diet;

Total 20 marks

7. (a) (i) sand;
above gravel / stone / brick;
algae and bacteria form jelly layer;
slow filter has organisms;
feed on bacteria / pathogens;
fast filter has alum gel;
traps bacteria / pathogens; max
(5)
- (ii) chlorine;
added to water;
kills bacteria;
by oxidation; max
(3)
- (iii) covered reservoirs;
prevent contamination;
distributed in (closed) pipes;
by gravity / pumps; max
(3)
- (b) mosquito is vector;
for *Plasmodium*;
eggs laid in water;
larvae / pupae develop there;
drain pond;
oil or cover prevents eggs being laid;
oil kills / prevents gaseous exchange of larvae / pupae;
could add fish;
bacillus thuringiensis;
eat larvae / pupae;
spray insecticides;
reduces number of adult mosquitoes;
so reduces number of humans bitten / infected;
use of nets / screens; max
(9)
adults cannot reach humans;

Total 20 marks

8. (a) clotting;
platelets initiate clotting process;
thrombokinas released;
prothrombin;
converted to thrombin;
converts fibrinogen;
to insoluble fibrin mesh;
closes cut / scab forms;
red cells trapped in mesh;
reference to role of vitamin K / Ca^{2+} ; max
(6)
- (b) white blood cells travel to cut area;
phagocytes engulfs bacteria;
digest bacteria;
before they can reproduce;
lymphocytes / granulocytes inactivate bacteria / produce
antibodies;
immunity / remain in blood;
reference to antitoxins; max
(6)
- (c) blinking;
reflex action / automatic;
quick;
eyelids cover eye surface;
tear fluid formed;
washes particles away;
into tear duct; max
(6)
- (d) melanin production / production;
absorbs uv light;
reduces radiation entering skin;
prevents damage to liver cells; max
(2)

Total 20 marks

9. (a) (i) photosynthesis;
in leaves of green plants;
(contain) chlorophyll;
traps sunlight / light energy;
converted to chemical energy;
combines carbon dioxide and water;
to form glucose;
converted to starch; max
(6)
- ACCEPT points on annotated diagram / equation;
- (ii) organism can trap sunlight;
transfers light into chemical energy;
base of a food chain / produces own food;
producing food for other organisms / eaten by other
organisms; max
(3)
- (iii) starts with green plant / named example;
herbivore / named example;
consumer to human; max
(3)
arrows in correct direction;
- (b) (i) wash chicken;
wash utensils and table / board / hands;
giblets removed;
(carcass) stored in fridge freeze;
at temp below 4 °C;
defrost thoroughly;
cook at high temperature; max
(4)
keep covered until cool to eat;
- (ii) flies settle on it;
bacteria added to food;
bacteria reproduce;
produce toxins;
spoil food;
infect human on eating;
food poisoning / vomiting & diarrhoea; max
(4)
possible other diseases;

Total 20 marks

PAPER TOTAL 100 MARKS

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