

# Mark Scheme January 2007

GCE

GCE O Level Human Biology (7042)



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## HUMAN BIOLOGY 7042, MARK SCHEME

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### 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 max  
nucleus; (2)  
cytoplasm;
- (b) (i) antibodies; **NOT** antitoxins (1)  
(ii) clump them together / breakdown cell membrane; (1)  
**NOT** kill
- (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; max  
 fertilisation impossible; (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  
(4)  
lock and key idea;
- (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  
(9)  
formation of peptide bonds;
- (c) named example;  
substrate;  
products; max  
(4)  
pH level;
- (d) denatures reject killed;  
active site destroyed / shape of active site changed ;  
cannot catalyse reaction; max  
(3)  
cannot attach to molecules;

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;  
thrombokinase 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;  
arrows in correct direction; max  
(3)
- (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;  
possible other diseases; max  
(4)

Total 20 marks

PAPER TOTAL 100 MARKS



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