QUESTIONSHEET 1

(a)

	The person produces an immune response	The person produces memory cells	The immunity can be acquired naturally and artificially
Passive immunity	✗	✗	✓ ;
Active immunity	✓	✓	✓ ;

One mark per correct row. **2**

(b) living but modified microorganism;
given heat/chemical treatment;
reduced reproduction rate/eq.; **max 2**

(c) more closely resembles a real infection;
provokes a better immune response/killed organisms may have modified antigens;
smaller initial inoculum needed;
immunity is longer lasting; **max 2**

TOTAL 6

QUESTIONSHEET 2

(a) (i) C;

(ii) B; **2**

(b) infects red blood cells or lives/reproduces inside red blood cells;
and in liver cells;
antigens (on surface) not exposed to/hidden from immune system/eq.;
different stages have different antigenic groups;
keeps changing its antigenic groups; **max 3**

(c) advantage: surrounded by <u>digested</u> food materials/sugars for respiration/amino acids for growth/eq.;
disadvantage: exposed to digestive enzymes/extreme pHs; **2**

TOTAL 7

QUESTIONSHEET 3

(a) (i) antigen/eq. on surface of virus;
fits with/locates onto/eq. receptor molecule on T cell; **2**

(ii) X: reverse transcriptase;
enzyme catalyses/promotes transcription/synthesis of DNA from (viral) RNA; **2**

Y: DNA polymerase;
assembles single stranded DNA into double stranded DNA; **2**

(iii) viral DNA transcribes messenger RNA;
and new viral RNA;
messenger RNA carries code for amino acids as triplets of bases/codons;
to ribosomes;
viral protein assembled;
viral protein and viral RNA assembled into new virions/virus particles; **max 4**

(b) (i) globular protein;
produced in response to a specific antigen;
by B lymphocytes; **max 2**

(ii) mix HIV antigens with sample of patient's blood;
look for evidence of agglutination/reaction; **2**

(iii) virus multiplies rapidly;
so many T cells destroyed/virus causes T-helper cell/lymphocytes to lyse;
T-helper cells induce B-lymphocytes to secrete antibodies/ref interleukins;
thus antibody formation is impared (fall on graph);
thus more susceptible to infection/virus causing tumours; **max 3**

TOTAL 17

QUESTIONSHEET 4

(a) blockage/build up of fatty material/atheroma/lipids;
in coronary arteries/arteries which supply the heart;
resulting in heart muscle/myocardium receiving insufficient oxygen; **max 2**

(b) (i) (risk of) mortality from CHD increases in diabetics;
for both sexes; **2**

(ii) transport cholesterol to liver for metabolism;
therefore lower cholesterol levels;
thus reduce the risk of developing atheroma/plaque; **max 2**

(c) between the ages 20 - 50 men have higher LDL cholesterol levels;
possible explanation for higher CHD mortality rate;
due to greater likelihood of developing atheroma/plaque; **max 2**

(d) smoking;
genetic;
hypertension;
obesity;
synthetic oestrogens/contraceptive pill; **max 2**

TOTAL 10

QUESTIONSHEET 5

(a) (i) plasma cells; **1**

(ii) binding sites attach to recognition sites/antigenic sites on bacteria/viruses/pathogens;
hinges allow antibody 'arms' to close or spread;
enables attachment to antigens at different distances apart/gives ability to cope with variability of the bacteria/viruses;
antibody molecules tend to group together/form groups of five;
(thus) can clump bacteria/viruses together into masses;
which can then be phagocytosed/ingested by macrophages; **max 4**

(iii) secrete interleukins;
(this) induces antibody formation by plasma cells/descendents of B-cells;
(this) stimulates the multiplication of killer T-cells;
(and) the differentiation of more killer T-cells (at the site of infection); **max 3**

(b) memory cells (stored in the lymphatic tissue) recognise the original antigen;
if the same pathogen infects the body at a later date, the memory cells bring about a much faster/larger response;
thus the pathogen is destroyed before symptoms are noticable;
ref to memory T-cells and memory B-cells; **max 3**

TOTAL 11

QUESTIONSHEET 6

(a) (i) antibiotics do not act against viruses;
since antibiotics cannot enter cells/cross cell membranes (and viruses are inside the cells);
constant exposure of bacteria to antibiotics selects resistant strains;
which arise by gene mutation;
thus reducing the effectiveness of the antibiotics when they are required/puts patients at risk/makes treatment more difficult;
will also save money since antibiotics are expensive/makes money available for other treatments; **max 3**

(ii) ref to need to maintain antibiotic concentration (in patient) high enough for long enough;
to kill all infecting bacteria/some bacteria may take longer than others to be killed;
some antibiotics only inhibit bacterial growth/are bacteriostatic, giving a chance for the immune response to kill the bacteria;
if the treatment stops too soon residual populations of the bacteria may multiply causing reinfection;
these bacteria may also acquire antibiotic resistance; **max 3**

(iii) intravenous injection enables a high concentration of antibiotic to reach the bacteria (almost) immediately;
important if bacteria are multiplying quickly/dangerous/liable to overwhelm patient/ref bacterial meningitis;
tablets take time to be absorbed into blood/diluted by gut contents/takes longer to reach bacteria in adequate concentrations;
max 2

(b) should have minimum side effects/not cause allergic responses;
must be able to reach site of infection in adequate concentrations;
should be effective within a reasonable time period;
must not interact with other drugs being taken (by the patient);
should be effectively bacteriocidal/bacteriostatic against the infecting bacteria;
should not be rapidly broken down by the body/body's metabolism/should not form harmful byproducts; **max 3**

TOTAL 11

QUESTIONSHEET 7

(a) bacteria + any named bacterial disease/diphtheria/whooping cough/tetanus;
viruses + any named viral disease/polio/measles/mumps/AIDS/chicken pox;
protozoa + any named protozoal disease/malaria/amoebic dysentery/sleeping sickness;
fungi + any named fungal disease/ringworm/farmer's lung/Aspergillosis/thrush; **4**

(b) (name of condition = 1, cause/defect = 1)
Down's syndrome; trisomy 21/non-disjunction;
Turner's syndrome; XO/non-disjunction;
Klinefelter's syndrome; XXY/non-disjunction; **max 2**

(c) diabetes (mellitus)/sugar diabetes;
failure to produce insulin/insulin does not work properly;
insufficient (blood) glucose converted to (liver/muscle) glycogen;
(thus) blood glucose level raised/glucose leaks into urine;
ref to possible ketosis/formation of ketone bodies; (accept other diseases with appropriate comments) **max 4**

(d) diseases due to inadequate diet;
kwashiorkor is due to a lack of dietary protein/lack of essential amino acids;
marasmus is due to a lack of dietary protein and calories; **max 2**

(e) ionising radiation/α- rays/β- rays/γ- rays/X- rays;
mutagenic chemicals/mustard gas/dioxane/any correct example; **2**

(f) (i) greater chance of developing bronchitis/chronic lung infections/pneumonia;
greater chance of developing emphysema/degeneration of elastic tissue in lungs;
greater chance of developing lung cancer;
greater chance of developing heart disease/peptic ulcers/gangrene; **max 3**

(ii) increased risk of gastritis/inflammation/irritation of the stomach lining;
development of obesity (since alcohol contains a lot of calories);
development of liver damage/cirrhosis;
development of dementia/loss of mental ability (since alcohol destroys brain cells);
risk of malnutrition/lack of vitamin/protein intake (since alcohol suppresses appetite); **max 3**

(g) hay fever;
allergy to penicillin;
food allergy/allergy to nuts/allergy to gluten/any other correct example; **max 2**

TOTAL 22

QUESTIONSHEET 8

(a) (i) antibiotic is produced by microorganisms/fungi/bacteria;
will kill/inhibit the growth of other microorganisms;
antibodies are produced by cells/B-lymphocytes of the immune system;
bind specifically to pathogens/bacteria/viruses causing their destruction;
antibiotics are non-protein chemicals, antibodies are protein/gamma-globulins; **max 4**

(ii) antibiotic injected into blood is carried directly to the infected tissue;
only has to leak through the capillary walls in the tissue;
thus a high concentration is achieved quickly (but does not last as long);
antibiotic injected into muscle has to be absorbed into blood capillaries (of muscle);
and released from blood capillaries in infected tissue;
thus levels do not rise as high but last longer (than when injected into blood);
antibiotic/tablet taken by mouth gets diluted by gut contents/has to dissolve;
has to be absorbed through gut wall to blood and then released to infected tissue;
thus lower concentrations obtained but the effect lasts longest; **max 6**

(iii) broad spectrum antibiotics act against a wide range of microorganisms;
used when it is not essential to identify the infecting organism/eliminate the need for laboratory testing to identify the organism;
narrow spectrum antibiotics only act on a small range of microorganisms;
used when the infecting organism has been identified/is known;
ref to use of broad spectrum antibiotics being more likely to result in development of antibiotic resistance/
narrow spectrum antibiotics less likely to result in development of antibiotic resistance; **max 3**

(b) to give passive immunity/immediate immunity;
when there has been a possible infection of tetanus/rabies/any other correct example;
when there is a risk that the body would succumb to the infection before active immunity could develop;
gives short term protection only/protects body until active immunity can develop;
ref to snake anti-venoms; **max 3**

TOTAL 16

QUESTIONSHEET 9

(a) HIV is an RNA virus/retrovirus;
reverse transcriptase makes viral/copy DNA from the viral RNA;
this viral DNA inserts itself into the host cell DNA/chromosomes;
can remain latent in host DNA until activated; **max 3**

(b) HIV cells only grow in/infect T-helper cells/T_4 cells;
bind specifically to the CD4 surface protein on T-helper cells;
insects do not contain T-helper cells/T_4 cells/CD4 surface proteins;
any HIV viruses in blood meals will be destroyed/digested by insect digestive juices;
Anopheline mosquito has the necessary recognition factors/receptors to carry Plasmodium; **max 3**

(c) cat HIV viruses have different surface antigens to human HIV virus;
thus do not/cannot attach to the CD4 protein/acceptors on T-helper cells; **2**

(d) HIV viruses infect T-helper cells thus reducing their activity/destroying them;
ref interleukin production;
T-helper cells normally stimulate antibody production by B-lymphocytes/plasma cells;
stimulate greater production of T-killer cells;
thus antibody response/cytotoxic response of body is diminished; **max 3**

TOTAL 11

QUESTIONSHEET 10

(a) retains a high sodium concentration in the lumen;
thus osmotcally retains water/draws more water into gut from blood; **2**

(b) enables glucose and sodium channel to work thus enhancing solute uptake;
thus water taken from the gut to blood osmotically; **2**

(c) no;
extra glucose would hold water in the lumen by osmosis; **2**

(d) yes;
starch osmotically inactive and will release glucose over a longer time; **2**

TOTAL 8

QUESTIONSHEET 11

(a) plaque causes narrowing of artery/lumen;
impedes flow of blood to heart muscle;
increases risk of clot/increases blood pressure;
heart muscle will die (heart attack) if O_2 supply reduced too much; **max 3**

(b) smoking;
high levels of blood cholesterol;
high alcohol intake;
high levels of LDLs;
diabetes mellitus ;
genetic;
age; **max 4**

(c) dilation/relaxation of arteries reduces blood pressure;
reduces workload of heart;
therefore reduces oxygen demand of heart;
dilation of coronary arteries improve blood supply to heart muscle; **max 3**

TOTAL 10

QUESTIONSHEET 12

(a) Any two from:
diabetes mellitus/high blood level of low-density lipoprotein (LDL)/high blood cholesterol level/ hypertension;; **2**

(b) synergistic effect with other factors;
smoking reduces HDL:LDL ratio;
smoking increases blood pressure;/heart rate/cardiac output/ vasoconstriction of peripheral arteries/blood glyceride concentrations;
CO binds to haemoglobin/myoglobin/cytochrome oxidase;
CO may increase permeability of endothelium of coronary arteries;
nicotine may directly damage endothelium of coronary arteries;
smoking increases platelet aggregation/adhesiveness/blood viscosity; **max 5**

(c) (i) chest pains which radiate down left arm/ref. referred pain;
breathlessness/muscular weakness/profound tiredness; **max 1**

(ii) shortage of oxygen/glucose in the heart muscle;
due to impeded/reduced blood flow;
heart muscle becomes severely fatigued/cramp; **max 2**

TOTAL 10