QUESTIONSHEET 1

(a) (i) Any two of : smaller number of alveoli/
larger air space per alveolus/
thicker walls of alveoli;; **2**

(ii) number of breaths per minute increases due to smaller capacity/vital capacity;
and due to build up of blood CO_2/HCO_3^- tension stimulating ventilation;
breaths shallower/less volume per breath due to reduced elasticity;
less gas exchanged due to reduced surface area; **max 3**

(b) less oxygen circulating in the blood due to reduced gas exchange;
(thus) respiration impeded/slowed up;
(thus) less energy/ATP available for muscle activity; **max 2**

(c) smoking;
air pollution/dust from industry;
ref genetics/potential to develop α-1 antitrypsin deficiency/inherited emphysema; **max 2**

TOTAL 9

QUESTIONSHEET 2

(a) (i) deposits of fat (atheroma) in the epithelium/endothelium/between epithelium/endothelium and muscle layers;
wall thickness increased;
the epithelium/endothelium is ruptured; **max 2**

(ii) increases blood pressure;
narrower lumen increases friction/ resistance/restriction on blood flow; **2**

(b) increases the level of blood cholesterol/lipids;
increases the ratio of LDLs to HDLs;
increases the rate of deposition of fats/damage due to free radicals in artery walls; **max 2**

(c) animals fats have more saturated fats and cholesterol/LDLs than plants;
these fats increase the chances of developing atheroma; **2**

(d) reduces blood flow to the heart;
less oxygen to heart muscle; **3**
muscle dies/ myocardial infarction/causes pain of angina;

(e) tissue type/cell surface proteins/cell antigens of donor different to recipient;
stimulates T-lymphocytes;
cytotoxic cells/ T-lymphocytes kill cells of donor organ;
ref to important to try and get a good tissue match; **max 3**

TOTAL 14

QUESTIONSHEET 3

(a) (i) $\frac{82}{(1.6)^2}$
=32.03; (accept 32.0) **2**

(ii) regular exercise increases the metabolic rate thus using more energy;
during exercise more energy may be used from food/reserves;
sugar and fat are high value energy sources so reduce intake;
if energy intake does not meet energy demands;
more fat/sugar reserves will be used (leading to weight reduction); **max 4**

(b) may be risk of deficiency diseases;
example of deficiency and effect on body (vitamin D, protein, fatty acids);
lethargy due to lack of energy to meet metabolic needs;
lower body temperature/feeling cold as too little subcutaneous fat for insulation; **max 2**

TOTAL 8

QUESTIONSHEET 4

(a) (i) exhaled air contains droplets of water containing the bacteria;
infected droplets inhaled by another person; **2**

(ii) more risk of breathing infected air droplets; **1**

(iii) spit contains bacteria which would form spores;
spores would be in the air/on surfaces and could infect many people; **2**

(b) (i) scars/damaged tissues absorb X-ray differently/have greater absorption/show as shadows; **1**

(ii) detected people in early stages so treatment more successful;
large number of people tested enabled more infected people to be treated;
ref to very quick method of screening so many people could be tested; **max 2**

(c) may visit a country where TB is still common;
ref to 'herd' effect/large number vaccinated gives protection to whole population; **2**

(d) antibiotics specifically attack/kill bacteria; **1**

TOTAL 11

QUESTIONSHEET 5

3

(a) 100 nm = 36mm and diameter of HIV = 52 mm; (allow ± 0.5 mm)

$\text{diameter} = \frac{52}{36} \times 100$; = 144 nm ;

(b) (i) RNA; **1**

(ii) allows a DNA copy to be made of RNA; **1**

(c) (i) helper T-Cells/T-lymphocytes; **1**

(ii) virus RNA used to make virus DNA;
virus DNA integrates into cell DNA;
correct enzyme reference, eg. action of reverse transcriptase/DNA polymerase/RNA polymerase;
virus DNA codes for production of new virus proteins/RNA;
viruses assembled inside T-lymphocyte; **max 4**

(d) virus DNA may remain inactive in host DNA/latent virus; **1**

(e) keeping to one sexual partner so less risk of transmission in semen/vaginal secretions;
screening/treatment of blood/blood products so virus is removed/killed;
drug users do not share needles/syringes so no blood passes between people; **max 2**

TOTAL 13

QUESTIONSHEET 6

(a) (i) rapid fall of deaths per thousand from 1.4 to 0.6/number of deaths (more than) halve in first five years;
decreases more slowly in next 10 years from 0.6 to 0.2;
levels off at around 0.2 deaths per thousand; **3**

(ii) carcinogens/deposits/ named deposit take time to remove from lungs;
cancers already present due to exposure to carcinogens before stopping smoking;
lung damage due to smoking takes long time to repair; **max 2**

(b) (i) more people smoke in developing countries;
fewer controls on industrial emissions in developing countries; **2**

(ii) in developing countries people more likely to die of communicable diseases;
developed countries people live longer so more likely to die of cancer;
in developed countries better diagnosis of cancer as cause of death; **max 2**

TOTAL 9

QUESTIONSHEET 7

(a) (i) only affects cell walls which are not present in human cells; **1**

(ii) affects protein synthesis is human cells;
bone marrow cells constantly growing/dividing so have high level of protein synthesis/may inhibit red/white cell formation; **2**

(b) (i) cancer cells have a higher rate of replication/DNA synthesis than normal cells;
drug would therefore kill more cancer cells than human cells; **2**

(ii) drug can be attached to the antibody;
cancer cells produce different cell surface proteins/antigens to normal body cells;
monoclonal antibody to cancer antigens would bind only to cancer cells; **3**

(c) viruses are inside the infected cells;
antibiotics cannot pass/penetrate the cell membranes (and so cannot reach the virus); **max 1**

TOTAL 9

QUESTIONSHEET 8

(a) (i) as body mass increases protein requirement increases;
until growth is complete;
increases as used to produce new cells/protoplasm/cytoplasm;
levels out at quantity needed to repair/replace cells in adult; **max 3**

(ii) males have a higher metabolic rate and use some protein for energy release;
male bodies are larger than female bodies after age 16-18 and so more growth/repair;
male bodies generally make more muscle than female bodies; **max 2**

(b) (i) 0-1 = $\frac{3850}{8}$; 7-9 = $\frac{8775}{25}$;
= 481.25; = 351; (units not needed since given in question) **4**

(ii) growth rate faster in first year of life;
greater energy (per unit body mass) needed to supply energy for growth;
protein synthesis requires energy/ATP; **max 2**

(iii) adolescent growth/puberty occurs later in males (than females)/converse; **1**

(c) energy requirement much higher because work uses muscles which require energy for contraction;
protein slightly higher as more likely to damage tissue which uses protein for repair;
regular use of muscles tends to make muscles grow/get larger; **max 2**

TOTAL 14

QUESTIONSHEET 9

(a) (i) 3 (glasses);
each glass = $\frac{12 \times 15}{8}$ = 22.5 mg ; (amount 1 glass of wine raises blood alcohol level)
3 x 22.5 = 67.5 mg which does not exceed the legal limit / 4 x 22.5 = 90 mg exceeds limit; **3**

(ii) depresses brain function by inhibiting the cerebral cortex/reticular activating system;
leads to lack of coordination/judgment/fine control of muscles;
driver responds more slowly to traffic/loses concentration/takes risks; **3**

(b) alcohol increases the risk of women having an accident more than men;
men have more body mass to absorb/metabolise the alcohol;
men produce more of an enzyme which breaks down the alcohol;
ref to alcohol dehydrogenase; **max 3**

(c) (i) alcohol kills liver cells/increases risk of hepatitis/cirrhosis;
cells replaced by fibrous tissue/cells swollen by fat;
liver cells therefore unable to remove break-down products/bile pigments accumulate; **3**

(ii) brain cells shrink due to dehydration;
capillaries may be blocked by blood clots;
cells may die due to lack of oxygen;
loss of short term memory/loss of capacity to learn new tasks/solve problems;
brain damage can result in behavioural problems/dependency; **max 4**

TOTAL 16

QUESTIONSHEET 10

(a) (i) in a normal person the concentration of LDH_2 is higher than that of LDH_1;
in myocardial infarction this is reversed; **2**

(ii) they are similar/isomers; **1**

(b) (i) converts lactic acid (back) to pyruvic acid;
when oxygen debt in muscle is recovered/muscle rests allowing enough oxygen in to meet requirements; **2**

(ii) in infarction coronary blood supply to heart muscle is impaired;
thus oxygen supply impaired and pyruvic acid converted to lactic acid;
ref to oxygen debt;
more lactic acid formation means more lactic dehydrogenase required; **max 3**

TOTAL 8

QUESTIONSHEET 11

(a) the ability of a pathogen to induce/cause disease; **1**

(b) invasiveness is the ability of a pathogen to invade/infect organisms, tissues and cells;
and to grow/multiply within them;
toxigenicity is the ability to produce chemicals that are toxic to the host;
may be a metabolic product of live bacteria;
may be released upon bacterial death; **max 4**

(c) endotoxins found in cell walls of Gram negative bacteria;
usually only released on bacterial death;
made of a lipopolysaccharide with a toxic sequence of fatty acids (called lipid A);
exotoxins are produced by both Gram positive and Gram negative bacteria;
consist of a specific protein component that attaches to a target cell;
a toxic component that enters the cell causing damage; **max 4**

(d) Exotoxin - Staphylococcus;
Endotoxin - Salmonella; **2**

TOTAL 11

QUESTIONSHEET 12

(a) A = (iii); B = (v); C = (iv); D = (ii); E = (i); **5**

(b) A = (v); B = (i); C = (iv); D = (ii); E = (iii); **5**

(c) A = (iii); B = (v); C = (ii); D = (iv); E = (i); F = (vi); **6**

TOTAL 16