

1. obese;  
iron;  
haemoglobin;

[3]

2. 24.7;;

*If answer incorrect or to the wrong number of dp, then*

**ALLOW** one mark for working:  $69 \div 1.67^2$

*24.74 = one mark*

**IGNORE** 25 and look for working mark

*If units are given, they **must** be  $\text{kg m}^{-2}$  (or  $\text{kg/m}^2$ )*

*Max 1 for incorrect units*

[2]

3. (i) overweight / borderline overweight;

**DO NOT CREDIT** if more than one answer given

1

- (ii) 1 very close to border / AW;

**DO NOT CREDIT** mistake reading graph

- 2 graph does not distinguish between male and female;

- 3 does not measure actual fat / AW;

- 4 has, more / less, muscle / bone (than normal)

**OR**

(does not take into account) muscle / bone, mass / density / weight;

*Must refer to idea of amount of muscle / bone being different from normal.*

**DO NOT CREDIT** muscle / bone unqualified

**CREDIT** has osteoporosis as ref. to different bone density

- 5 muscle / bone, heavier / denser, than fat / AW;

- 6 pregnant;

2 max

[3]

4. 1 coronary heart disease / CHD / atherosclerosis / angina /  
coronary thrombosis / myocardial infarction / heart attack /  
cardiac arrest / cardiovascular disease / stroke;  
*DO NOT CREDIT heart disease alone / arteriosclerosis*
- 2 (osteo)arthritis;  
*DO NOT CREDIT rheumatoid arthritis*
- 3 (Type 2) diabetes;  
*DO NOT CREDIT Type 1 diabetes*
- 4 high blood pressure / hypertension;
- 5 gallstones;
- 6 cancer;  
*ACCEPT any type of cancer*

[2]

5. (i) (diagram shows that some) individuals have more than one risk factor;  
*DO NOT CREDIT CHD is multifactorial*

1

- (ii) *Mark the 1<sup>st</sup> answer on each numbered line.*

- 1 high, saturated / animal, fat diet;  
*ACCEPT absence of polyunsaturated fats*
- 2 high salt intake;
- 3 (diet) low in (named) antioxidants / vitamin A / vitamin C / vitamin E;
- 4 obesity;
- 5 genetic / heredity / inherited / ethnicity / race;
- 6 gender / sex;
- 7 excess alcohol consumption;  
*must indicate, excess / high levels*
- 8 (increasing) age;
- 9 diabetes;
- 10 stress;

2 max

(iii)

**DO NOT CREDIT** hybrid ticks  
**IGNORE** crosses in the 'blank' boxes

effect	nicotine	carbon monoxide
increases heart rate	✓	
constricts arterioles	✓	
damages the lining of arteries		✓
reduces the ability of haemoglobin to carry oxygen		✓
makes platelets sticky	✓	

4

[7]

6. 1 damage to endothelium;
- 2 LDLs contain, saturated fat / cholesterol;  
**DO NOT CREDIT** moves / transports  
**CREDIT** LDLs are protein **and** saturated fat / cholesterol
- 3 LDLs collect at site of damage;  
*must be stated*
- 4 fatty substances / cholesterol / LDLs, deposited, in artery wall / under endothelium;  
**ACCEPT** fats / lipids  
**ACCEPT** under lining of artery wall  
**DO NOT CREDIT** veins / vessels / capillaries

[2]

7. 1 increases size / AW, of lumen;  
*ACCEPT reduces blockage in lumen*
- 2 increases / eases / decreases resistance to, blood flow;  
*ACCEPT 'more blood' / 'blood flows more freely' /  
 'blood flows as normal' / 'quicker blood flow'*
- 3 (therefore) more, O<sub>2</sub> / glucose;  
*needs idea of more oxygen (than before operation)  
 CREDIT idea of preventing oxygen starvation*
- 4 for aerobic respiration;
- 5 in, heart muscle / cardiac muscle / myocardium;
- 6 more CO<sub>2</sub> removed;  
*'more oxygenated blood' gets mark points 2 and 3*

[4]

8. (a) (i) Plasmodium;  
*Look for correct spelling of generic name but do not  
 penalise the use of lower case initial letter.  
 We are not looking for specific name(s), so IGNORE  
 species name.  
 So e.g. Plasmodium falciparum should be credited  
 but NOT P. falciparum / P. vivax / P. ovale / P. malariae*

1

- (ii) female Anopheles;  
*CREDIT phonetic spelling but genus must be correct*

1

- (iii) hepatocyte / liver (cell);  
 erythrocyte / red blood (cell);  
*If a choice of answers is given do not credit unless both  
 are valid.  
 DO NOT CREDIT 'RBC' as this is not a name*

1 max

- (b) (i) humoral response;
- (ii) (B) cell / lymphocyte,  
 has antigen receptor / carries antibody on its surface;
- (iii) specific to / matches / complementary to, only one antigen;
- (iv) clonal selection;
- (v) selection / activation, of, appropriate / specific,  
 B lymphocyte / B cell;
- (vi) by, macrophages / antigen presenting cells / dendritic cells /

- T helper cells / cytokines / interleukins;
- (vii) clonal expansion;
- (viii) (selected cell) divides by mitosis / clones;
- (ix) (B) cells, differentiate / specialise;
- (x) (B cells) form, plasma / effector, cells;
- (xi) (which) secrete / produce, antibodies;
- ACCEPT** 'forms antigen-antibody complex'
- (xii) antibodies are, specific / complementary, to antigen;
- (xiii) (B cells) form memory cells;
- (xiv) **Either** (memory cells) long-lived / remain in circulation / remain in body / provide immunological memory  
**or** (provides) secondary response  
**or** faster / stronger, response to subsequent exposure (of same antigen / pathogen / parasite);

**DO NOT CREDIT** ref to disease alone

7 max

**QWC** ~ correct sequence;

*Clonal selection, then clonal expansion, then differentiation (stages named or described)*

*Use the QWC tool to indicate these in the correct sequence and add 1 mark to the 7max for content when*

*all 3 stages have been addressed in the correct sequence.*

1

- (c) Assume that candidates are answering in terms of a person leaving the malarial area (unless otherwise stated).

no repeat infections /

no further exposure (to antigen / pathogen / parasite);

no booster / lose immunological memory;

**DO NOT CREDIT** disease / malaria / bacterium / virus

limited life for memory cells / numbers of memory cells reduce

/ memory cells lost;

so no, secondary response / secondary response described;

**CREDIT** converse points if they answer the question in the context of a person staying in the malarial area.

*e.g. repeat infections;*

*maintain immunological memory;*

*memory cells present;*

*secondary response available;*

2

- (d) different, strains / species / types (*of Plasmodium*);  
different antigens;  
due to, mutation / variation;

**DO NOT CREDIT** 'disease' or 'malaria' unqualified  
**Max 2** if they think it is a virus / bacterium

more than one stage in the life cycle (within human);  
different stages have different antigens;

so will need, a different vaccine / components of vaccine,  
for each, strain / stage;

'different strains will require different vaccines' = 2  
(mp 1 & 6)

(parasite) concealed / hidden, in cells;  
(parasite) only, exposed / in circulation, for short time;

**CREDIT** antigenic concealment

AVP;

*e.g. antigenic, shift / drift*  
*eukaryotes have greater capacity for variation*  
*antigens (on parasite) change over time when in*  
*human*

3

[16]

9. (i) named component of cigarette smoke  
(correctly linked to a stated problem);

*tar, hydrogen cyanide, carbon monoxide (but NOT in context of*  
*Hb), ammonia, sulphur dioxide*

destroy / paralyse, cilia;  
mucus not removed;

*tar*

over-active goblet cells / extra mucus produced;

(accumulation of mucus) leads to, infections / bronchitis;

*e.g. 'tar destroys cilia' = 2*  
*(1 for this mark, linking the component with a stated*  
*problem, and also the mark for destroying cilia)*

**DO NOT CREDIT** tar more than once

**IGNORE** nicotine

neutrophils / phagocytes / macrophages / monocytes (invade);  
 secrete, enzyme / elastase;  
 elastin / elastic fibres, digested / destroyed;  
 low(er) level of, elastase inhibitor /  $\alpha$  antitrypsinase;  
 alveoli fail to recoil;  
 constriction of (terminal) bronchioles;  
 (so) coughing / forced expiration, causes alveoli to burst;  
 reduced surface area;

**ALLOW** white blood cells

**DO NOT CREDIT** lymphocytes

**CREDIT** formation of scar tissue / fibrosis

5 max

**QWC**;

**Award** if at least 1 mark has been given from each of the mark scheme sections for this question.

Use the **QWC** symbol and add to the content mark(s).

1

- (ii) shortness of breath / shallow breathing /  
 strained breathing / hard to breathe out / wheezing;  
 barrel chest;  
 fatigue / extreme tiredness / cannot exert themselves;  
pulmonary hypertension / high blood pressure to lungs;  
 enlargement of right side of heart;  
 heart failure / congestive cardiac failure / fluid buildup in lungs;  
 cyanosis / skin with blue tinge;

**DO NOT CREDIT** difficulty in breathing / heavy breathing /  
 hard to breathe in

e.g. cannot walk far

**DO NOT CREDIT** heart attack / MI / CHD / COPD

**ALLOW** grey / ashen

**DO NOT CREDIT** pale unqualified

2 max

- (iii) long term / lifelong / persistent;  
 slow onset / takes time for the symptoms to show;  
 (usually) degenerative / gets (progressively) worse;

**ALLOW** no cure / irreversible

**IGNORE** ref to death

2 max

[10]

10. (i) rises in both, initially / until age 15;  
 (always) lower in smoker / higher in non smoker;  
 gap / difference, increases with age;  
 in non smoker, plateaus / flattens / increase slows,  
 after 17 / at 18 or 19;  
 in smoker falls after, 15 / 16;  
 in smoker, trough / fall then rise / minimum / anomaly, at 17;  
 figs to compare;

*Two sets of x and y figures with **units for peak flow rate**  
**at least once** – **must compare**  
**either** peak flow of smoker and non-smoker at same  
 stated age  
**or** peak flow at two different stated ages for same person  
 Could be in the same place or in different parts of the  
 answer*

4 max

- (ii) (initial increase as) lungs grow with age;  
 loss of, elastin / elastic fibres, in alveoli;  
 reduced / no, recoil;  
 decreased diameter of / thicker smooth muscle in /  
 scar tissue in / inflammation of /  
 blockage due to mucus of, (named) airways;  
 increase in resistance to air flow;  
 suitable explanation for, low / anomalous, reading at 17;

*e.g. infection / unreliable (procedure) / asthma  
**IGNORE** ref to increased smoking*

2 max



- (iii) more individuals (male) should be used;  
 replicates / repeat measurements (at one time);  
 calculate, mean / average;  
 identify / deal with, anomalous results;  
 take measurements at more frequent intervals;  
 controlled variable;
- e.g. every 6 months*  
*Suitable examples include but are **not** limited to make sure that ...*
- *same number of cigarettes smoked*
  - *same type of cigarette*
  - *similar level of fitness*
  - *similar, build / body size*
  - *exclude individuals with other respiratory problems (e.g. asthma / bronchitis)*
  - *same exposure to, passive smoking / environmental pollution*
- DO NOT CREDIT** ref to females / (general) health /  
 occupation unqualified / lifestyle

3 max

[9]

11. (i) crush (small amount of) seed pod;  
 add (small volume of) biuret, A / NaOH, and biuret, B / CuSO<sub>4</sub>;  
 positive = colour change from blue to, mauve/purple;

max 2

- (ii) *preparation - allow 2 marks max:*

- 1 crush, samples / leaves and seed pods, separately with water;
- 2 use same mass of each / AW and use same volume of water;
- 3 filter;

*method - allow 4 marks max:*

- 4 add benedict's reagent to filtrate; A CuSO<sub>4</sub> in alkaline solution
- 5 excess reagent used / stated volume;
- 6 same volume added;
- 7 heat in a water bath/ at near boiling;
- 8 for stated time (up to 5 min);

*analysis - allow 2 marks max:*

either

- 9 colour change from blue to green / yellow / orange / red;
- 10 shows increasing concentration of reducing sugar;

or

- 11 use of centrifuge to remove precipitate;
- 12 use of colorimeter to compare intensity of blue colour in liquid portion;
- 13 red filter used in colorimeter;

8

- (iii) humans eat only the seeds so do not gain, nutrition / energy, from, leaves / pods;  
 seeds maybe deficient in (some) essential amino acids;  
 cattle better at digesting, plant matter / seeds / leaves / pods, than humans / AW;  
 meat (from cattle) provides more essential amino acids for humans (than plant material)/AW;  
 cattle also produce milk;  
 AVP; e.g. cattle naturally roam to find food / intensive labour needed for human collection of plant material;

max 3

**[13]**

12. (i) *any three from the following:*  
*award mark only if structure related to suitable function*  
 variable region is antigen binding site; **R** receptors / 'sticky ends' / active site  
 (shape of) variable region specific to antigen / amino acid sequence (of variable region) gives, complementary / matching, shape;  
 hinge region allows flexibility in binding / AW;  
 constant region, for binding to receptors on cells / phagocytes / mast cells;  
 AVP; e.g. disulphide bonds hold polypeptide chains together
- (ii) human and chimp are more closely related;  
 common ancestor is more recent;  
 less time for, mutations / variation, to arise;

3

2

**[5]**

13. (i) *any three from following:*  
 education on HIV / AIDS less effective;  
 sexual attitudes / number of partners;  
 availability of condoms;  
 poverty / poorer / less money;  
 sex industry;  
 less primary health care / less likely to be diagnosed;  
 AVP; e.g. ref to unscreened or untreated blood  
 unsterilised needles or surgical apparatus  
 civil war / rape  
 no alternative to breast feeding  
**R** access to drugs for treatment  
**R** no vaccine  
**R** ref to intravenous drug addiction

3

(ii) *any three from the following:*

to find out where rates, are highest / people are most at risk;  
 to keep track of infection rates over time/ AW;  
 to see where disease is likely to spread / where epidemic most likely;  
 to help research (into how it is spread / into effectiveness of drugs);  
 to allow organisations to provide, aid / health care, where it is needed most;  
 to allow organisations to provide education (about disease) where it is  
 needed most;

AVP; e.g. tourist industry

4

[7]

14. find person who is immune and isolate gene that provides immunity;  
 use gene to find shape of protein that provides immunity and manufacture  
 protein to use as vaccination / cure;

find shape of CD4 receptor;  
 develop drug to block receptor;

max 2

[2]

15. (a) (clinically) obese/obesity; **R** *morbidly obese*

1

(b) *Diet B*

essential fatty acids/linoleic acid/linolenic acid/fat soluble  
 vitamins/A/D /E/K;

*Diet C*

sugars/named sugar/starch; **A** *vitamin C*

2

(c) (i) **B**;

energy intake (of B) is lower ORA;

2

(ii) energy intake is less than energy used ORA;

1

(d) (no fruit may mean) scurvy/described; **R** *vitamin C deficiency unless qualified*

raised, cholesterol/LDL, levels in blood; **R** *intake*  
fatty substances deposited in artery walls/atherosclerosis;

coronary arteries;

narrows lumen;

reduces, blood/oxygen, delivered to heart muscle;

CHD/heart attack/angina;

thrombosis/clot;

raised blood pressure/hypertension;

stroke;

stress on liver;

stress on kidney;

due to excess protein/amino acids/urea;

AVP;

AVP; e.g. deposition of subcutaneous fat/AW

obesity

stress on joints

anorexia/bulimia/obsession on diet

constipation

bowel cancer

hypoglycaemia

giddiness

lethargy/fatigue/tiredness [*but R 'lack of energy'*]

3 max

[9]

16. physical;  
disease/illness/sickness;  
carbohydrates;  
animal/saturated;  
20; **A** *from 20 to 60*  
70;

6

[6]

17. (a) different methods of recording statistics;  
 inaccurate recording of, cause of death/incidence of coronary events;  
 poor diagnosis/ORAs;  
 coronary event may not be CHD;  
 not all (coronary) events cause, mortality/death;  
 higher standard of health care (can prevent deaths)/AW/ORAs;  
 smoking increases chance of death due to a coronary event (cf. Russia and Finland);

AVP; e.g. availability of, equipment/trained staff/drugs  
 speed of medical response  
 different levels of exercise/active lifestyle  
 different levels of obesity  
 different diet  
 different genetic (predisposition)  
 qualified ref to air pollution

3 max

- (b) no relationship between prevalence of smoking and incidence of coronary events; **A statement that country X (Russia) has high prevalence smoking and high incidence of coronary events while country Y (Scotland or Finland) has low prevalence and high incidence**

use of figures to compare;

e.g.: compare China **and** Russia (both about 68% prevalence of smoking but China has 90 (85-95) per 100 000 coronary events, while Russia has 480 (470-490) per 100 000 coronary events)

no relationship between prevalence of smoking and mortality from CHD;  
**A statement that country X (Russia) has high prevalence smoking and high incidence of mortality while country Y (Germany) has high prevalence and low incidence**

use of figures to compare;

e.g.: compare China **and** Russia (both 68% prevalence but China has 110 (105-115) per 100 000 deaths while Russia has 710 (705-715) per 100 000 deaths)

2 max

- (c) *mark comments on government strategy only, reject references to personal steps*

*qualified reference to*

education/advice;

improve diet of population; e.g. food labeling/‘five a day’

screening of population;

reducing levels of obesity in population;

increasing level of exercise in population;

*provision of:*

specialist paramedics;

more/better equipped, ambulances;

more resuscitation equipment; **A** *ref to funding for equipment*

specialist cardiac care in hospitals/AW; **A** *ref to funding for cardiac care*

improved training of medical personnel;

AVP; e.g. provide money for, equipment/training of first aiders,  
in workplace

provide drugs/beta blockers/statins

anti-smoking adverts

tax on tobacco/cigarettes

anti smoking legislation [*eg ban smoking in public places*]

increase funding for research into reducing mortality

legislate to improve quality of food

3 max

[8]

18. (a) plasma/effector; **A B**, *lymphocyte/cell*

1

- (b) (i) bind/attach to antigen;

hold, shape/tertiary structure, of molecule;

hold (polypeptide) chains together/maintain quaternary structure; *max 1*

attach/bind to, phagocyte;

allow molecule to, bend/flex/bind with more than one pathogen/AW;

**R** *allow molecule to move*

4

- (ii) (different antibodies) have different amino acid sequence;

(different antibodies) have different shape;

(different antibodies) fit different antigens;

ref. to specificity/complementary; **A** *lock and key*

2 max

[7]

19. (i) *time taken for*  
antigen presentation/AW;  
clonal selection/AW;  
clonal expansion/AW;  
differentiation (of B cell into plasma cell);  
production of antibodies;  
there are no memory cells;  
AVP; e.g. more detail of one of the above 2 max
- (ii) rise starts between day 31 and 35;  
rise is steeper and rises higher (50au) than first response;  
concentration declines, more slowly/with less steep gradient; 2 max [4]
20. (i) binary fission;  
DNA replicates;  
mitosis;  
membrane forms/cytokinesis;  
two cells produced;  
genetically identical/clones; 2 max
- (ii) one parent only required/no need to find a mate;  
no gametes/no energy wasted producing gametes;  
large numbers of offspring/rapid reproduction;  
spreads (quickly) before destroyed by host immune system/AW;  
AVP; e.g. retain, advantageous alleles/adaptation to environment 2 max [4]
21. (a) persistent chemical/AW;  
builds up in food chains;  
still used in other parts of the world; (and so can still enter ecosystems)  
ref to global cycling;  
AVP; max 2
- (b) to remove weeds from crops to increase yield/AW;  
ref to decreased competition (in crops)/AW;  
quicker and cheaper (than using labourers);  
ref to size of target species;  
ref to specificity of insecticides/ora;  
ref to validity of data in study/ref to comparative data;  
AVP; max 3 [5]

22. Tau-fluvalinate;  
less needed/ref to data with correct units; max 2 [2]
23. (i)  $\frac{105}{(1.7)^2}$ ; **A** 105/2.89  
BMI = 36; **A** 36.3 or 36.33 2
- (ii) BMI is 35 to 39.9; **A** *ecf*  
relative risk of dying is 1.45; **A** *number between 1.4 and 1.5*  
she is, 45%/nearly half as much again, more likely to die from  
cancer than non-obese person; max 2 [4]
24. *read whole statement and decide*  
inherited; **A** hereditary *treat "genetic" as neutral*  
result in a, gradual / progressive, decline of bodily, tissues /  
functions / **AW**; **R** ref to chronic  
TB / AIDS / cholera / cold / influenza / measles / mumps / malaria /  
chicken pox / cervical cancer / leukaemia / **AVP**;  
**A** HIV/AIDS *treat "HIV" as neutral*  
mental / psychiatric / psychotic / neurotic;  
*treat "psychological" as neutral*  
permanent or temporary damage to part of the body / any disease that is  
not mental; **A** harm *treat "wear and tear" as neutral* 5 [5]
25. *accept alternative wording that gives idea of each point*
- 1 identify location where disease is spreading *or* predict, where / when,  
epidemic may arise;
  - 2 identify those at risk / contact tracing;
  - 3 find a way to prevent spread / isolate / quarantine;
  - 4 ref to targeting vaccination;
  - 5 give (individuals) advice on, lifestyle / diet / other named risk factor;
  - 6 qualified ref to targeting funding;



- 7 ensure sufficient, medicines / antibiotics / vaccines / facilities, are  
 8 available;  
 ensure enough medical personnel are available;  
 9 qualified ref to education of population;  
 10 prioritising diseases;  
 11 target screening;  
 12 assess effectiveness of treatment programme; max 3

[3]

26. (a) (i) produce / secrete / release, mucus;  
 prevent collapse of / hold open / support, airways;  
**A** provide shape of bronchus  
**R** gives wall, structure / strength 2
- (ii) cilia, destroyed / damaged; **R** cilia not working  
 (epithelium replaced by) scar tissue / scarring;  
 (smooth) muscle becomes thicker;  
 mucous glands enlarge / larger goblet cells / more goblet cells;  
**R** more mucus secreted  
 inflammation of connective tissue;  
 AVP; idea of tumour if it describes a structural change max 2
- (b) stretch, as air is inhaled / allow alveoli to expand during inhalation;  
 to increase lung volume / surface area;  
 prevents alveoli bursting;  
 (elastic fibres) recoil, as exhale; **R** contract  
 more, complete / rapid, expulsion (from the alveoli); **A** expel more air max 2
- (c) tidal volume is reduced / less air inhaled and exhaled / residual  
 volume is larger / air trapped in alveoli / vital capacity smaller;  
 more difficult to exhale;  
 (as) alveoli cannot, stretch / recoil;  
 rapid / shallow, breathing / breathlessness / wheezing;  
 alveoli may burst;  
 leaves gaps in tissue / larger air spaces / AW;  
 less surface area (for gaseous exchange);  
 blood / haemoglobin, less well oxygenated / less carbon dioxide  
 removed;  
**R** less able to do exercise / need to use oxygen max 4

[10]

27. (i) coronary; 1
- (ii) high concentration of, cholesterol / LDL, in blood;  
 endothelium / lining damaged;  
 deposition (fat / cholesterol) in wall of artery; **R** “on artery”  
ref to plaque / atherosclerosis / atheroma; max 2 **[3]**
28. (i) ref to suitable drug; e.g. anticlotting, blood pressure reducing, diuretic  
 bypass operation;  
 stents fitted;  
 angioplasty / balloon on catheter;  
 AVP; e.g. name of drug  
 extra detail about a named drug or one of above procedures max 2
- (ii) avoid, saturated / animal, fats; **A** cholesterol  
 eat, unsaturated fats / polyunsaturated fats / plant oils / fish oils;  
 qualified ref to, more / regular, exercise;  
 avoid smoking;  
 avoid stress;  
 eat more, fruit / vegetables / antioxidants; **A** moderate intake of red wine  
 reduce weight;  
 reduce alcohol intake;  
 eat more soluble fibre;  
 ref to vitamin D production / exposure to sunlight; max 2 **[4]**
29. (a) *treat fibre / water as neutral*  
 carbohydrates / sugars / polysaccharides;  
 vitamins; 2
- (b) (i) those that must be ingested;  
 those that cannot be synthesised (by the human body); max 1
- (ii) to make, protein / polypeptide / named protein;  
 to make, other / non essential, amino acids;  
**R** use in deamination and respiration  
*treat growth / repair as neutral* max 2

- (c) (i) muscle wasting;  
oedema / described;  
moon face;  
swollen, abdomen / liver (**R** stomach) / extremities / hands  
/ feet / other named part;  
dry / brittle / red / sparse, hair;  
skin dry / flaky;  
low body weight;  
irritability;  
apathy;  
diarrhoea;  
fatty liver;  
loss of appetite;  
tooth decay;  
AVP; e.g. increase in infections, poor immune system,  
loss of muscle strength  
xerophthalmia / poor night vision max 3
- (ii) age they are weaned *or* younger (than 6-18 months),  
fed on milk / breast-fed;  
milk contains proteins;  
food eaten, cereal / starchy / may have less protein /  
poor quality protein;  
AVP; e.g. weaned early as second child on way / AW  
growing quickly so need lots of protein max 2

[10]

30. low % infected in, Western Europe / North America;  
high % infected in Sub-Saharan Africa;  
  
highest % increase in Eastern Europe and Central Asia;  
high % increase in, North Africa / Sub-Saharan Africa / East Asia;  
low % increase in, Western Europe / North America;  
  
figures to illustrate a comparison; max 2

[2]

31. *HIV/AIDS difficult to prevent because...*

- 1 no cure;
- 2 no vaccine;
- 3 high mutation rate / antigenic, shift / drift / change;
- 4 cannot be treated with antibiotics;
- 5 symptomless carriers / long incubation period;
- 6 HIV is transmitted by, unprotected sexual contact / unscreened blood products / across placenta / in breast feeding / blood to blood contact / mixing of blood / reusing needles;
- 7 people reluctant to be tested for HIV;

*Higher rate increase in LEDC because...*

*marking points below refer to LEDCs*

*Accept reverse argument in each case*

- 8 poverty;
- 9 less education about, means of transmission / disease;
- 10 sexual attitudes / promiscuity / more partners / ref to sex industry;
- 11 lower availability of condoms;
- 12 religious / cultural, reasons;
- 13 denial / superstitious beliefs;
- 14 fewer, medical personnel / clinics / facilities / hospitals / (effective) drugs, (to treat infected people);
- 15 less, screening of blood products / testing of people;
- 16 ref to government financial constraints;
- 17 (enforced) migration / refugee camps;
- 18 more infected mothers breast feed;
- 19 more cases of rape;
- 20 more intravenous drug abuse;
- 21 more use of, shared / unsterilised, needles;
- 22 AVP; e.g. lack of contact tracing
- 23 AVP; HIV inside cell so hidden from immune system / antigens concealed

max 7

**QWC – legible text with accurate spelling, punctuation and grammar;**

1

[8]

32. (a) *Plasmodium*;  
antigens;  
cytotoxic / killer / T killer / T<sub>k</sub> / T<sub>c</sub>;  
helper / T helper / T<sub>h</sub>;  
cytokine / lymphokine;  
memory; 6
- (b) antibodies / immunoglobulins; 1
- (c) 1 several, strains / species, of malarial parasite;  
**A** *P. falciparum* is not the only malarial parasite **R** disease  
2 parasite is a, protist / protoctist / eukaryote;  
3 many surface, proteins / antigens; **A** more than one stage in human  
4 mutation;  
5 ref to antigenic drift / antigens may change;  
6 ref to antigenic shift;  
7 much of life cycle inside, host cells / red blood cells / hepatocytes;  
8 hidden / protected, from immune system;  
**A** ref to antigen concealment  
9 AVP; e.g. qualified ref to economic argument  
low antigenicity max 3
33. (a) (i) 1 mutation;  
2 random / spontaneous / chance / pre-existing;  
3 natural selection;  
4 drug / insecticide, is, selective agent / selective pressure;  
5 resistants have selective advantage;  
6 resistants survive / susceptibles die;  
7 pass, allele / mutation, to offspring; **R** gene / resistance  
8 allele frequency increases;  
9 rapid because, multiplicative phase / short generation time / large  
10 numbers offspring / many breeding sites; max 5
- (ii) *Plasmodium* inside, liver cell / red blood cell;  
antibodies cannot reach target / cannot be detected by immune system;  
large genome;  
antigenic variation / AW;  
variation from meiosis;  
detail; e.g. independent assortment / crossing over  
parasite switches between different versions of proteins;  
ref *var* gene; max 3

[10]

- (b) (i) *marks in pairs - one pair only*  
 mutation; with lack of production;  
*examples*  
*in, promoter / 'on' switch; so not transcribed;*  
*to give premature stop codon; so, no useful / shortened, product;*  
*deletion; with loss of allele / different product;*  
*frameshift; so, different / no useful, mRNA / product;*  
*in initiation codon; so mRNA not translated;*  
*AVP mutation; AVP lack of production;* max 2

- (ii) *marks in pairs - one pair only*  
 no, membrane receptor / AW; so no, binding / internalisation;  
 no, channel / carrier / pump; so lack of essential, nutrient / ion;  
 do not multiply in liver; so not available to infect red blood cells;  
 AVP protein; problem; max 2

- (c) 100% protection with 2 boosters;  
 irrespective of dosage;  
 70% with 1 booster;  
 no evidence with 50 000 whether works with one booster;  
 ref to memory cells;  
 needs large numbers of parasite / ref 10 000 x 3;  
 safe / will not cause disease / does not kill mice;  
 might mutate back to wild type;  
 can infect liver cells even if no further development;  
 may need drug to remove from liver;  
 data relates only to mice / may not be applicable to humans;  
 AVP; e.g. no data comparing results with standard antigenic (AW)  
 vaccine max 3

[15]

34. (i) decreased (invertebrate) food / AW;  
 seeds coated with pesticide eaten by birds / AW;  
 food chain accumulation;  
 concentrated in fatty tissue / fat soluble / slow to degrade;  
 ref to, egg shell thinning / decreased reproductive rates;  
 AVP; e.g. fungicides on seed coats / food for young nestlings max 3

- (ii) predators might eat other food;  
 disease;  
 habitat change;  
 farming changes likely to affect all bird species;  
 accept general reference to predator prey relationship;  
 AVP; e.g. detail on any of the above max 2

[5]

35. (a) *mental*

Alzheimer's / schizophrenia / phobia / anorexia / depression / Parkinson's / Huntington's / CJD / AVP;

*self-inflicted*

alcoholism / cirrhosis / smoking addiction / drug addiction / lung cancer / obesity / CHD / anorexia / AVP; **R** unnamed cancer

*inherited*

sickle cell / haemophilia / cystic fibrosis **A** CF / diabetes / Huntington's / Down's syndrome / AVP;

3

- (b) (i) to find out where, rates are highest / people are most at risk;  
to keep track of infection rates over time;  
to see where, disease is likely to spread / epidemic most likely;  
to help research (into how it is spread / into effectiveness of drugs);  
to allow organisations to provide aid where it is needed most;  
to allow organisations to provide education (about disease)  
where it is needed most;  
AVP; e.g. tourist industry  
e.g. limit potential spread by migration or imports 3 max
- (ii) education on HIV/AIDS less effective in Africa;  
sexual attitudes / number of partners;  
availability of condoms; **R** general reference to contraceptives,  
not used / refused  
poverty / poorer / less money;  
sex industry;  
less primary health care / less likely to be diagnosed;  
AVP; e.g. ref. to unscreened or untreated blood  
unsterilised needles or surgical apparatus  
civil war / rape  
no alternative to breast feeding  
**R** access to drugs for treatment  
**R** no vaccine  
**R** ref to intravenous drug addiction 2 max
- (c) find person who is immune;  
isolate gene that provides immunity;  
identify protein (receptor) that provides immunity;  
develop drug (to fit normal receptor) that provides immunity;  
(gene used to) manufacture, drug, protein / antibody / immunoglobulin,  
giving immunity;  
protein used as, vaccination / cure / AW;  
gene therapy used in at risk groups / AW;  
AVP;  
AVP; 2 max
36. (i) phagocyte / macrophage / dendritic cell; **A** antigen presenting cell / APC  
**R** white blood cell / lymphocyte / neutrophil 1
- (ii) bacteria in vacuole / phagosome; **A** lysosome

[10]

bacterium, cut up / partly, digested / partly broken down / AW  
 (so antigens still whole);  
 enzymes / lysins / lysozyme;  
 AVP; e.g. hydrolysis / hydrolases 2 max

(iii) receptors / binding sites;  
 on cell surface membrane (of T helper cell);  
complementary to antigen; **R** matching **A** analogy to lock and key 2 max

(iv) mitosis; **R** cloning 1

(v) produced during, primary / first, immune response / exposure to antigen;  
 remain in body; **A** blood / tissue fluid etc  
 (memory cell or antibody) specific to antigen;  
 produce secondary response;  
 more quickly / no symptoms;  
 divide / clone, to make plasma cells;  
 (plasma cells) manufacture antibodies;  
 more antibodies made / antibodies accumulate faster;  
 gives long term immunity / immunological memory / AW; 4 max

[10]

37. variable region binds to, antigen / pathogen; **A** antigen-binding site  
 variable region specific to, antigen / pathogen; **A** antigen-binding site  
 agglutinate pathogens / stick pathogens together;  
 immobilise pathogens / attach to flagellum (of pathogen);  
 combine with pathogen to stop entry to cell;  
 break wall of bacterium open / lysis;  
 constant region, attracts phagocytes / makes it easier to engulf bacterium;  
 AVP; e.g. ref to hinge region in context 2 max

[2]

38. (a) *Mycobacterium tuberculosis* / *Mycobacterium bovis*;  
**A** *M. tuberculosis* / *M. bovis* / *Mycobacterium*  
**R** *Microbacterium* / *Myobacterium* 1



- (b) short of breath / breathless / less easy to inflate lungs *or* breathe;  
 due to less surface area for gaseous exchange;  
 less oxygenation of, blood / haemoglobin; **R** oxidation  
 coughing due to irritation in lungs (alveoli filled with some substance);  
 coughing up blood;  
 longer diffusion pathway;  
 as alveoli walls thicker;

AVP; e.g. destruction / loss of, alveoli and blood vessels

AVP; weight loss

chest pain when coughing

2 max

- (c) opportunistic disease / immune system already weakened;  
 long course of treatment not always completed;  
 drug / antibiotic, resistance; **R** strand **R** mutation alone  
 vaccine is less than 100% effective / no vaccine for mutated strains /  
 more effective in some parts of world;  
 symptomless carriers / dormant in body;  
 lack of education about TB;  
 overcrowding (in poorly ventilated accommodation);  
 Less Economically Developed Countries cannot afford, treatment /  
 drugs / vaccines;  
**A** lack of access  
 malnutrition;  
 untreated milk / uncooked meat;  
 breakdown of treatment programmes due to, war / civil unrest;  
 migration of carriers / refugees / tourists / **AW**;

AVP; e.g. link to HIV/AIDS

AVP; ref badgers as carriers

spitting / in sputum

poverty, increased homelessness

vaccine, refused / not wanted

5 max

[8]

39. (a) (chronic) bronchitis;  
 emphysema;  
 COPD;  
 heart disease;  
 stroke;  
*two marks available for the following*  
 lung / mouth / throat / breast / bladder / oesophagus / prostate other  
 named cancer;;

AVP; e.g. gangrene, erectile dysfunction

AVP;

2 max

(b) *max 3 for each named component*

*carbon monoxide (no mark)*

- c1** binds to haemoglobin / forms carboxyhaemoglobin;
- c2** irreversibly / permanently; **A** greater affinity than for oxygen
- c3** less effective oxygenation of haemoglobin; **R** oxidation
- c4** shortage of breath;
- c5** damages lining of arteries;
- c6** AVP;

max 3

*nicotine (no mark)*

- n1** addictive;
- n2** adrenaline released;
- n3** increases heart rate;
- n4** reduced circulation to extremities / vasoconstriction;  
**R** contract **A** narrow lumen
- n5** sticky platelets;
- n6** cause blood clotting / thrombosis;
- n7** AVP; e.g. ref to effect on synapse / brain function

max 3

*tar (no mark)*

- t1** coats the (internal) surfaces of breathing system; **A** lungs
- t2** reducing efficiency of exchange;
- t3** irritation of mucous membranes;
- t4** goblet cells stimulated / over secretion of mucus;
- t5** inactivation of, cilia / ciliated epithelium;  
**A** destroys / damages **R** kills
- t6** mucus not moved;
- t7** coughing;
- t8** carcinogenic / cancer-causing / causes mutations;
- t9** causes emphysema / described; **R** ref to elastin damage alone
- t10** AVP; e.g. ref to more infections / increased risk of chronic bronchitis

max 3

*may be awarded anywhere*

- AVP; strain on heart / heart disease
- AVP; raised blood pressure / hypertension

8 max

**QWC – clear well organised using specialist terms;**

1

*award the QWC mark if four of the following are used in the correct context*

haemoglobin	carboxyhaemoglobin	affinity
oxygenation	addictive	adrenaline
vasoconstriction	lumen	platelets
thrombosis	mucous membranes	goblet cell
cilia	epithelium	carcinogenic
emphysema	bronchitis	hypertension

**[11]**

40. specific (antibodies) ;  
variable regions ;  
complementary shape ;  
to antigens on red blood cells ;  
attach to red blood cells ;  
agglutination ;  
AVP ; e.g. ref to rhesus factor

2 max

**[2]**

41. low (TC:HDL) ratio = low risk ; *ora*  
low (resting systolic) blood pressure = low risk ; *ora*  
data quote ;  
AVP ; e.g. if ratio is 3 high systolic pressure does not increase risk

3max

**[3]**

42. (a) self-inflicted;  
social; **A** non-infectious
- (b) many factors contribute to risks / many risk factors /  
no one factor causes disease;  
**A** if name two or more factors  
**A** a number of causes  
**R** many things

1 max

1

- (c)
- 1 (carbon monoxide / nicotine) increases heart rate;
  - 2 (nicotine) constricts arterioles / vasoconstriction;  
**R** arteries / blood vessels
  - 3 (nicotine makes) platelets sticky;
  - 4 blood clot / thrombosis, more likely;
  - 5 increases blood pressure / hypertension;
  - 6 increases deposition of, fatty substances / cholesterol,  
in walls of arteries / formation of atheroma or plaque;
  - 7 increases (risk of), atherosclerosis / hardening of arteries;
  - 8 reduces lumen of artery;
  - 9 reduces, blood flow / oxygen supply, to heart, muscle / tissue;
  - 10 AVP; e.g. carbon monoxide damages, walls / lining, of artery
- 3 max

- (d) *high in some places because (accept ora)*
- 1 more, animal / saturated fats, in diet;
  - 2 less, linolenic / linoleic, acids (in diet); **A** polyunsaturated
  - 3 more salt (in diet);
  - 4 high(er) incidence of obesity; AW
  - 5 high(er) prevalence of smoking; AW
  - 6 more alcohol abuse;
  - 7 less exercise (is undertaken);
  - 8 high(er) stress levels;
  - 9 high(er) blood pressure;
  - 10 high(er), cholesterol / LDL, concentration in blood;
  - 11 hereditary factors / ethnicity;
  - 12 'at risk', gene / allele, may be more common; **A** FHC gene
  - 13 ref to education;
  - 14 AVP; e.g. ref to differences in data collection
  - 15 AVP; e.g. ref specific dietary differences  
red wine / antioxidants  
ref to cholesterol-reducing drug(s) / food(s)  
ref to life expectancy (if low do not develop CHD)  
ref to maternal diet during pregnancy  
ref to diabetes
- 4 max

(e) *benefits to society*

fewer people have CHD / lower mortality due to CHD;  
 fewer drugs used;  
 fewer operations carried out / shorter waiting times;  
 e.g. by-pass surgery / heart transplant;  
 less, NHS / doctors', time taken up;  
 lower cost to NHS / more money to spend elsewhere;  
 fewer work days lost / less disability benefits paid out;

*benefits to individual*

better quality of life;  
 live longer;  
 awareness of harm to body;  
 people eat, more healthily / less fatty food / less alcohol consumption;  
 people, exercise more / more active;  
 people do not smoke / less passive smoking;

AVP; e.g. lower levels of obesity

AVP; e.g. stop people taking up smoking

3 max

[12]

43.

	pathogen;
	degenerative;
	aerobic; <b>R</b> <i>aerobic respiration</i>
	tidal;
	pandemic;

[5]

44. pathogen / bacterium, recognised as foreign;  
 antigens / pathogen is antigenic; AW  
 engulfed / phagocytosis / phagocytosis described / endocytosis;  
 in, vesicle / phagosome / vacuole;  
 lysosomes fuse to vesicle;  
 release, lysins / enzymes / named enzyme;  
 digest / break down, pathogen / bacterium / AW;  
 AVP; e.g. ref to presentation of antigen  
 hydrolysis  
 release of HCl *or* H<sub>2</sub>O<sub>2</sub> *or* toxins *or* free radicals into vesicle

4 max

[4]

45. (i) *increase in*

- pollution;  
 certain crops (oil seed rape);  
 use of food additives;  
 diagnosis;  
 awareness;  
 use of antibiotics;  
 AVP; e.g. better hygiene, less breast feeding, multiple vaccinations 1 max
- (ii) 42 – 43 (%); 1 [2]
46. (i) human immunodeficiency (virus) / HI(V); 1
- (ii) *immune system unable to*  
 reproduce (enough) T (helper) cells;  
 release cytokines;  
 stimulate B cells;  
 make plasma cells;  
 release antibodies;  
 stimulate macrophages;  
 stimulate T killer cells;  
 no humoral response;  
 make memory cells; 3 max
- (iii) unprotected sexual intercourse;  
 reusing / sharing, needles; **R** dirty / unsterile, needles  
 blood transfusion / mixing blood; **R** blood donation  
 across placenta / child birth;  
 breast feeding;  
 needle stick;  
 AVP; 3 max [7]
47. (i) to maintain genetic diversity / prevent genetic erosion ;  
**A** maintain, genetic variation / gene pool  
 for, future / unknown / potential, use ;  
 for changed environmental conditions ; **A** climate change  
 e.g. of such change ;  
 to counteract, inbreeding / extinction ; 3 max
- (ii) use, emasculated hermaphrodite / female plant ;  
 cross with, male / hermaphrodite, with resistance ; **A** female resistant and  
 male not offspring, grown in presence of disease / challenged ;  
 select offspring with resistance and commercial traits ;  
 cross to commercial plant for alleles of background genes ;  
 idea of many generations ; 3 max [6]
48. membrane, stability / fluidity ;  
 impermeability to, hydrophilic substances / AW ; ora

synthesis of, steroid hormones / named examples ;  
 waterproofs skin ;  
 synthesis of vitamin D ;  
 synthesis of, bile salts / named bile salt(s) ; **R** bile alone  
 AVP ; e.g. protects skin from absorbing (some) harmful chemicals

3 max

[3]

49. 1 (saturated) fats in diet ;  
 2 converted to cholesterol / cholesterol in meal ;  
 3 may affect concentration of, HDLs / LDLs ;  
 4 ref to reliability of reading / AW ;  
 5 AVP ;

2 max

[2]

50. (i) (X) 10 / 900% (increase); **NOT** 10% increase  
 ignore 1000% increase

1

(ii) *candidates may use information from the passage*  
*e.g. typical [NOT average] = 20 units*  
*threshold = 200 units*

- 1 no increase, between 0 and 20 units / at low levels / well below  
 threshold, of radon;  
 2 radon increasing, from 20 to 200 units / towards threshold,  
 increases risk;  
 3 by 10X / 900%;  
 4 high radon and smoking gives greatest risk;  
 5&6 other suitable quantitative risk statement;;  
 7 consequence / relevant effect on cell;

2 max

[3]

51. (a) *Plasmodium* / *P. vivax* / *P. falciparum*;  
*Anopheles*;  
 infected;  
 blood;  
 vector; **R** carrier  
 (blood) transfusion / shared needle / across placenta / at birth / AW;  
**R** mixing blood unless qualified

6

- (b) *reduce mosquito numbers*  
 stock ponds with fish (*Gambusia*) to eat larvae; **R** kill mosquitoes  
 oil on surface;  
 spray bacteria (*Bacillus thuringiensis*) to kill mosquito larvae;  
 DDT / pesticide spray;  
 release of sterile male mosquitoes;  
 draining, ponds / bodies of water;
- avoid being bitten by mosquitoes*  
 wear insect repellent;  
 long sleeved clothes;  
 sleep under nets;  
 nets soaked in, insecticide / repellent;  
 sleep with, pigs / dogs;
- use drugs to prevent infection*  
 use, prophylactic drug / quinine / chloroquine / larium / artemisinin /  
 vibrimycin / tetracycline / antimalarial;  
 use malaria vaccine;
- 2 max

[8]

- <sup>a</sup> i52. acts on, genes / chromosomes / DNA;  
 causing, mutation / change in genetic code;  
 of genes that control cell division / oncogenes;  
 cells divide out of control / AW; **R** rapidly **R** grow  
 AVP; e.g. detail of change / substitution / deletion / insertion /  
 chromosome abnormality  
 cells do not undergo apoptosis
- 3 max

[3]

53. shortage of breath / difficult to breathe / AW; **R** wheezing  
 persistent / constant, cough; **R** smoker's or severe cough  
 coughing up blood;  
 chest pain / pain when breathing;  
 swollen / painful, lymph glands;  
 weight loss;
- 2 max

[2]



54. (i) (antigens) injected / taken orally; ora ('not caught') **R** vaccination 1

(ii) **1** injection of antigen *or* attenuated / weakened / dead / similar, pathogen; **R** disease

**2** immune system activated / causes immune response;

**3** attacked / engulfed, by, phagocytes / macrophages;

**4** ref antigens presented;

**5** selection / production, of active T, cells / lymphocytes;

**6** T cells, clone / divide / mitosis;

**7** secretion of cytokines;

**8** activation of B cells;

**9** B cells, clone / divide / mitosis;

**10** production of, plasma / effector, cells;

**11** production of antibodies (by plasma cells);

**12** production of memory cells;

**13** memory cells remain in body;

**14** (secondary) response to infection quicker;

**15** (secondary) response to infection greater;

**16** no symptoms when infected / AW;

4 max

(iii) herd vaccination;  
vaccinate, most / all, people;  
stops infection spreading (within population) / lack of people to pass infection on to;

ring vaccination;  
vaccinate all people around victim;  
contains spread (within ring);

surveillance / spotting and reporting victims;  
isolation of victim;

trace contacts;  
isolation of contacts;

ref to making it notifiable;

travel restrictions;

AVP; e.g. if notified can organise ring vaccination

3 max

[8]

55. increasing availability of phosphate increases growth of all three species;  
 greatest effect on nettle;  
 linear effect / increases proportionally / steadily / AW (on nettle);  
 slow increase / small increase, in growth of wavy hair grass;  
 levels off at higher phosphate concentrations;  
 high levels decrease growth of small scabious / ref to increase and then  
 decrease in growth of small scabious;  
 small scabious increases steeply / AW (at low phosphate concentrations);

max 4

[4]

56. (a) nicotine; 1
- (b) *any two from*

carbon monoxide / CO;  
 binds to haemoglobin / forms carboxyhaemoglobin;  
 Hb has greater affinity for CO / CO binds more strongly than oxygen;  
 A irreversibly reduces oxygen carrying ability / amount of oxygen  
 that can be carried; (3 max)

tar;  
 accumulates, in lung / on alveolar surface;  
 increases, diffusion barrier / thickness of barrier between air and  
 blood / AW;  
 reduces rate of diffusion / gaseous exchange more difficult / AW;  
 causes cancer / carcinogenic;  
 paralyses / damages cilia; **R** kills cilia  
 increases mucus production / AW;  
 increases chance of infection;  
 production of scar tissue;  
 reduces elasticity of the airway / (oxidants) increase activity of  
 elastase (emphysema); (3 max)

carcinogen;  
 causes cancer;  
 changes DNA / mutation;  
 uncontrolled mitosis / no programmed cell death / no apoptosis;  
 tumour; (3 max)

AVPs (2 × 3 max)

e.g. arsenic;  
 interferes with cytochromes in respiratory chain;  
 prevents ATP production;  
 replaces phosphate group in ATP;

benzpyrene;  
 adheres to surfaces;  
 cancer-causing;

A nicotine if not given in (a)

5 max

[6]

57. (i) % heavy smokers rises from, professional / gp 1, to, unskilled manual workers / gp 6 / AW; A statements comparing groups 1 and 6 ref to figures used as a comparison;

2 max

(ii) as % heavy smokers increases so does number of people suffering long-standing illness;  
 the relative increase in smoking is far greater than the relative increase in long-standing illness / not a proportional increase / AW;

use of figures to illustrate;

e.g. smoking increases more than 6 fold while long-standing illness increases less than 2 fold  
 smoking increases from 3% to 19% while long-standing illness increases from 290 to 420 (per 1000)

AVP; e.g. ref to anomalous point

2 max

(iii) *qualified ref to*

medical services;  
 working environment;  
 living conditions;  
 income;  
 education (about diet / possible relief from long-term illness);  
 diet;  
 work-related injury;  
 alcohol intake;  
 (work related) stress;  
 (aerobic) exercise;

2 max

[6]

58. (a) eating too much;

high, fat / sugar / carbohydrate / alcohol (in diet);  
 energy intake greater than use;  
 insufficient exercise;  
 AVP; e.g. genetic predisposition  
                   underactive thyroid

2 max

(b) decrease in % underweight;  
 decrease in % acceptable;  
 increase in % overweight;  
 large / great / dramatic / significant, increase in % obese;  
 use of figs to illustrate one change;

4 max

[6]

59. 1 high level of saturated fat in diet;  
 2 animal fat / red meat / dairy products;  
 3 high cholesterol (in blood / body);  
 4 lack of, vitamin E / antioxidants;  
 5 high salt in diet;
- 6 obesity linked to, high blood pressure / hypertension;  
 7 damage to artery, walls / endothelium;  
 8 cholesterol transported in lipoproteins;  
 9 cholesterol deposited in artery walls;  
 10 in coronary arteries;
- 11 atherosclerosis / atheroma;  
 12 formation of, plaques / fatty streaks;  
 13 hardening / loss of elasticity (of artery wall);  
 14 roughens lining / increases friction;  
 15 clot formation / thrombosis / thrombus;  
 16 narrows / restricts, lumen;  
 17 reduced / restricted, blood flow / oxygen, to heart muscle;  
 18 heart (muscle), under stress / works harder;  
 19 angina / heart attack / myocardial infarction / heart failure /  
 hypertrophy; **R** CHD
- 20 AVP; e.g. aneurism in aorta  
 21 AVP; low density lipoproteins (LDL) associated with deposition  
           high density lipoproteins (HDL) associated with less deposition

7 max

**QWC – clear well organised using specialist terms;**

1

*award the QWC mark if four of the following are used in correct context*

saturated	coronary	cholesterol	lumen
vitamin E	atherosclerosis		antioxidants
blood pressure		plaque	hypertension
endothelium		thrombus	thrombosis
angina	myocardial infarction		atheroma
(low density / high density)	lipoprotein		

[8]

60. (i) R; 1
- (ii) **R** / binding site / variable region, has specific, amino acid sequence / primary protein structure;  
**R** / binding site / variable region, has specific shape;  
 complementary to / matching (part of), antigen **A**; **A** lock and key idea 2 max

[3]

61. (i) *award two marks if correct answer (17.2 / 17) is given*  
*award one mark for calculation – if answer incorrect or left at 82.8*  
 $92/100 \times 90 = 82.8$      $100 - 82.8;$   
 17.2; **A** 17% 2

- (ii) difficult to diagnose;  
 not all / enough, of population vaccinated; **A** need 93-95% vaccination  
**A** ref to herd, vaccination / immunity
- poor response to vaccine / only 90-95% vaccinated people have protection; *ora*  
 boosters needed / difficult to trace those who need boosters; *ora*  
 migrants can (easily) bring measles into a community;  
 AVP; e.g. length of time vaccination remains effective / *ora*  
 AVP; measles mutates more frequently / *ora*  
 people less worried about measles so don't get vaccinated / *ora*  
 concerns about link of MMR to, side effects / autism 2 max

[4]

62. (a) cannot be made within the body; **R** ref. to amino acids  
 no enzyme(s);  
 not able to form a double bond between final (omega /  $\omega$ ) carbon and  
 existing double bond;  
 ref. to deficiency, disease / condition;  
 required for cell membrane (phospholipids); **A** lipid membrane / lipid  
 bilayer  
 required to make, signaling molecules / prostaglandins;  
 required for, immune system / renal system / blood clotting; 1 max
- (b) *award two marks if correct answer (84) is given – must be rounded up  
 award one mark for calculation e.g. showing that 35% should be  
 calculated / dividing by 37*  
 35% of 8 830 / 3 090.5 /  
 $\frac{3\ 090.5}{37} / 83.53 / \frac{x}{37}$ ;  
 84; 2
- (c) saturated fat, raises concentration of LDLs in the blood;  
 raises (blood) cholesterol;  
 (increases risk of) atherosclerosis / described; **A** atheroma / plaque /  
 fat *or* cholesterol in wall of artery;  
 raises blood pressure;  
 (increases risk of) blood clots / thrombosis;  
 (coronary) heart disease / heart attack / heart failure / MI / angina / CVD;  
 stroke;  
 overweight / obesity;  
 increase body mass index (BMI);  
 AVP;; e.g. obesity-related diseases such as arthritis, named cancer  
 (**R** lung), gall stones, diabetes, hypertension, hernia,  
 varicose veins, haemorrhoids, joint / knee damage,  
 depression (**R** mental health problems)  
 ref. to surgery being difficult  
 ref. to adipose tissue 4 max

- (d)
- 1 any two references to differences in quantities;  
**A** rich / richer / good source of
  - 2 use of figures to make a comparison between quantities for any one nutrient;
  - 3 protein needed for, repair / replacement / ref. pregnancy / ref. lactation / AW;
  - 4 vitamin A, ref. to function *or* deficiency;  
rods / retina / night vision / xerophthalmia / ref. epithelia / immune system
  - 5 vitamin D, ref. to function *or* deficiency;  
absorption *or* deposition of calcium / osteomalacia **R** rickets
  - 6 calcium, ref. to function *or* deficiency;  
skeleton / teeth / bones / fetal growth / muscles / nerves
  - 7 iron, ref. to function *or* deficiency;  
haemoglobin / anaemia / menstrual loss / red cells
  - 8 other foods needed to provide iron *or* calcium / need to take supplements;
  - 9 AVP; consequences of deficiencies, e.g. osteoporosis, fatigue
  - 10 AVP; any ref. to RNI for any one of these nutrients  
ref. to polyunsaturated fatty acids in 'oily fish'  
*idea that one food does not make a diet*
- 4 max

[11]

63. (a) (i) passive; 1
- (ii) cross the placenta; *treat breast milk as neutral* 1
- (b) B / plasma; **A** B effector cells *treat white blood cell(s) as neutral* 1
- (c) antigen presentation;  
correct ref. to T helper cells;  
clonal selection / selection of appropriate clone / AW;  
ref. to (surface / glycoprotein) receptors / binding sites;  
ref. to specificity (of cells / receptors to antigen / antibody to antigen);  
clonal expansion / described; e.g. more B cells must be made  
mitosis / division, of B cells; **A** replicate / multiply  
formation / differentiation, of, plasma cells / effector cells;  
any detail; e.g. development of ER / ribosomes  
ref. to time taken for, making antibodies / protein synthesis; 3 max

(d) memory cells / immunological memory;  
 constant exposure to, measles / virus / antigen;  
 fast, secondary response / antibody production;  
**A** works before symptoms develop  
 greater, secondary response / antibody production;  
 AVP; e.g. not necessary to increase number of specific cells / AW  
 ref. to clonal selection quicker / AW

2 max

(e) ref. to antibodies (from mother); **A** (passive) immunity from mother  
 remove / combine with, measles antigen / vaccine;  
 no immune response / no primary response / AW;  
 immune system not yet fully functioning / AW;  
 malnutrition;  
 lack of protein / energy, to make, antibodies / cells;  
 ref. to children who were born premature;  
 AVP; e.g. mutation involved in lymphocyte development

2 max

**[10]**

64. (a) *Plasmodium*;

Accept

*P. falciparum* / *P. ovale* / *P. vivax* / *P. malariae*;

1

(b) bitten by mosquito carrying malarial parasite; **A** 'infected'  
 (genus) *Anopheles* / female;  
 injects parasites with, saliva / anticoagulant;  
 ref. to vector;  
 (mosquito) fed on / bit / took a blood meal from, an infected person;  
*accept transmission by needle*  
 injected into blood;  
 after use by someone with malaria;  
 (needle) shared / reused / used but not sterilised;  
**A** transmission across the placenta;  
**A** blood transfusions;

3 max



- (c)
- 1 resistance of, *Plasmodium* / pathogen, to drugs;
  - 2 eukaryote / protoctist, has many genes;
  - 3 many surface antigens / antigenic variation; **A** ref. to mutation
  - 4 inside red blood cells / in liver cells / antigen concealment;
  - 5 difficult for immune system to operate / idea;
  - 6 dormant / in body for a long time / symptomless carriers / long incubation;
  - 7 different stages in life cycle in the body;
  
  - 8 resistance of, vector / mosquito, to insecticides; **A** mutation / selection
  - 9 mosquito, breeds in small areas of water; **A** implications
  - 10 breeds quickly;
  - 11 mosquitoes, spread over large area / widely distributed / fly a long way;
  - 12 mosquito control programmes disrupted by war etc;
  - 13 lack of infrastructure (for control programmes);
  - 14 problems with sleeping nets, described;
  - 15 more effective when soaked in insecticide;
  - 16 no vaccine;
  - 17 people lose immunity if, malaria eradicated / move to non-endemic area;
  
  - 18 poor primary health care / few doctors or other medical personnel;
  - 19 ref. to poor housing / slums / shanties;
  - 20 ref. to remote rural areas;
  - 21 ref. to cost of control programmes;
  - 22 ref. to travel / migration;
  - 23 ref. to change in climate;
  - 24 ref. to education;
  - 25 ref. to problems of biological control;
  
  - 26 AVP; e.g. effects of insecticides on, ecosystems / humans
  - 27 AVP; side effects of drugs  
 Impossible to isolate infected people  
 ref. to sterilising male mosquitoes  
 opening new areas of tropics  
 different, species / strains, of malaria  
 cost to individual  
 ref. to detection in bloodstream  
 blood transfusions  
 mother to fetus across placenta

8 max

**QWC – legible text with accurate spelling, punctuation and grammar;**

1

**[13]**

65. (a) high death rate;  
 preventable / avoidable, deaths;  
 premature deaths / younger than life expectancy / people of working age;  
 AVP; e.g. cost of care / medical facilities

1 max

(b) *Mark (i), (ii) and (iii) together to max 5*

(i) data support hypothesis (no mark)

death rates (for both men and women) are lower;  
ref. to any two figures from the table to show a comparison  
(e.g. Spain v Latvia);

(ii) data support / do not support hypothesis (no mark)

*support* – all figures for men (in 35-74 age range) are higher than those for women;

*do not support* – no data for men and women over 74 / only applies to 35-74 age range / no data for men and women under 35 / smoking-related not gender-related;

ref. to any two figures from the table to show a comparison  
(e.g. men and women in the same country);

(iii) data do not support / do support (no mark)

*idea that*

prevalence of smoking is, higher / no lower, in, Mediterranean countries / named country, than in some countries with higher death rates from CHD;

ref. to men in Latvia and Russian Federation who show high prevalence of smoking and have high death rates from CHD;

**A** no correlation between prevalence of smoking and mortality from CHD

ref. to any figures from the table to show a comparison;

5 max

[6]

66. *reward any appropriately worded statements, e.g.*

lifestyle increases susceptibility to degenerative diseases;

e.g. diabetes, CHD, atherosclerosis;

smoking increases risk of developing, (lung) cancer / COPD / CHD;

no signs of symptoms of disease, may be developing or increasing risk of developing (non-infectious) diseases;

father's heart attack, may mean that there is a genetic predisposition to heart disease;

not a balanced diet;

little fresh fruit and vegetables, little, dietary fibre / antioxidants / vitamins;

little (aerobic) exercise;

except on one occasion a week, may put strain on heart /AW;

health risks associated with, binge drinking / alcohol;

AVP;;; e.g. social well-being

3 max

[3]

67. (chronic) bronchitis;

emphysema;  
COPD;

max 2

[2]

68. (a) damage to, artery wall / lining / endothelium;  
**A** scarring **R** damage to artery / damage in artery  
 invasion by phagocytes;  
 cholesterol / fat / LDLs, deposited / accumulates, in artery wall;  
 growth / proliferation of, smooth muscle / fibrous tissue;  
 wall thickens / lumen becomes narrow / reduces blood flow;  
 rougher surface / AW; **A** 'stickier' / more friction  
 platelets secrete clotting factor(s);  
 endothelial cells secrete less, anti-clotting factor(s) / prostaglandins;  
 AVP; e.g. atheroma, breaks open / bursts through wall  
 loss of elasticity/ 'walls do not stretch as much'

max 3

- (b) *nicotine*  
 increases, heart rate / blood pressure (possibly leading to damage to  
 artery walls); **A** ref to hypertension  
*A for CO as well – but only once in answer*  
 decreases width of arteries / lumen smaller / reduces blood flow;  
 increases number of platelets / makes platelets more 'sticky';  
 decreases antioxidants;
- CO*  
 damages walls of arteries;  
 reduces oxygen carrying capacity of blood / binds with haemoglobin /  
 forms carboxyhaemoglobin;
- both*  
 increase development of, plaque / atheroma;  
 stimulate production of, fibrinogen / clotting factors;  
 reduces production of enzymes that remove clots;  
 increase blood cholesterol (concentration);  
 AVP; e.g. ref to nicotine and adrenalin

max 3

[6]

69. bone marrow; **R** marrow on own  
 phagocytes / neutrophils / PMNs / monocytes / macrophages;  
 thymus;  
 plasma cells / effector cells;  
 antibodies;

5

[5]

70. 1 ref to antigen presentation / described;  
 2 receptors on T cell (surface) are complementary to antigen;  
**R** same shape  
 3 ref to specificity (in context of T cells);  
 4 clonal selection / described;  
 5 clonal expansion / clonal proliferation / T cells divide by mitosis;  
**R** 'T cells clone' unqualified / 'reproduction' / 'replication'  
 6 T helper cells release, cytokines / lymphokines;  
 7 stimulate B cells to, divide / clone / differentiate (into plasma cells);  
 8 stimulate macrophages to carry out phagocytosis (more actively);  
 9 T<sub>c</sub> / cytotoxic / killer (T) cells, search for / kill / attach to,  
 infected (host) cells;  
 10 secrete, enzymes / toxins;  
 11 named enzyme / toxin;  
 e.g. hydrolytic / protease / nuclease / H<sub>2</sub>O<sub>2</sub> / free radicals / perforin  
 12 active immunity;  
 13 memory (T) cells / immunological memory;  
 14 ref to secondary response; e.g. more rapid / greater  
 15 AVP; e.g. suppressor cells  
 16 AVP; e.g. function of suppressor cells  
 cell mediated response max 7

**QWC – clear, well organised using specialist terms;** 1

**[8]**

71. shared needles *or* surgical instruments / needles, reused without sterilisation;  
**A** contaminated needles reused  
 (mother to child) across placenta / at birth;  
 breast milk / breastfeeding;  
 blood products / blood transfusion;  
 needle-stick / described;  
 AVP; e.g. blood to blood, blood to wound max 3

**[3]**

72. *mark this question to max 6*

- (i) decrease;  
 increase / remain constant / fluctuate;  
 correct use of figures to show a change;  
**A** 'approx / nearly / about / no greater than' to describe numbers  
 e.g. 1985, 2050      1988, 1300      1991, 1680      2001, 1400

- (ii) earlier diagnosis;  
use of drugs / named drug e.g. zidovudine / AZT / retrovir;  
**A** highly active anti-retroviral therapy / HAART  
stops replication of virus / controls HIV spread through the body;  
(drug) delays onset of AIDS;  
  
control of, secondary / opportunistic, infections; **A** bacterial / fungal  
by antibiotics;
- (iii) similar number diagnosed each year / ref to figures to make this point;  
fewer dying / developing AIDS, each year;  
*idea that* symptomless carriers increase chance of spread;

**[max 6]**