

1. (a) Insulates nerve fibre / axon / does not allow passage of ions / charge;
Ions only pass at non-myelinated points / nodes / action potential only occurs at node;
Saltatory conduction (is faster) / description of 'jumping'; 2 max
- (b) Rise / fall in cholesterol concentration in cytoplasm / cell;
Reject references only to plasma concentrations;
Fall / rise in cholesterol receptors (in plasma membrane);
Leads to fall / rise in cholesterol / cholesterol returns to norm; 3
- (c) (i) Mutation produces receptor with different shape / tertiary structure / not specific to LDL;
So LDL will not bind to it and be absorbed / removed from the blood;
Do not penalise 'active site'. 2
- (ii) Endothelium / lining of artery torn / damaged;
Atheroma / plaque / underlying cells come into contact with blood;
Triggers blood clotting mechanism;
OR
Artery narrowed by plaque / atheroma;
May be blocked by clot from elsewhere; 2 max
- (d) 2517;
Accept 2514 or 2511 if explanation refers to start / and stop codons. 1
- (e) If recessive would inherit one allele from each parent; *reject 'gene'*
Parents could be heterozygotes / carriers;
Parents / heterozygotes / carriers would not show the condition;
NB points 2 and 3 may appear in one linked sentence. 2
- (f) 1003.3 / 1003;
Two marks for reason from below:
(As dominant,) both heterozygote and homozygote at risk;
(Heterozygotes 1 in 100 so) 1000 are heterozygous;
(Homozygotes 1 in 30000 so) 3 / 3.3 homozygous; 3 max

[15]

2. (a) men, smokers; 1
 age 60 with ch above 7/age 60 with bp above 160/
 age 70 with ch above 6/age 70 with bp above 140; 1
- (b) (i) because formation of atheroma/deposition of fatty material in
 artery walls;
 which weakens the wall leading to aneurysm;
 or leads to narrowing increasing the chance
 of a clot obstructing the artery; max 2
- (ii) presence of oestrogen protects women against CHD; 1
- (c) risk factors will change over 10 year period;
 smoking not quantified; 2
- other risk factors involved -
 stress;
 exercise;
 heredity;
 high salt diet max 2
- max. for part (c) = 3

[8]

3. (a) extract DNA;
 remove specific section;
 using restriction endonuclease
 base sequence;
 method of finding the base sequence eg gene probe;
 compare with normal sequence for gene; max 3
- (b) screening of individuals at risk for presence of markers;
 example of individual at risk;
 earlier detection of tumours;
 earlier surgery/drug treatment; max 3

[6]

4. (a) Oestrogen inhibits FSH;
 prevents follicle developing;
 progesterone inhibits LH;
 also inhibits FSH;
 inhibits ovulation;
 FSH and LH bring about ovulation max 5

(b) Condoms protect against sexually transmitted diseases;
oral contraceptives very reliable;
more likely to contribute to falling birth rate;
demographic effects of falling birth rate

max 3

(c) Narrower base;
indicating fewer children;
base not widest part;
wider top;
indicating more older people;
2050 pyramid smaller in area than pyramid for 2000

max 4

[12]

5. (a) (i) in a person with chronic bronchitis there will be
more/larger mucus secreting cells;
mucus covering epithelium/mucus plugs;
no/fewer cilia;
fibrous/scar tissue;

max 2

(ii) coughing to remove excess mucus;
mucus not removed by cilia;
breathlessness due to narrowing of airways by mucus/fibrous tissue;
phlegm produced;

max 2

(b) compare incidence of disease in smoking and non-smoking population;
using large/random sample;
all other risk factors/named risk factor kept constant;
data analysed statistically;

max 3

[7]

6. (a) Base of 1931 pyramid narrower/fewer in youngest age-group in 1931;
idea that pyramid does not show infant/perinatal mortality/
idea of youngest age-group in 1901 'moving up' 1931 pyramid;

2

(b) Life expectancy improved between 1901 and 1956;
because of advances in medicine/better housing;

2

[4]

7. (a) (i) walls of alveoli broken down / fewer alveoli present;
smaller surface for diffusion;
- OR
- reduced elasticity;
ventilation restricted;
- OR
- scar tissue formed;
less area for gas exchange / slower gas exchange; max. 2
- (ii) infection eg (chronic) bronchitis;
heredity;
industrial pollution - must contain reference to
inhalation of particles (dust); max.2
- (b) (i) as number of cigarettes smoked increases so does the death rate; 1
- (ii) damage already done / cancer already developing; 1
- (c) causes mutation;
of genetic material or DNA;
which controls cell division;
affects oncogenes; 3
8. (a) Monkeys feed on bananas;
Yellow fever transmitted to humans by *A. simpsoni*;
Monkey, banana and *A. simpsoni* in close proximity; max 2
- (b) Antigens present on the virus;
Stimulate production of antibodies;
By lymphocytes/white blood cells;
Rapid response of memory cells; max 2
- (c) Relatively few people are vulnerable to infection;
Therefore only limited chance of passing infection on; 2
9. (a) (i) Curve showing constant population until approx 1920;
Increases after this and does not level out; 2
- (ii) Immigration and emigration/migration; 1
- (b) Death rate prone to large fluctuations/spikes;
Representing spread of disease during epidemics; 2

[9]

[6]

(c) Demographic transition in Mauritius occurs over shorter period of time/
Birth rate not stabilised at end/occurred earlier in UK; 1 [6]

10. (a) (i) mitosis; 1
(ii) abnormal mass of cells / undifferentiated;
continually / rapidly dividing; 2

(b) (i) affects / causes mutation of DNA; 1
(ii) (nearer equator so) more UV light; 1 [5]

11. (a) weaken blood vessels may burst / aneurysm;
vessels narrow;
blood pressure may rise;
blood clot may occur which restricts or cuts off blood flow;
in coronary artery this leads to myocardial infarction / heart
attack / angina;
in artery to brain this leads to stroke; max 4

- (b) **Fat**
 blood cholesterol level increases;
 LDLs transport cholesterol in the blood;
 LDLs deposit;
 cholesterol in arteries / atheroma formed;
 blood pressure increased;(*)

Salt

Increased salt concentration in blood;
 decreases water potential of the blood;
 water moves into the blood;
 blood pressure increased;(*)

Smoking

decreases conc. of antioxidants in blood;
 phagocytes release more free radicals;
 this increases the damage done to artery walls;
 raises the number of platelets in the blood;
 makes them more sticky;
 more blood clots are likely to form;
 increase cholesterol / fat concentration in blood;
 causes constriction of coronary arteries;
 carbon monoxide combines with haemoglobin so less available to transport oxygen;
 blood pressure increased;

(*)Allow ref to increasing blood pressure only once.

max 8

[12]

12. (a) (i) Concave survival curve; 1
 (ii) Narrow-based population pyramid; 1
- (b) Infectious disease causing large number of deaths in population with low expectation of life;
 Many such diseases waterborne; 2
- (c) Decrease in percentage of population dying from infectious disease,
 Therefore greater proportion of those remaining dying of cancer;
 Reference to percentage and not actual numbers;
 Greater survival to old age so cancer more likely;
 Because of accumulated genetic error/exposure to mutagens/reduced immune response; max 2

[6]

13. (a) 16.6 dm^3 gains two marks no unit given = 1 mark
correct method i.e. $8.33 \text{ minutes} \times 2 \text{ dm}^3$
gains one mark if above answer incorrect 2

(b) cannot swim faster than 0.6 m^{-1} 1

(c) *NB answers must relate to data which is oxygen INTAKE*
high velocity requires high oxygen intake / low oxygen debt;
linked to respiration / energy transfer / lactic acid production;
exercise has enabled competitive swimmer to develop greater lung volume;
therefore increased uptake of oxygen into blood; max 3

[6]

14. (a) cities have more industry or cars therefore more air pollution
OR more smokers in cities;
effect of pollution e.g. lung tissue damaged / irritated 2

(b) air passages narrow / mucus or phlegm produced;
more difficult to ventilate alveoli / gaseous exchange reduced 2

(c) emphysema affects alveoli (rather than bronchioles);
phlegm produced in bronchitis (but not in emphysema);
emphysema long term effects whereas bronchitis possibly short term max2

[6]

15. (a) increase by one risk factor doubles incidence;
but adding third risk factor has larger effect on incidence/
effect of adding factors has exponential effect
(*copying figures from graph neutral*) 2

(b) (high blood cholesterol may lead to) fatty deposition in artery walls;
detail e.g. in epithelial / fibrous layer;
atheroma formed;
blood pressure increased;
lumen of coronary vessels narrowed;
reduced blood supply to heart muscle;
angina;

weakness of arterial wall increases chance of aneurysm;
 increased risk of blood clot blocking vessels;
 increased risk of heart attack; affected heart muscle dies;
 high blood pressure puts increased strain on heart;
 and greater risk of aneurysm rupturing;
 atheroma increases risk of blood clots forming;
 smoking increases risk of aneurysm;
 less antioxidants / more free radicals;
 smoking increases number/activation of platelets
 leading to increased chance of clots;

10

[12]

16. (a) (i) E.g. better food supply, so fewer deaths by starvation;
 clean water supply, so less disease transmission. 2 max

(ii) Curve rising rapidly and then falling. 1

(b) E.g. narrowing at base of age pyramid;
 increasing percentage of older people; 1 max

(c) E.g. predation on other species/eat more of other species;
 inter-specific competition/disruption of food chain;
 destruction of habitat/damage by pollution;
 niche not present;
 competition for named abiotic resource; 3

[7]

17. (a) Diagram shows:
 narrower base;
 increase in numbers of older age groups/ straighter sides; 2

(b) (i) High fertility rate;
 higher than replacement rate of 2.0;
 not balanced by under-5 mortality;
 ref. to life expectancy greater than reproductive life; 2 max

- (ii) Disease/AIDS - affecting people of reproductive age
 increasing child mortality;
 shortage of resources/starvation - increasing as population rises;
 improved standard of living / contraception, so fewer children born
 effects of war, reducing number of parents, or causing
 starvation/shortage of resources;
 (Allow 1 mark for 2 factors, without explanations)

2 max

[6]

18. (a) DNA strand has complementary bases/nucleotides
 joining of matching pairs, i.e. C to G / A to T;
 hydrogen bonding

3

- (b) Availability of treatment/cure if cancer detected;
 reliability of detection -e.g. number of false positive/negatives;
 cost effectiveness - related to (e.g.) frequency of cancer (*not just cost*);
 ethical issue explained, e.g screening of whole population, or by
 patient choice;
 (*not: safety, since urine is tested*)

max 2

[5]

19. (a) Has cell wall / capsule / no glycoprotein spikes;
 Has organelles / ribosomes / plasmids;
 may have flagellum;

2 max

- (b) In droplets;
 expelled during cough / sneeze / breathing out;
 carried in aerosol by air currents / breathed in by other person;

2 max

- (c) Mutation (of genes / genetic material);
 change in nucleic acid base sequence;
 change in amino acid sequence of (glyco)protein;
 change in tertiary structure, or in shape of protein;
 existing antibodies do not match / new ones have to be produced;
 immunological memory ineffective / takes time to develop immunity;
 most people not immune, so rapid spread/epidemic,
 previous vaccines ineffective,

6 max

[10]

20. (a) (i) better nutrition / better knowledge of spread of disease / reduction in infectious diseases / application of medical advances / clean water / improved living conditions (specific e.g. sanitation) / use of smallpox vaccine;
(ignore general reference to vaccines/antibiotics)
(reject health care) (allow specific reference to smallpox) 1
- (ii) lack of contraception / large families needed to help family provide sufficient food/earn income / pressure to have many children due to high infant mortality rate / cultural/religious idea of extended family; 1
- (b) link between changes in birth and death rates and population change; decrease in both birth and death rates leading to rise in population description of population rising then levelling off; 2 [4]
21. (a) tumour cells carried in bloodstream/lymphatic system / by growth into other organs; 1
- (b) (i) $\frac{4013 + 2157}{30775} \times 100 = 20\%$
principle of correct calculation/correct equation but incorrect calculation = 1 mark
correct answer = 2 marks
- (ii) men smoke(d) more/ explained/example of work-related reason; 1
- (c) mutation in DNA/ of skin cells/ specific example; (allow damage to DNA) caused by UV light/ UV light is mutagenic/carcinogenic; uncontrolled cell division; (reject faster) switches on/makes cancer-causing gene/oncogenes/ switches off cell division suppressor genes; 3 max [7]
22. (a) (i) A – high proportion of young, decreasing proportion in successively older groups / low proportion of older people; B – approximately same proportion of all age groups; (must have pattern i.e. refer to whole age range) 2
- (ii) a large base to pyramid/high proportion of young /high birth rate; 1
- (b) birth rate and death rate; emigration and immigration; 2 [5]

23. (a) (i) smoking increases risk and the effect increases as plasma cholesterol increases/is higher at high plasma cholesterol; smoking increases risk and the effect is greater at high blood pressure; 2
- (ii) cholesterol/fatty tissue deposited in lining/wall of arteries; formation of plaques/blood clots; which obstruct blood flow; 2 max
- (b) noradrenaline produced by SNS; stimulates SAN; increase in heart rate/cardiac output; blood pressure increases; increased risk of cerebrovascular accident/stroke; increased risk of blood clot/thrombosis; 4 max
24. (a) mass of undifferentiated/unspecialised/totipotent cells; uncontrolled cell division; (*not 'repeated'*) metastasis /(cells break off and) form new tumours/spread to other parts of body; 3
- (b) cancer takes time to develop/exposure when young but cancer triggered later; other organs destroyed before death occurs/metastasis affects other organs; immune system less effective in old people; longer time of exposure to UV/ accumulation of mutagenic effect; 1 max
- (c) dark skin/melanin/pigment stops UV light/prevents burning; so less cancer risk in dark skinned people/less likely to develop tumours; (*allow converse*) 2
25. (a) (i) 1931; smallest difference between birth and death rate; 2
- (ii) rate of increase = $34.3 - 22.0 = 12.3$ per thousand, so increase = $18\ 000 \times 12.3/221\ 400$; size of population = $18\ 000\ 000 + 221\ 400$ (increase) = 18 221 400; 2
- (b) herd immunity/effect; any individual has lower chance of meeting infected individual; lower chance of disease being passed on/prevents spread of disease; 2 max

[8]

[6]

- (c) males have XY, females XX/ males have Y chromosome females do not;
 so males have only one allele for some genes;
 these alleles are expressed;
 (harmful alleles) increase chance of early death/valid example;

OR

males have XY, females XX/ males have Y chromosome, females do not;
 males develop testes;
 which are responsible for testosterone production;
 which causes males to take more risks/valid example;

OR

males have XY, females XX/ males have Y chromosomes, females do not;
 females develop ovaries;
 which are responsible for oestrogen production;
 which protects individuals against diseases/valid example, e.g CHD;

3 max

[9]

26. (a) sigmoidal curve/low (in A), increase(in B), rapid increase (in C), levelling off/slow rise (in D); 1

(b) limited/changing food supply;
 outbreaks of disease (*accept epidemic*); 2

(c) D 1

[4]

27. (a) secreted by the liver/storage/release from gall bladder;
 into the duodenum/small intestine;
 bile passes unchanged from small intestine to colon; 2 max

(b) (i) chance alone has not caused the difference (between the two patients types);
 high steroid high bacteria (significantly) higher percentage of cancer patients/
 low steroids low bacteria (significantly) higher percentage of control patients; 2

(ii) some patients with low levels of one/both factor(s) have cancer; 1

- (c) change in code/base sequence/structure of gene;
 addition/deletion/substitution;
 mRNA/transcription changed;
 gene product/protein structure/amino acid sequence changed/
 different protein;
 loss of function;
 uncontrolled cell division; 4 max

[9]

28. (a) (i) build up of fatty deposits/atheroma/arteriosclerosis/ plaque deposits/
 blood clots;
 in walls of arteries; 2
- (ii) narrowing/blockage (of coronary arteries);
 restricts/reduces blood flow to the heart;
 heart reduced supply/starved of oxygen;
 muscle dies;
 (cardiac muscle) does not contract; 3 max

(allow points included in answer to part (i))

- (b) fewer people with very high cholesterol levels;
 therefore contribution to total/ relative number of deaths lower; 2

[7]

29. (a) (i) *suitable reason for birth rate increase;*
examples,
 more people survive to reproductive age;
 better pre-natal care / health care of mother;
 better nutrition of mother; 1 max

- (ii) *suitable reason for death rate fall;*
examples,
 better nutrition;
 better sanitation;
 (widespread) introduction of health care;
 better post-natal care (mother or child);
 vaccination programmes; 1 max

- (b) (i) birth rate decreasing;
 as the death rate constant but births minus deaths is falling; 2

- (ii) reduces population growth until 1989/90 (as more (net) emigration);
increases population growth from 1989/90 (as more (net) immigration); 2

[6]

30. (i) less / no calbindin protein;
{*reject carrier protein*}
calcium not transported / moved (across the cytoplasm);
so diffusion gradient reduced at small intestine interface; 2

- (ii) **A** is channel / pore protein (for calcium ions);
passage by facilitated diffusion;
down diffusion /concentration gradient; 2 max

- B** is carrier protein(for calcium ions);
passage by active transport;
against concentration gradient / requires energy / ATP; 2 max

[6]