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 <u>shape</u> / 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 <u>plaque / atheroma</u>;
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'*
<u>Parents</u> 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 above7/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

          [9]

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

          [6]

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

(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 <u>DNA</u>;   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 minutes × 2 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 <u>air</u> 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 <u>coronary</u> vessels narrowed;
reduced blood supply to <u>heart</u> 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 <u>cells</u> carried in bloodstream/lymphatic system /
by growth into other organs;   1

(b) (i) $\dfrac{4013 + 2157}{30775} \times 100 = 20\%$

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

                                                                   [8]

24.   (a)   mass of undifferentiated/unspecialised/totipotent cells;
<u>uncontrolled cell division</u>; (*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;   2
(*allow converse*)

                                                                   [6]

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 × 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

(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) hig<u>her</u> percentage of
cancer patients/
low steroids low bacteria (significantly) hig<u>her</u> 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 <u>fatty</u> 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 <u>increase</u>;*
                  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 <u>calbindin</u> 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 <u>facilitated</u> 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]