1 Mumps is a disease caused by a virus. Mumps vaccine is usually given to children as part of the MMR vaccine.

(a) What diseases, other than mumps, does the MMR vaccine protect against?

_____

(2)

(b) Mumps vaccines contain mumps viruses. Suggest why these viruses do not cause mumps.

_____

_____

(1)

(c) Explain how the vaccine makes someone immune to mumps.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(5)

(d) A child who has not been given the mumps vaccine catches mumps. Suggest why a doctor would **not** give antibiotics to cure the child of mumps.

_____

_____

(1)
(Total 9 marks)

2   The body's immune system protects us from diseases.

Describe the different ways in which white blood cells protect us from infectious diseases.

_____

_____

_____

_____

_____

_____

_____

_____

_____

(Total 4 marks)

3   The MMR vaccine is used to protect children against measles, mumps and rubella.

(a)   Complete the sentences about vaccination.

Vaccines stimulate white blood cells to produce_____.

This makes children_____to the pathogen.

(2)

(b) In the 1990s, many people thought that the MMR vaccine caused autism in some children.
As a result, the Japanese government stopped using the MMR vaccine.

The graph gives information about the percentage of children in Japan vaccinated with the
MMR vaccine and the number of children who developed autism during the 1990s.
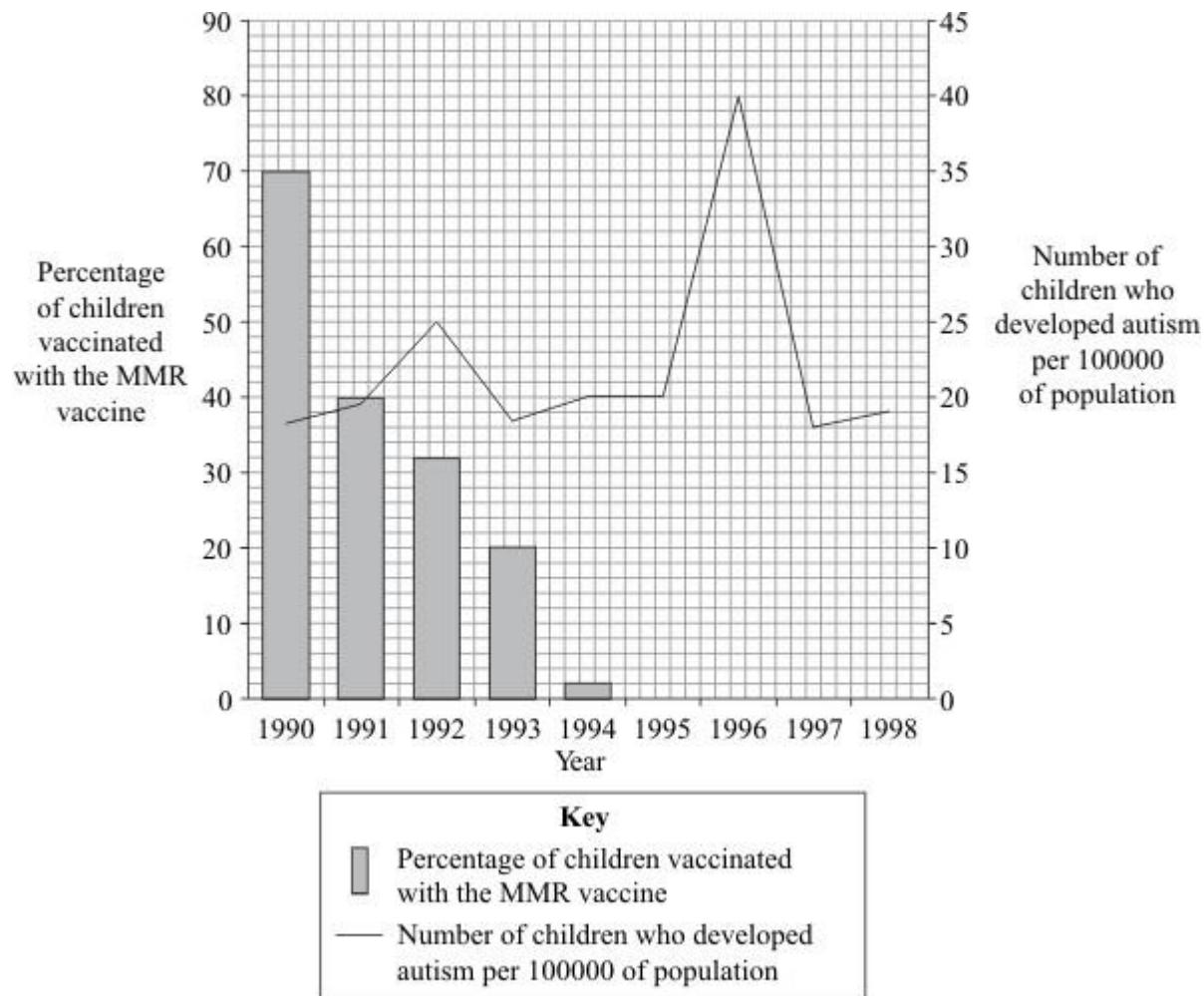
(i) Describe how the percentage of children vaccinated with the MMR vaccine changed
between 1990 and 1995.

_____

_____

_____

_____

_____

(2)

(ii)   Does the data in the graph support a link between MMR vaccination and autism?

Draw a ring around your answer. **Yes** / **No**

Explain the reason for your answer.

_____

_____

_____

_____

_____

(2)

(Total 6 marks)

4   Hepatitis B is a liver disease caused by a virus. The virus is found in body fluids such as blood, saliva and urine. Diagram **1** shows the structure of the virus in cross section.
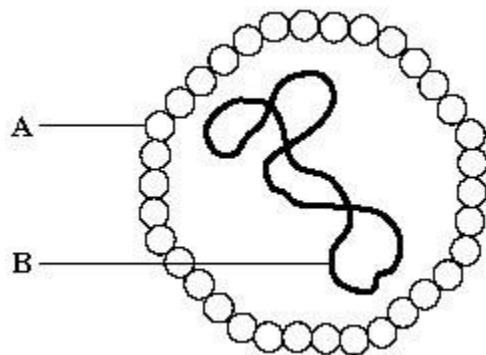

Diagram 1

(a)   The human body has several natural defences against viruses. Some of these prevent viruses from entering the body. Others act once the viruses have entered.

(i)   Diagram **2** shows a white blood cell attacking a group of viruses.

Complete diagram **2** by drawing the 2nd stage.

**1st stage**   **2nd stage**   **3rd Stage**
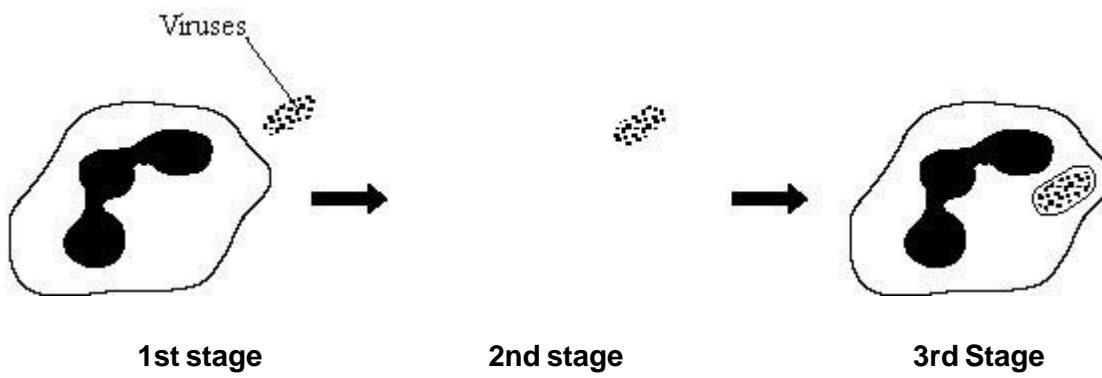
Diagram 2

(1)

(ii)   What type of chemical is released by some white blood cells to attack viruses?

_____

(1)

(b)   Hepatitis B is more likely to be spread among people who share needles when they inject drugs. Use information given at the beginning of this question to explain why this is so.

_____

_____

_____

_____

(2)
(Total 4 marks)

5 Scientists have trialled a new statin called rosuvastatin.

- 17 802 people took part in the trial.

- All of these people had high levels of a protein called CRP in their blood.

- The higher the level of CRP in the blood, the higher the risk of a heart attack.

- None of these people had heart conditions at the beginning of the investigation.

- None of these people had high LDL (low density lipoprotein) levels.

- All of these people were aged 50 or above.

- Half the people were given a rosuvastatin tablet each day; the other half were given a placebo.

- The trial was stopped 7 months early when it was found that the people given rosuvastatin were 54% less likely to have a heart attack than people given the placebo.

(a) Give **two** control variables in this investigation.

1. _____

2. _____

(2)

(b) What would the placebo be in this investigation?

_____

_____

(1)

(c) The trial gave reliable results.

Give **one** reason why.

_____

_____

(1)

(d) The trial was stopped 7 months early.

Give **one** reason why.

_____

_____

(1)

(e)   The manufacturers of rosuvastatin paid for the trial.

However, the manufacturers took no part in the trial.

Suggest **one** reason why the manufacturers did not take part in the trial.

_____

_____

(1)

(f)   The table shows some of the results of the trial.

Substance	Concentration in blood in mg per 100 cm^3 after 3 years of trial	
	People given rosuvastatin	People given placebo
LDL cholesterol	53	106
HDL cholesterol	50	49
Saturated fats	106	123

Rosuvastatin reduces the risk of heart attacks.

Use the data in the table to explain why.

_____

_____

_____

_____

(2)
(Total 8 marks)

6   Controlling infections in hospitals has become much more difficult in recent years.

(a)   Explain why MRSA is causing problems in many hospitals.

_____

_____

_____

_____

(2)

(b) The pioneer in methods of treating infections in hospitals was Ignaz Semmelweiss. He observed that women whose babies were delivered by doctors in hospital had a death rate of 18% from infections caught in the hospital. Women whose babies were delivered by midwives in the hospital had a death rate of 2%. He observed that doctors often came straight from examining dead bodies to the delivery ward.

(i) In a controlled experiment, Semmelweiss made doctors wash their hands in chloride of lime solution before delivering the babies. The death rate fell to about 2% – down to the same level as the death rate in mothers whose babies were delivered by midwives.

Explain why the death rate fell.

_____

_____

(1)

(ii) Explain how Semmelweiss's results could be used to reduce the spread of MRSA in a modern hospital.

_____

_____

_____

_____

(2)
(Total 5 marks)

7 Medicinal drugs are used to treat diseases.

(a) Draw **one** line from each drug to its correct use.

Drug	**Use**
	Used as a fertility drug
Painkiller	
	Used to relieve disease symptoms
Statin	
	Used to treat leprosy
Thalidomide	
	Used to lower blood cholesterol
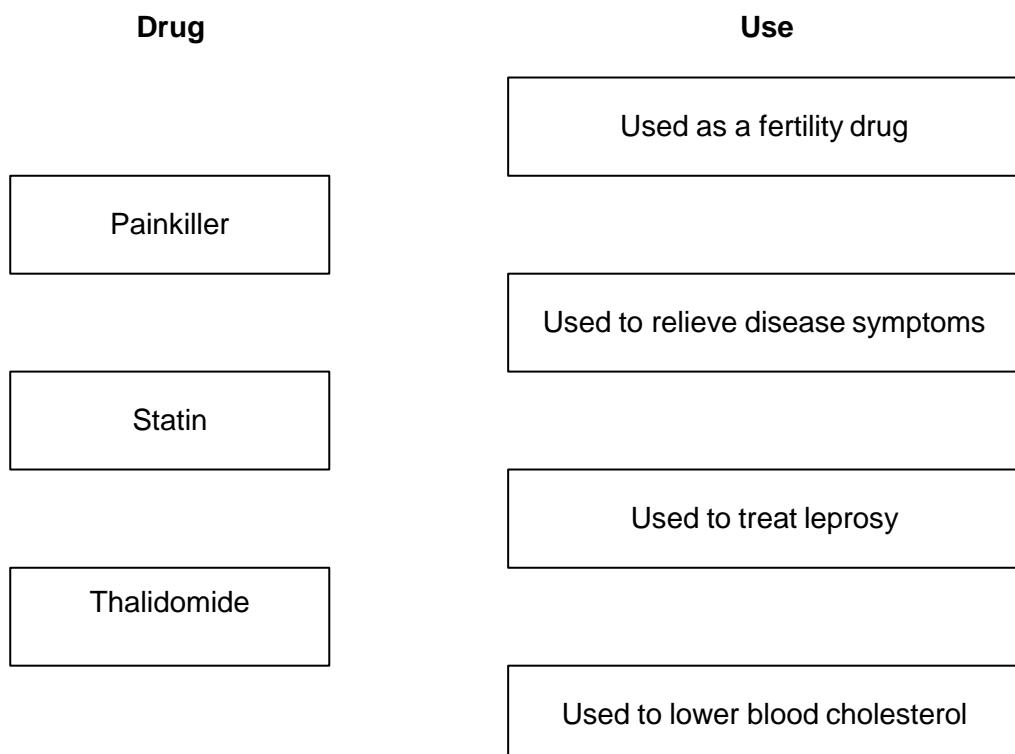
(3)

(b) New drugs need to be tested before going on sale.

The diagram shows a time line for the testing of a new drug.

Time in years

0   1   2   3   4   5   6   7   8   9   10   11   12

Pre-clinical testing	Clinical testing	Drug on sale

Laboratory tests including tests on animals	Phase 1	Phase 2	Phase 3
	10–100 volunteers	200–400 patients	3000+ new patients
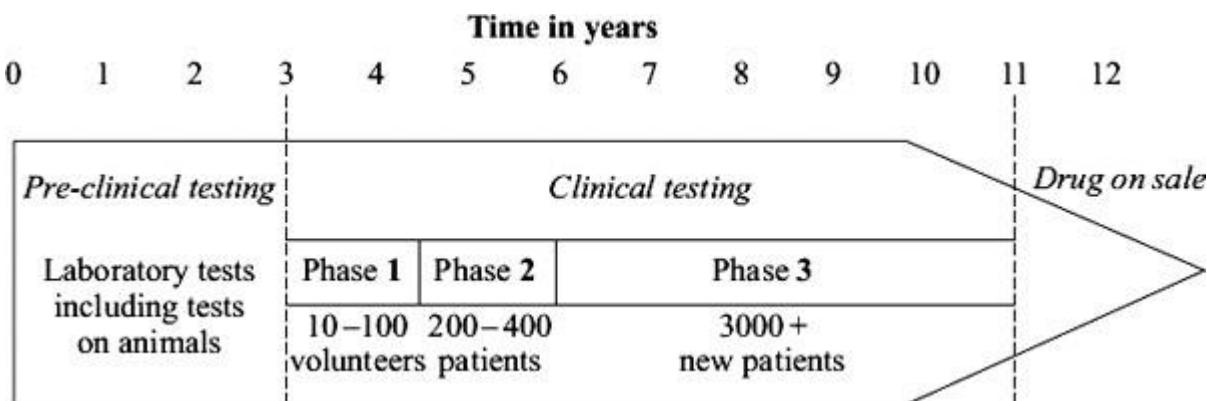
(i) How long do trials on humans take? _____ years

(1)

(ii) What is the minimum number of humans the drug is tested on throughout *clinical testing?*

_____

(1)

(c)   Draw a ring around the correct answer to complete each sentence.

(i)   A new drug is first tested in the laboratory to find

if it is toxic.

if it is cost effective.

the optimum dose.

(1)

(ii)   The drug is then tested on a few volunteers to find

if it is cost effective.

if it has side effects.

the optimum dose.

(1)
(Total 7 marks)

8   Diet and exercise affect health.

(a)   Many people are obese (very overweight).

Obesity can lead to heart disease.

Other than heart disease, name **two** conditions which are linked to obesity.

1. _____

2. _____

(2)

(b)   The graph shows the number of deaths from heart disease each year in the UK.
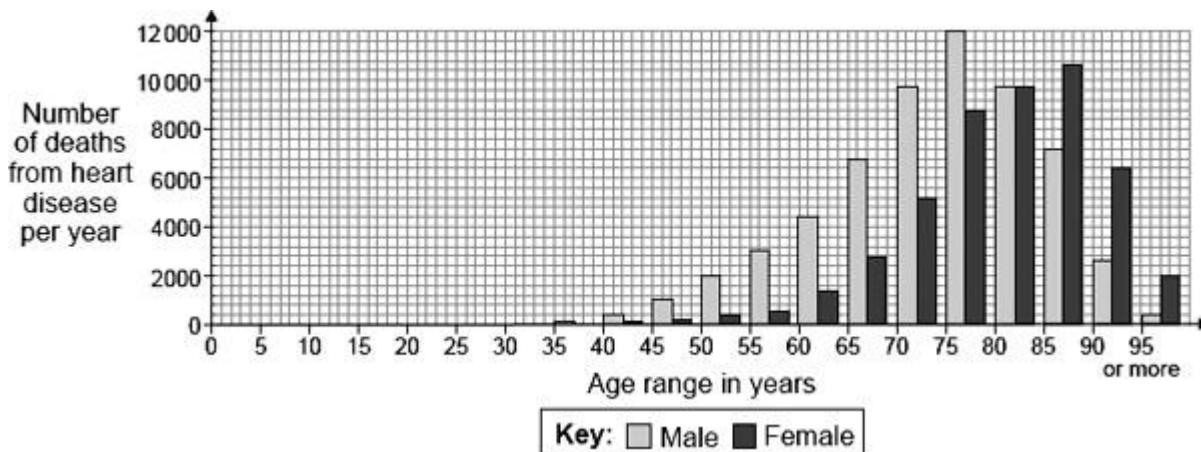
The pattern for deaths from heart disease in men is different from the pattern in women.

(i)   Give **two** differences between the patterns for men and women.

1. _____

_____

2. _____

_____

(2)

(ii)   Suggest **two** reasons for the difference in the number of deaths from heart disease in men and women between the ages of 40 and 60.

1. _____

_____

2. _____

_____

(2)

(c) Scientists have developed drugs to reduce the concentration of cholesterol in the blood.

Give the **three** main stages in testing a new drug before it is sold to the public.

1. _____

_____

2. _____

_____

3. _____

_____

(3)

(Total 9 marks)

9 New drugs have to be thoroughly tested before they are sold.

The diagram shows a time line for the testing of a new drug.

Time in years

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

Pre-clinical testing | *Clinical testing* | *Drug on sale*

Laboratory tests including tests on animals | Phase 1 | Phase 2 | Phase 3

10–100 volunteers 200–400 patients 3000+ new patients
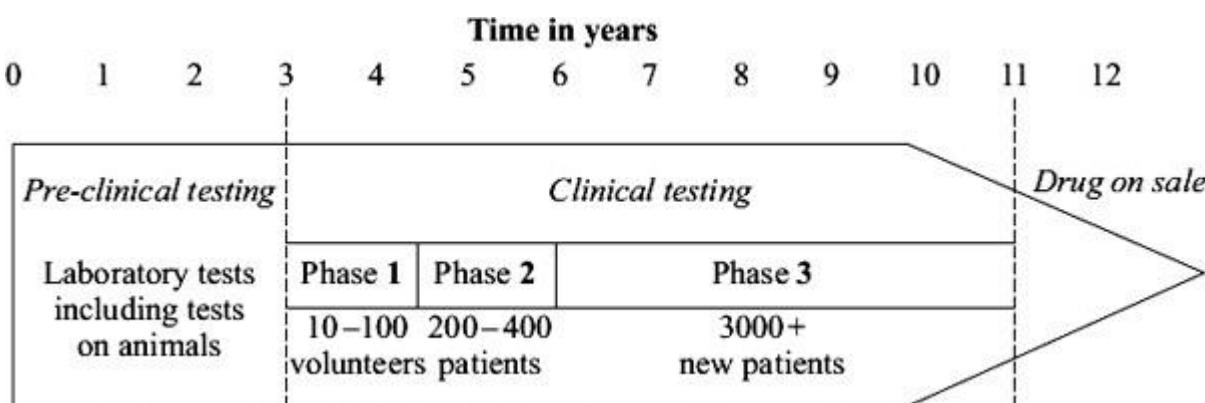
(a) What is the main purpose of *pre-clinical testing?*

_____

_____

(1)

(b) In Phase **1** of the *clinical testing,* very low doses of the new drug are used on a small number of volunteers.

(i)   What is the main purpose of Phase **1** testing?

_____

_____

(1)

(ii) In Phase **1** testing, healthy volunteers are used rather than patients.

Suggest **one** reason for this.

_____

_____

(1)

(c) What is the main purpose of the Phase **2** and Phase **3** testing?

_____

_____

(1)

(d) During Phase **3** testing, many of the patients are given a *placebo.*

(i) What is meant by a *placebo?*

_____

_____

(1)

(ii) During the testing, who knows which patients are receiving the *placebo?*

Tick (✔) **one** box.

Only the patients ☐

Only the doctors ☐

Both patients and doctors ☐

Neither patients nor doctors ☐

(1)
(Total 6 marks)

Mark schemes

1   (a)   measles

ignore mumps

1

rubella

accept German measles

1

(b)   viruses are 'dead'

accept other viral treatments
accept 'non-virulent'
mild' must be qualified
*do **not** accept 'small dose'*

1

(c)   The answer to this question requires good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme.

Maximum of 4 marks if ideas not well expressed

any **five** from:

contains antigens or proteins

accept reference to immunological memory or memory cells'

white cells (accept lymphocytes)

do not accept phagocytes

idea of specificity in antibodies or antigens

antibody <u>production</u>

ignore engulfing

antigens destroyed / virus destroyed

<u>rapid</u> antibody production if infected

max 5

(d)   antibiotics do not kill / affect viruses

1

[9]

2   (wbc) ingest / digest pathogens / bacteria / viruses

allow eat germs
ignore swallow germs
ignore ingest the disease
ignore attack / kill the disease

1

(wbc) produce antibodies

1

(wbc) produce antitoxins

1

any **one** from:

- (antibodies) destroy or kill pathogens / bacteria / viruses / germs
  ignore destroy / kill disease
  ignore attack / fight pathogens

- (antitoxins) counteract / destroy / neutralise toxins / poisons
  ignore attack / killing toxins

- reasonable reference to memory cells **or** rapid
  production of antibodies upon re-infection

1

[4]

3 (a) antibodies
      allow antitoxins / memory cells
      *do **not** allow antigens*

1

   immune
      ignore protection
      allow resistant

1

(b) (i) fell

1

      numerical qualification to zero / nothing / by 100%
         allow stopped in 1995

1

   (ii) (no)
         ignore circle

1

      % vaccination fell **or** when no vaccination

      but autism numbers did not fall / stayed high / increased

      or

      '(yes) might support it if time lag between vaccination and autism
      symptoms' / 'time lag fordiagnosis' (1)

      6 year time lag quantified (1)

1

[6]

4 (a) (i) diagram shows extensions of intact cell membrane around viruses

1

(ii) antibodies
allow enzymes re (ii)
allow interferon
ignore antitoxins / proteins

1

(b) <u>virus</u> is transferred

1

(virus in) blood / body fluids – transfer (via needles)

1

[4]

5 (a) any **two** from:

• (high) CRP / protein

• (no) heart condition
allow health

• (not high) LDL

• over 50 / age

• number of tablets (each day)
ignore time
ignore placebo / rosuvastatin
ignore number of people

2

(b) any **one** from:

• tablet with no drug
allow fake (pill) / dummy (pill) / sugar / chalk (pill)

• tablet that has no effect
allow drug that has no effect

• tablet without chemicals
ignore vitamin / mineral pill

• tablet that people thought contained statin **or** reference to psychological effect
ignore control / different statin

1

(c) 17802 / large number of people **or** enough people
ignore control group / fair test / control variables
ignore time / repeats

1

(d)　any **one** from:

　　　ignore cost

- placebo group at risk of heart attack **or** to allow statin to be given to everyone

- statin group 54% less likely to get heart attack **or** showed that statin worked **or** showed trial (very) successful

　　　ignore reliable

- sufficient information gained / results conclusive

　　　ignore got results early

- unethical / unfair to carry on trial

1

(e)　to avoid bias **or** show impartiality **or** show results independent

　　　allow manufacturers could cheat

　　　ignore reliability

　　　ignore could be sued / blamed if trial went wrong

　　　ignore manufacturer would know which group got statin / placebo

1

(f)　any **two** from:

- reduction in LDL

　　　*allow improves LDL:HDL balance **or** LDL and HDL concentrations equal*

　　　ignore less cholesterol

　　　ignore more HDL

　　　*do **not** accept less HDL*

- reduction in (saturated) fats

- reduces deposition of fat / cholesterol / LDL in walls of blood vessels
  or
  blood vessels less likely to be blocked with fat / cholesterol / LDL

2

[8]

6　(a)　any **two** from:

　　　virus is neutral

- resistant to (most) antibiotics

- contagious **or** easily passed on **or** reference to open wounds

- patients ill therefore less able to combat disease

2

(b) (i) chloride of lime / hand washing killed bacteria (picked up from corpses)
allow disease / germs / infection / disinfectants

1

(ii) people to wash hands after contact with patient

1

so <u>bacteria</u> / <u>pathogen</u> / <u>MRSA</u> not transferred to other patient

1

[5]

7 (a)
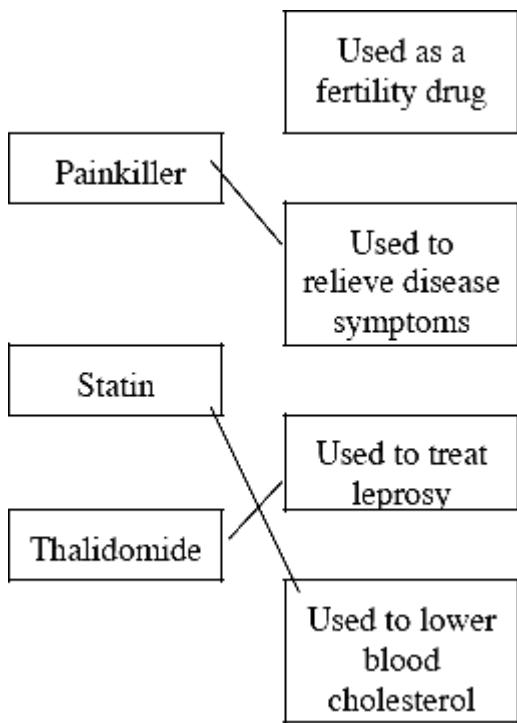
all three correct = 3 marks
two correct = 2 marks
one correct = 1 mark
extra line from a statement cancels
the mark

3

(b) (i) 8

1

(ii) 3210

1

(c) (i) if it is toxic

1

(ii) if it has side effects

1

[7]

8   (a)   any **two** from:

•   arthritis
    allow damaged joints

•   diabetes
    accept high blood sugar

•   high blood pressure

•   strokes
    allow blocked blood vessels / thrombosis

•   allow breathing difficulties
    ignore cancer
    ignore high cholesterol

2

(b)   (i)   any **two** from:
        to gain marks there must be a comparison
        ignore comparison at single age

•   lower number of women deaths up to age of 75-80

•   higher number of women deaths after 80
    *ignore women die older **or** men die younger*

•   men's peak higher

•   men's peak at an earlier age

•   men's death start earlier than women

•   more men than women die of heart disease

2

(ii) any **two** from:

- men smoke more (cigarettes)
  ignore alcohol

- more men smoke

- men under more stress

- men less active

- more men overweight / eat more / less diet conscious **or** different fat distribution
  ignore reference to body size

- genetic factors

- men might have lower metabolic rate
  ignore references to hormones

- men less likely to visit doctor even though they have symptoms

2

(c) *points can be in any order*

laboratory tests / tests on tissues
or
tests on animals
or
tests for toxicity
    ignore computer simulations

1

tests for <u>side effects</u> on volunteers / healthy people / small numbers

1

widespread testing
or
testing for optimum dose
or
test on patients / sick people
or
test to see if it is effective
    accept use of placebo

1

[9]

9 (a) testing for toxicity / see if it is safe /see if it is dangerous / to see if it works
    ignore side effects unqualified

1

(b)　(i)　testing for side effects / testing for reactions (to drug)

ignore to see if it works

*do **not** accept dosage*

1

　　　(ii)　any **one** from

ignore immune system

- dose too low to help patient

- higher risk for patient

- might conflict with patient's treatment / patient on other drug

- effect might be masked by patient's symptoms / side effects clearer

1

(c)　to find optimum dose

*allow testing on larger sample **or** it makes results more reliable*

allow to find out if drug is effective /find out if drug works on ill people (not just if drug works)

1

(d)　(i)　(tablet / drug / injection) that does not contain drug

allow control / fake / false

allow tablet / injection that does not affect body

*do **not** accept drug that does not affect body*

1

　　　(ii)　neither patients nor doctors

1

[6]