

Q1.

(a) Describe how bacteria are destroyed by phagocytes.

(Extra space)

(3)

(b) Give **two** structures a bacterial cell may have that a white blood cell does not have.

1. _____

2. _____

(2)

(Total 5 marks)

Q2.

Read the following passage.

Low-density lipoprotein (LDL) is a substance found in blood. A high concentration of LDL in a person's blood can increase the risk of atheroma formation. Liver cells have a receptor on their cell-surface membranes that LDL binds to. This leads to LDL entering the cell. A regulator protein, also found in blood, can bind to the same receptor as LDL. This prevents LDL entering the liver cell. People who have a high concentration of this regulator protein in their blood will have a high concentration of LDL in their blood. Scientists have made a monoclonal antibody that prevents this regulator protein working. They have suggested that these antibodies could be used to reduce the risk of coronary heart disease.

5

10

A trial was carried out on a small number of healthy volunteers, divided into two groups. The scientists injected one group with the monoclonal antibody in salt solution. The other group was a control group. They measured the concentration of LDL in the blood of each volunteer at the start and after 3 months. They found that the

15

mean LDL concentration in the volunteers injected with the antibody was 64% lower than in the control group.

Use the information in the passage and your own knowledge to answer the following questions.

- (a) The scientists gave an injection to a mouse to make it produce the monoclonal antibody used in this investigation (line 7).

What should this injection have contained?

(1)

- (b) LDL enters the liver cells (lines 3–4).

Using your knowledge of the structure of the cell-surface membrane, suggest how LDL enters the cell.

(2)

- (c) Explain how the monoclonal antibody would prevent the regulator protein from working (lines 7–8).

(2)

- (d) Describe how the control group should have been treated.

(2)

(Total 7 marks)

Q3.

(a) Describe how B-lymphocytes respond when they are stimulated by antigens.

(4)

(b) The table gives information about some components of a red blood cell.

Component	Glycoprotein	Phospholipid	Haemoglobin
Location in cell	on outer surface of plasma membrane	within plasma membrane	in cytoplasm

Suggest which component of an intact red blood cell is most likely to act as an antigen during a blood transfusion. Explain your answer.

Component _____

Explanation _____

(2)

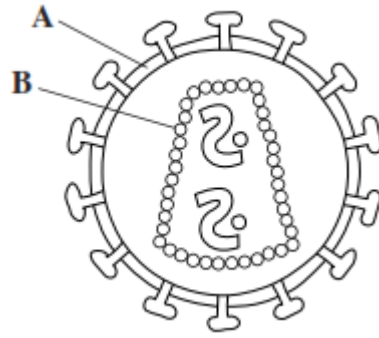
(Total 6 marks)

Q4.

(a) The table below shows features of a bacterium and the human immunodeficiency virus (HIV) particle.

Complete the table by putting a tick (✓) where a feature is present.

Feature	Bacterium	Human immunodeficiency virus (HIV) particle
RNA		
Cell wall		
Enzyme molecules		
Capsid		



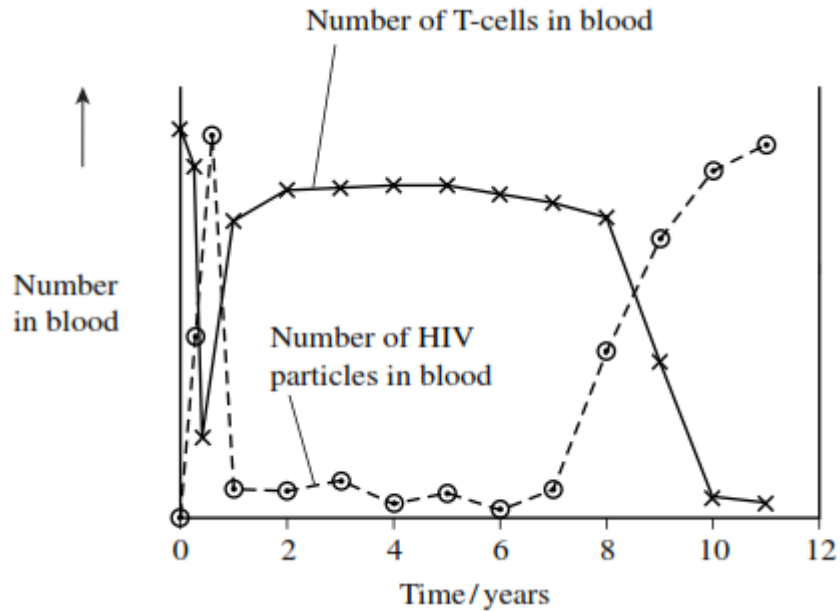
(a) Name

A _____

B _____

(2)

The graph shows changes in the number of T-cells and HIV particles in the blood of a person following infection.



(b) Explain why the number of HIV particles in the blood

(i) rises during the first few months after infection

(2)

(ii) remains low between 1 and 7 years after infection.

(1)

- (c) This person developed a large number of infections about 9 years after he first became infected with HIV. Using information from the graph, explain why.

(Extra space) _____

(4)

(Total 9 marks)

Q6.

Read the following passage.

Azidothymidine (AZT) is a drug used to treat people infected with human immunodeficiency virus (HIV). It inhibits the enzyme that synthesises DNA from HIV RNA. This does not destroy HIV in the body but stops or slows the development of AIDS.

- 5 In the past, some people who took AZT on its own eventually developed AIDS. Some of the HIV in their bodies had become resistant to AZT. To prevent this from happening, people infected with HIV are now treated with highly active antiretroviral therapy (HAART). This involves taking AZT with other anti-HIV drugs at the same time.
- 10 AZT is taken in low doses. This is because people who took high doses over long periods of time suffered muscle wastage. It was found that high doses of AZT inhibit replication of mitochondria.

Use information from the passage and your own knowledge to answer the questions.

- (a) Suggest and explain why AZT does not destroy HIV in the body but stops or slows the development of AIDS (lines 3–4).

(4)

(b) Suggest and explain **two** advantages of using HAART (lines 7–9).

Advantage 1 _____

Advantage 2 _____

(4)

(c) Suggest why high doses of AZT lead to muscle wastage (lines 10–11).

(2)

(Total 10 marks)

Q7.

Nicotine is the addictive substance in tobacco. When nicotine reaches the brain, it binds to a specific protein. This causes the release of chemicals that give a feeling of reward to the smoker. This reward is part of the reason why people find it difficult to stop smoking.

Scientists have developed a vaccine against nicotine to help people stop smoking.

They set up an investigation, which involved a large number of volunteers. Once a month for 5 months, one group of volunteers was given the vaccine and the other group was given a placebo.

At regular intervals, the scientists measured the concentration of antibodies to nicotine in the blood of each group of volunteers. They also calculated the percentage of volunteers who had stopped smoking from months 2 to 6 of the investigation.

- (a) (i) In this investigation, neither the volunteers nor the scientists knew if a particular volunteer was receiving the vaccine or a placebo.

Suggest **two** reasons why this made the scientists' results more reliable.

1. _____

2. _____

(2)

- (ii) The scientists measured the concentration of nicotine in the blood of two volunteers who smoked the same number of cigarettes per day.

Suggest **two** reasons why the concentration of nicotine in the blood of these smokers might be different.

1. _____

2. _____

(2)

- (b) (i) Suggest how this vaccine could help people to stop smoking.

(Extra space) _____

(3)

- (ii) Some people have suggested that this vaccine should **not** be given free to smokers on the National Health Service (NHS). Evaluate this suggestion.

(Extra space) _____

(3)

The scientists measured the concentration of antibodies to nicotine in the blood of the volunteers for 12 months after the first vaccination. As a result of these measurements, they divided the volunteers who received the nicotine vaccine into three groups:

- high antibody responders
- medium antibody responders
- low antibody responders.

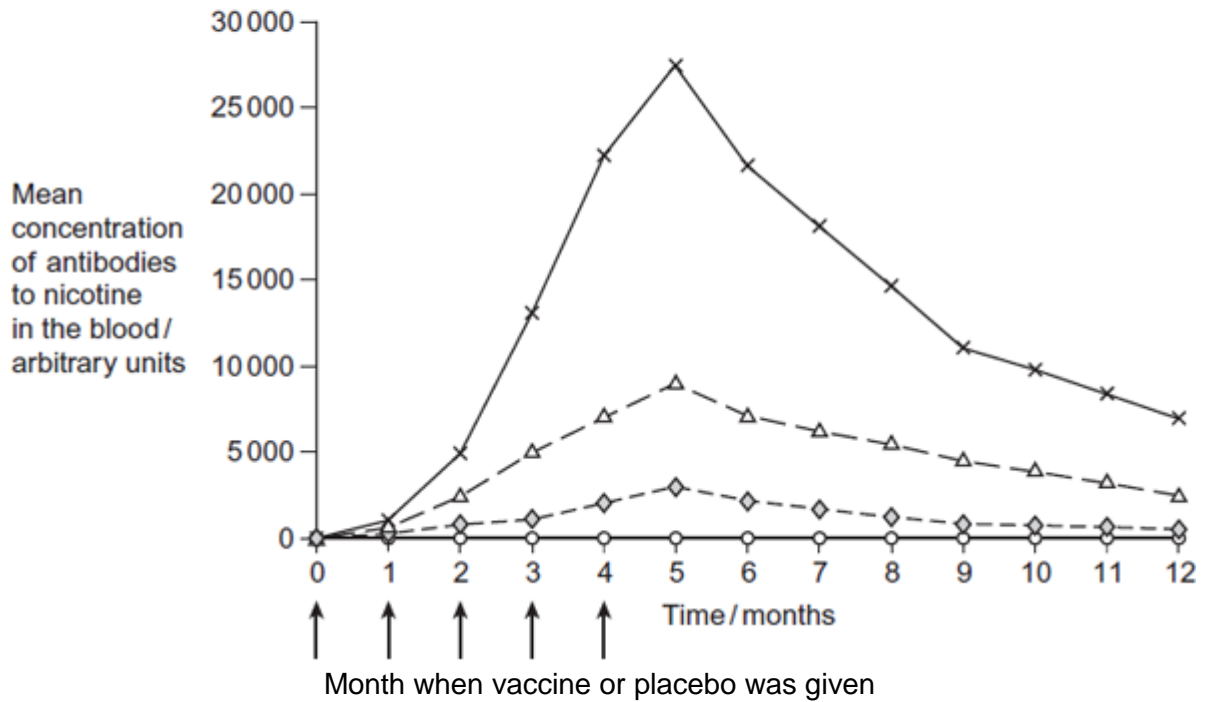
The figure below shows their results.

The scientists also recorded the number of volunteers who had stopped smoking from months 2 to 6 of the investigation.

The table below shows these results.

Key

- x— High antibody responders
- △— Medium antibody responders
- ◇— Low antibody responders
- Placebo



Group	Percentage of volunteers who had stopped smoking from months 2 to 6 of the investigation
High antibody responders	56.6
Low antibody responders	38.1
Medium antibody responders	32.1
Placebo	31.3

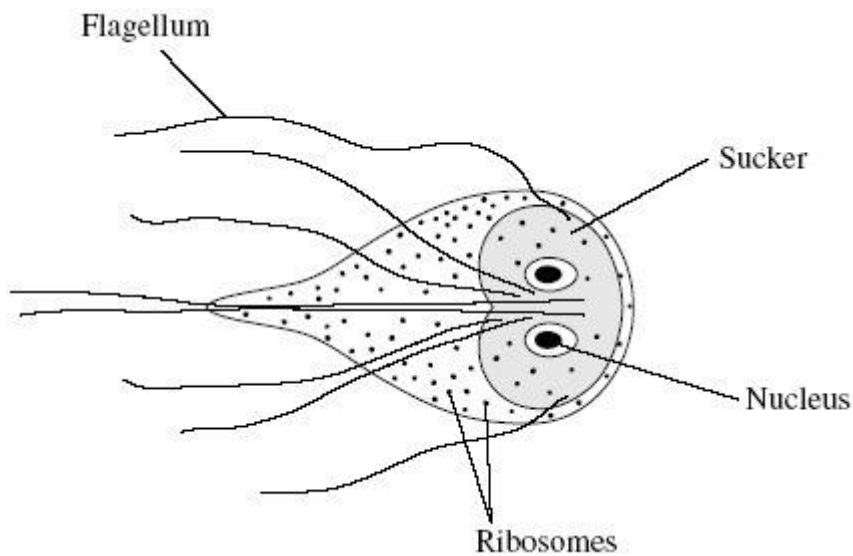
(c) A journalist reported that this vaccine is a major breakthrough in helping people to stop smoking. Do these data support this statement? Explain your answer.

(Extra space) _____

(5)
(Total 15 marks)

Q8.

Giardiasis is an intestinal disease. It is caused by the microorganism *Giardia lamblia*. The drawing shows some of the structures present in *G. lamblia*.



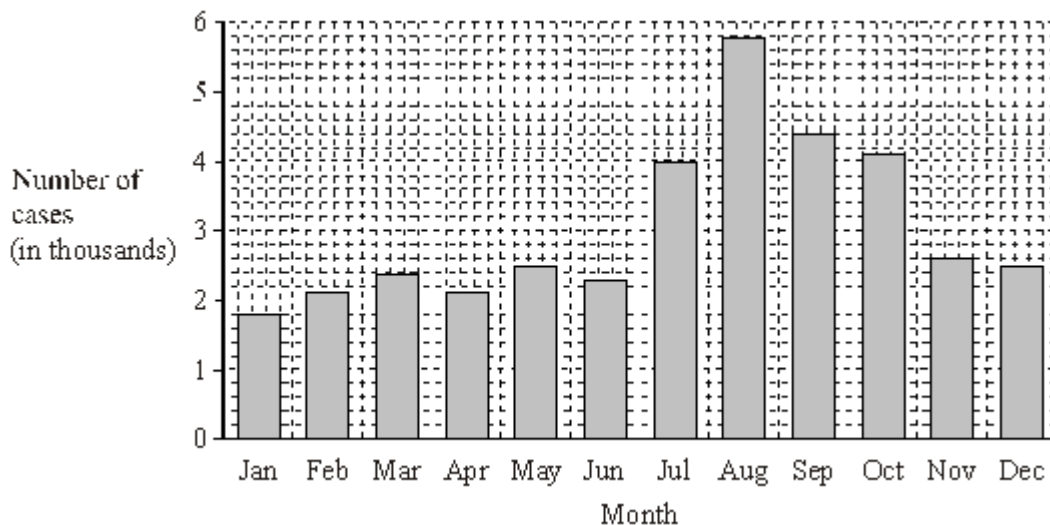
- (a) Name **one** structure shown in the drawing which confirms that *G. lamblia* is a eukaryotic organism.

(1)

- (b) *G. lamblia* can attach itself with its sucker. Explain how this is an adaptation to living in the intestines.

(1)

- (c) Giardiasis is one of the main causes of diarrhoea in the USA. It is usually transmitted by drinking contaminated water. The bar chart shows the number of cases of giardiasis in one state of the USA during one year.



- (i) Calculate the percentage increase in the number of cases of giardiasis from January to August. Show your working.

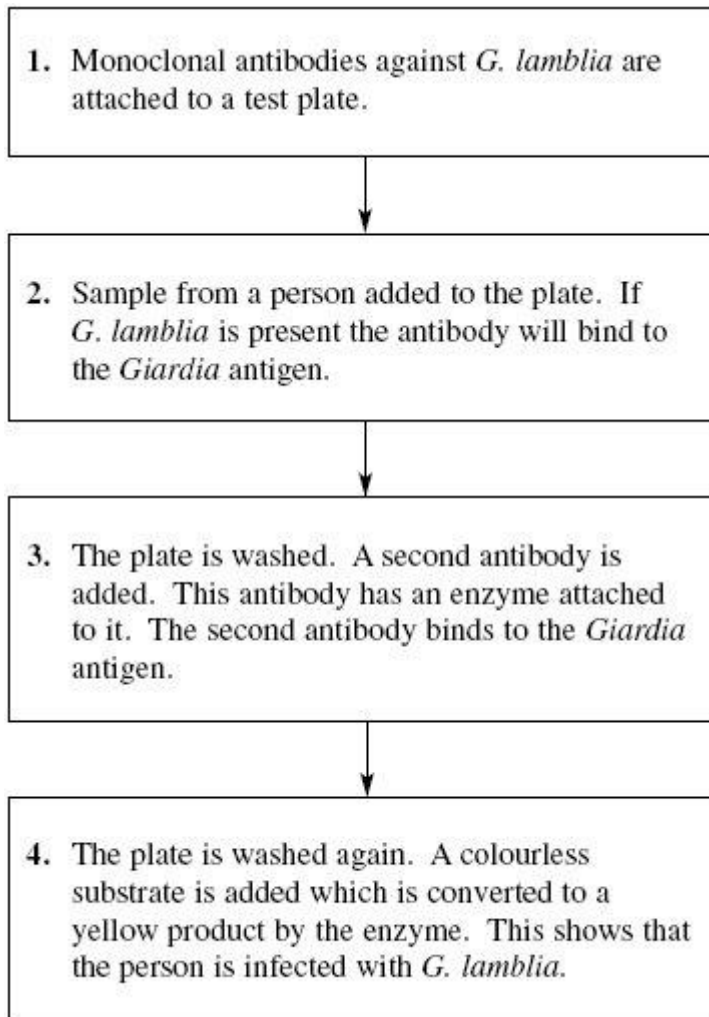
Answer _____

(2)

- (ii) Suggest **one** reason for the number of cases being highest in the late summer months.

(1)

- (d) A test has been developed to find out whether a person is infected with *G. lamblia*. The test is shown in the flow chart.



(i) Explain why the antibodies used in this test must be monoclonal antibodies.

(1)

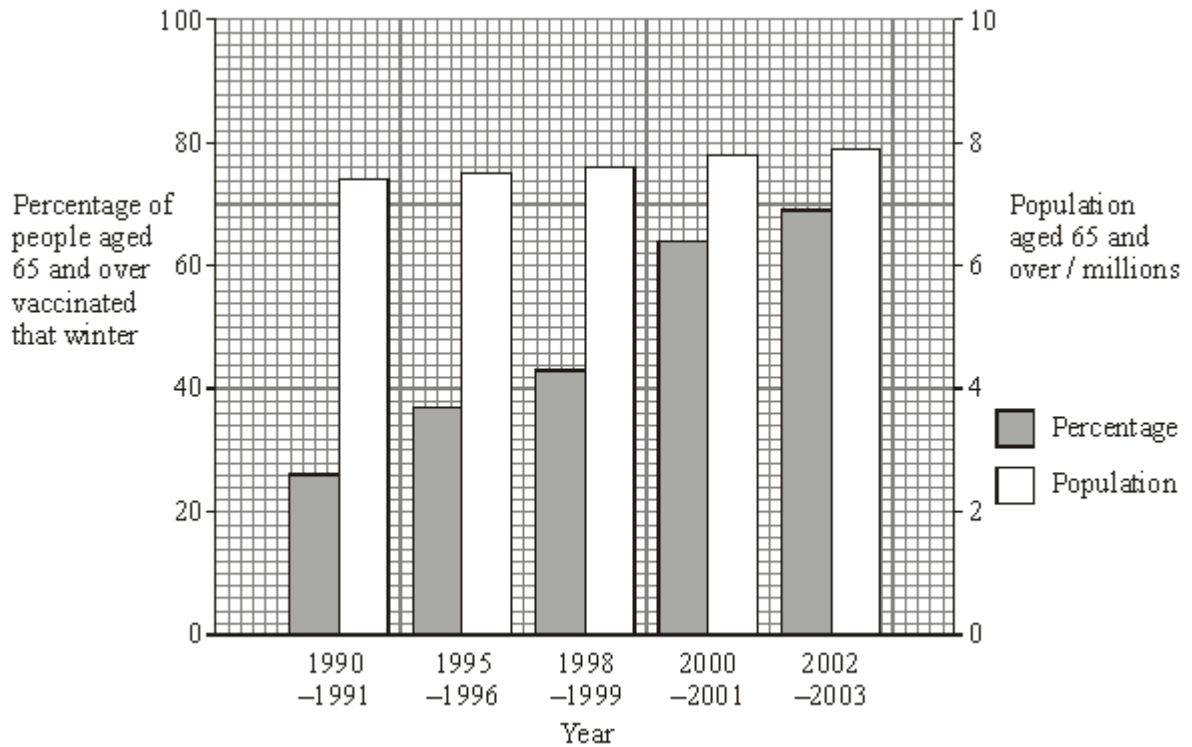
(ii) Explain why the *Giardia* antigen binds to the antibody in step 2.

(1)

(iii) The plate must be washed at the start of step 4, otherwise a positive result could be obtained when the *Giardia* antigen is not present. Explain why a positive result could be obtained if the plate is not washed at the start of step 4.

Q9.

People considered 'at risk' are offered a vaccination against influenza each year. The bar chart shows the number of people in the UK population aged 65 and over and the percentage of those who were vaccinated against influenza each winter.



- (a) Suggest **one** reason to explain the change in the percentage of people aged 65 and over being vaccinated.

(1)

- (b) (i) Calculate the change in the total number of people aged 65 and over being vaccinated between 1990/91 and 2000/01. Show your working.

Answer _____

(2)

- (ii) A student suggested that some people aged 65 and over were being vaccinated every year. Explain how the information in the bar chart supports

this suggestion.

(2)

- (iii) Suggest why it is advisable for people to be vaccinated against influenza every year.

(2)

- (c) An influenza virus consists of a protein coat surrounding nucleic acid. The influenza vaccine consists only of the protein coat of the virus. Explain how the influenza vaccine produces immunity in the body.

(2)

(Total 9 marks)

Q10.

Read the following passage.

Pathogens affect humans. They also affect farm animals. Once pathogens have entered the body of an animal they can cause disease. Vets sometimes have difficulty identifying the disease from which a particular animal is suffering. Until recently, they have had to take blood samples and send them to a laboratory. The laboratory carries out tests on the sample.

5

New tests have been developed. Some of these new tests use monoclonal antibodies. Tests using monoclonal antibodies are fast, specific and allow vets to identify a disease while they are still on the farm.

10

Brucellosis is a disease of cattle. It is caused by bacteria. These bacteria can infect people who drink milk or eat dairy products

from infected cattle. A test using monoclonal antibodies allows vets to identify cattle that are carriers. The carriers are cattle that carry the brucellosis bacteria but do not show any symptoms of the disease.

Use the information from the passage and your own knowledge to answer the following questions.

- (a) Other than bacteria, name **one** type of pathogen (line 1).

_____ (1)

- (b) Give **two** ways in which a pathogen may cause disease when it has entered the body (lines 1–2).

1. _____

2. _____

(2)

- (c) Some new tests use monoclonal antibodies (lines 6–7).

- (i) Explain why these antibodies are referred to as monoclonal.

(1)

- (ii) Tests using monoclonal antibodies are specific (line 7). Use your knowledge of protein structure to explain why.

(3)

- (d) The tests using monoclonal antibodies allow vets to identify brucellosis while they are still on a farm. Explain the advantages of this.

(3)

(Total 10 marks)

Q11.

(a) What is an antigen?

(2)

(b) A zookeeper was bitten by a snake. The bite contained venom which is a poison. He was given an injection of antivenom. This antivenom contained antibodies against this snake venom.

The antivenom did not give the zookeeper lasting protection against this snake venom. Explain why.

(Extra space) _____

(2)

(Total 4 marks)

Q12.

Read the passage below.

Most cases of cervical cancer are caused by infection with Human Papilloma Virus (HPV). This virus can be spread by sexual contact. There are many types of HPV, each identified by a number. Most of these types are harmless but types 16 and 18 are most likely to cause cervical cancer.

5 A vaccine made from HPV types 16 and 18 is offered to girls aged 12 to 13. Three injections of the vaccine are given over six months. In clinical trials, the vaccine has

proved very effective in protecting against HPV types 16 and 18. However, it will be many years before it can be shown that this vaccination programme has reduced cases of cervical cancer. Until then, smear tests will continue to be offered to women, even if they have been vaccinated. A smear test allows abnormal cells in the cervix to be identified so that they can be removed before cervical cancer develops.

The Department of Health has estimated that 80% of girls aged 12 to 13 need to be vaccinated to achieve herd immunity to HPV types 16 and 18. Herd immunity is where enough people have been vaccinated to reduce significantly the spread of HPV through the population.

Use information from this passage and your own knowledge to answer the following

- (a) HPV vaccine is offered to girls aged 12 to 13 (line 5). Suggest why it is offered to this age group.

(1)

- (b) The vaccine is made from HPV types 16 and 18 (line 5). Explain why this vaccine may **not** protect against other types of this virus.

(2)

- (c) Three injections of the vaccine are given (lines 5 to 6). Use your knowledge of immunity to suggest why.

(2)

- (d) It will be many years before it can be shown that this vaccination programme has reduced cases of cervical cancer (lines 7 to 9). Suggest **two** reasons why.

1. _____

2. _____

(2)

- (e) Smear tests will continue to be offered to women, even if they have been vaccinated (lines 9 to 10). Suggest why women who have been vaccinated still need to be offered smear tests.

(1)

- (f) Suggest **one** reason why vaccinating a large number of people would reduce significantly the spread of HPV through the population (lines 14 to 16).

(2)

(Total 10 marks)

Mark schemes

Q1.

(a) QWC

1. (Phagocyte engulfs) to form vacuole / vesicle / phagosome;
Accept surrounds bacteria with membrane
2. Lysosome empties contents into vacuole / vesicle / phagosome;
Accept joins / fuses
3. (Releasing) enzymes that digest / hydrolyse bacteria;
Ignore breakdown / destroy / lytic enzymes

3

(b) Two suitable structures;;

Examples,

1. Cell wall;
2. Capsule / slime layer;
3. Circular DNA;
Reject "circular chromosome"
4. Naked DNA / DNA without histones;
5. Flagellum;
6. Plasmid;
7. Pilus;
8. 70s / smaller ribosomes;
9. Mesosome;

2 max

[5]

Q2.

(a) Regulator protein.

Accept regulator protein antigen
Reject regulator protein receptor
Ignore regular protein

1

- (b)
1. Lipid soluble / hydrophobic
 2. Enters through (phospholipid) bilayer
- OR**
3. (Protein part of) LDL attaches to receptor
 4. Goes through carrier / channel protein.
4. Accept by facilitated diffusion or active transport

4. Reject active transport through channel protein

2

- (c) Any **two** from:
1. (Monoclonal antibody) has a specific tertiary structure / variable region / is complementary to regulator protein
Do not award MP1 if reference to active site.
 2. Binds to / forms complex with (regulator protein)
"It" refers to monoclonal antibody in MP1 and MP2
 3. (So regulator protein) would not fit / bind to the receptor / is not complementary to receptor
3. Reject receptor on LDL

2 max

- (d) 1. Injection with salt solution
1. Accept inject placebo in salt solution
2. Otherwise treated the same.

2

[7]

Q3.

- (a) divide by mitosis / form clones;
produce plasma cells;
(plasma cells) make antibodies;
(plasma cells) produce memory cells;
- (b) glycoprotein;
different shape to body proteins / body phospholipids are the same /
located on the outside of the cell / the haemoglobin is located
inside the cell;

4

2

[6]

Q4.

(a)

Feature	Bacterium	Human immunodeficiency virus (HIV) particle
RNA	✓	✓
Cell wall	✓	
Enzyme molecules	✓	✓
Capsid		✓

1 mark for each correct vertical column

2

- (b) 1. (Complementary) nucleotides/bases pair
OR
A to T **and** C to G;
Ignore '(DNA polymerase) forms base pairs/nucleotide pairs'

2. DNA polymerase;
3. Nucleotides join together (to form new strand)/phosphodiester bonds form;
Ignore 'DNA polymerase forms base pairs/nucleotide pairs'
*If clearly writing rote answer about DNA replication **2 max***
e.g. helicase or separating strands

3

- (c)
1. DNA double stranded/double helix **and** mRNA single-stranded;
Contrast requires both parts of the statement
 2. DNA (very) long **and** RNA short;
Accept 'RNA shorter' or 'DNA bigger/longer'
 3. Thymine/T in DNA **and** uracil/U in RNA;
 4. Deoxyribose in DNA **and** ribose in RNA;
R Deoxyribonucleic/ ribonucleic acid
Ignore ref. to histones
Ignore ref. to helix and straight chain alone
 5. DNA has base pairing **and** mRNA doesn't/ DNA has hydrogen bonding and mRNA doesn't;
 6. DNA has introns/non-coding sequences **and** mRNA doesn't;
Ignore ref to splicing

3 max

[8]

Q5.

- (a) A = envelope/membrane/phospholipid (bilayer);
 B = capsid / nucleocapsid / capsomere / protein;
- (i) (HIV is) invading cells which make new viruses;
 Cells release viruses into blood;
- (ii) Virus remains dormant/exists as provirus/exists as DNA in host DNA;
Accept virus stays in cells
- (c) HIV destroys T cells;
 More (free) viruses produced leads to fall in T-cells;
 (So fewer) T-cells activate B-cells/memory cells;
 Reduced/no antibody production;
 Immune system not working properly/inability to fight infection;
 Opportunistic infections;

2

2

1

4 max

[9]

Q6.

- (a)
1. Person (infected with HIV) has HIV DNA (in their DNA);
 2. New HIV (particles) still made;
 3. (AZT) inhibits reverse transcriptase;
 4. (AZT) stops these (new HIV particles) from forming new HIV DNA;
OR
 Slows / stops replication of HIV;
 5. Stops destruction of more / newly infected T cells;

6. So immune system continues to work (and AIDS does not develop);
 4. *Context is important*
 4. *Allow slows / stops (re)production of HIV*
 4. *Reject (AZT) prevents DNA replication*

4 max

- (b) 1. Slows / stops the development of AIDS;
 2. Because HIV **resistant to AZT** is damaged / destroyed / prevented from replicating (by other drugs);

OR

3. AZT continues to work as a drug;
4. Because HAART prevents the spread of AZT-resistant HIV to rest of the human population;

OR

5. No new HIV particles made;
6. Because HAART might interfere with viral protein synthesis;

Mark in pairs.

Do not mix and match.

2. *Neutral HIV killed*
2. *Accept other drugs prevent HIV resistant to AZT from infecting new / more cells*
6. *Accept blocks transcription / translation / synthesis of lipid envelope / aspect of viral structure*

4 max

- (c) 1. (Fewer mitochondria so) less (aerobic) respiration;
 2. (Muscles receive) less ATP (so waste);
1. *Ignore no respiration*
 2. *Reject less energy produced*
 2. *Ignore no ATP is made*

2

[10]

Q7.

- (a) (i) 1. (Scientists) can't show bias / influence / may have a vested interest / work for the company developing the vaccine;
Relates to the scientists
2. (Volunteers) can't show psychological / mental effects / 'placebo effect' / expectations;
Relates to the volunteers
Accept: reduces the 'Hawthorne effect' / demand characteristics
Neutral: so they have no idea what they are taking
- (ii) Any **two** suitable suggestions, eg
Neutral: refs. to age and health
1. Amount of nicotine in cigarettes;
Neutral: different types of cigarette / different ways / frequency of smoking

2

2. Amount inhaled / absorbed / time since last cigarette;
Neutral: absorption by gut / digestion
Accept: absorption by mouth
3. (Different) amounts excreted / metabolism / rate of binding (of nicotine) to protein;
Accept: broken down (differently)
4. (Different) blood volumes;
Neutral: different body masses
5. Nicotine from passive smoking / other smokers / other sources;
6. Some volunteers received the vaccine / placebo;
Accept: some volunteers would have / would not have the antibodies

2 max

- (b) (i)
1. Antibodies to nicotine produced / antibodies bind to nicotine;
Q Reject: *vaccine contains / produces antibodies*
Q Neutral: *antibodies digest / kill / fight nicotine*
 2. (So) nicotine does not bind to protein / does not reach the brain;
Q Reject: *any reference to 'active site'*
Neutral: idea that the antibodies bind to the protein
 3. (So) cigarettes / smoking does not satisfy addiction / reward smokers / release (reward) chemicals;

3

(ii) **(Agree):**

1. People choose to smoke / know the risks;
2. Should spend this money on education / preventing people from starting to smoke / treating other health problems / vaccines are expensive;

(Disagree):

3. Unethical not to treat;
4. Less money needed to treat the effects of smoking / cancer / smokers pay taxes so are entitled to treatment;

3 max

- (c)
1. High antibody responders have a high % to stop smoking / are more likely to stop smoking;
'People producing a high concentration of antibodies' is equivalent to 'high antibody responders'
Accept: reference to values from the table
 2. Only a few may be high antibody responders / no numbers on how many are high / medium / low antibody responders;
Neutral: not all people are high antibody responders

3. Percentage who stopped smoking is similar for placebo group and low / medium responders / some / % of placebo group (still) stopped smoking / placebo has the lowest value / % to stop smoking;
Accept: reference to values from the table
4. Large sample size / double blind **so** reliable / representative;
5. Antibody levels peak at / drop after 5 months / boosters may be needed at / after 5 months;
6. May start smoking again after 5 / 6 months / do not know the percentage who stopped smoking after 5 / 6 months;
7. Nicotine is not the only factor responsible for making people smoke;
Must mention nicotine
Do not accept: correlation does not mean causation / could be due to other factors

5 max

[15]

Q8.

- (a) Nucleus; 1
- (b) Enables organism to remain in area (of food source) / prevent its removal;
Q 'To attach' is not sufficient unless qualified 1
- (c) (i) Correct answer of 222(%);;
Incorrect answer that clearly identifies difference in number of cases as 5800 –1800 or 5.8 – 1.8;
Correct answer gains two marks 2
- (ii) More water-related activities / more 'organisms' with increased temperature;
Q Allow any reference to growth or replication of 'organisms'. Do not penalise reference to bacteria.
Q Do not allow increase in water consumption. 1
- (d) (i) All have same shape / only binds to *Giardia* / one type of / specific antigen; 1
- (ii) Has complementary (shape) / due to (specific) tertiary structure / variable region (of antibody);
Q Binds / fits not sufficient unless qualified; 1
- (iii) Enzyme / second antibody would remain / is removed by washing;
Enzyme can react with substrate (when no antigen is present); 2

[9]

Q9.

- (a) Publicity about vaccination / better health education / risks of 'flu epidemics;
(Accept: now free on NHS (though only since 2000) / better awareness / more commonly available) 1
- (b) (i) 1990: 26% of 7.4million = 1.92million *and* 2000: 64% of 7.8 million = 4.99million;
increase = 3.07 million; 2
(Correct reading of all 4 figures from graph = 1)
(Correct answer but no 'millions' = 1)
(Correct method resulting from wrong graph reading = 1)
- (ii) Over 50% of population being vaccinated;
But only from 2000 onwards;
(Principle of more people being vaccinated each year = 1) 2
- (iii) Different strain / type of virus each year / virus mutates;
With different antigens;
Influenza antibodies / memory cells (rapidly) destroyed / need replacing; max 2
- (c) (Protein coat) carries antigens which stimulates B-cells / production of antibodies;
Production of memory cells; 2

[9]

Q10.

- (a) Virus / fungus / protozoan;
Neutral: named example 1
- (b) Produces toxins;
Neutral: infects / colonises / invades cells
Damages cells / tissues / example given e.g. cell lysis; 2
- (c) (i) (Antibodies) produced from a single clone of B cells / plasma cells;
Accept: hybridoma cell line instead of B cell / plasma cell
Reject: idea that antibodies are cloned
- OR**
- (Antibodies) produced from the same B cell / plasma cell; 1
- (ii) (Specific) primary structure / order of amino acids;
(Specific) tertiary / 3D structure;
(So) Only binds to / fits / complementary to one antigen;

Reject: 'active site' for either point 2. or 3. only once

3

- (d) (Rapid) treatment of carriers / infected cattle / disease;
Neutral: reference to rapid identification of infected cattle

Can isolate / cull carriers / infected cattle / infected (dairy) products not sold / consumed / tracked;

Reduces spread of disease / no need to kill / prevents the death of non-infected animals;

Neutral: ethical arguments

3

[10]

Q11.

- (a) Protein / molecule/glycoprotein;
On surface of cell/microorganism;
Stimulates immune response/production of antibodies;

2 max

- (b) Zookeeper is not producing antibodies/passive immunity;
No memory cells made;

OR

Antivenom is an antigen/stimulates production of (anti-antivenom) antibodies;
(Antivenom) destroyed by zookeeper's own antibodies;

OR

Antibody destroys antigen/venom;
Before immune response/no immune response;

2

[4]

Q12.

- (a) Girls are not sexually active / not likely to carry HPV / vaccine may not work if already infected / few girls sexually active (at this age);

Neutral: girls are not sexually mature

Neutral: to provide better protection

Accept: provides immunity before sexually active

Neutral: girls are less likely to have 'it' as could mean the vaccine from the question stem

1

- (b) Other (HPV) types have different antigens;

No memory cells for other types / memory cells not activated / antibodies cannot attach to antigen / correct antibodies not produced / antibodies are not complementary;

Accept: refs. to antigenic variability

Accept: B cells for memory cells

Accept: memory cells cannot recognise antigen for 'not activated'

- (c) More antigen;

More memory cells;

So more antibodies produced / antibodies produced quicker (if infected);

Accept: 'many' / 'enough' instead of 'more'

Neutral: primary / secondary response

Accept: T cells / B cells / plasma cells instead of 'antibodies'

Reject: the idea that vaccines contain antibodies

Q *Reject: antibodies 'fight' / 'antibiotics'*

2 max

- (d) Cancer takes years to develop / develops later in life;

Takes time for females to become sexually active / females must become sexually active to obtain data;

Few people / only teenagers vaccinated;

Neutral: will take time to vaccinate 80% of young girls

Accept: do not develop cancer instantly

2 max

- (e) (Cervical cancer) can be caused by other types of HPV / other factors / example given;

OR

(Some) women may have been infected (with HPV) before receiving the vaccine;

OR

(As a precaution) in case vaccine does not work / a way of monitoring if the vaccine has worked;

Accept: 'caused by other types of HPV' in the context of mutation

Neutral: to check for abnormal cells / that they are immune to the virus

1

- (f) Virus cannot replicate / is destroyed / is not carried (in vaccinated people);

Non-vaccinated people more likely to contact vaccinated people;

Neutral: 'do not spread virus' as in question stem

Must be in context of the individual and not the population as in question stem

Q *Do not allow 'disease is destroyed'*

Neutral: 'herd effect' as given in the question stem

2

[10]