

Q1. (June 2018)

2 Which is the **most** effective treatment for HIV?

- A Antibiotics
- B Antigens
- C Antiseptics
- D Antivirals

Your answer

[1]

Q2. (June 2018)

3 Heart disease kills thousands of people in Britain every year.

Why is it difficult to decide why a person gets heart disease?

- A Heart disease is caused by the interaction of many factors.
- B It is not possible to measure any of the risk factors.
- C Many microorganisms cause heart disease.
- D There is no genetic link to heart disease.

Your answer

[1]

Q3. (June 2018)

5 Which of these is an adaptation of white blood cells?

- A The ability to make clotting enzymes.
- B They can change their shape to pass out of capillaries.
- C They can synthesise antibiotics.
- D They lack a nucleus.

Your answer

[1]

Q4. (June 2018)

14 Females aged between 12 and 13 are offered a vaccination for the human papilloma virus (HPV).

Which statement describes the reason for offering this vaccine?

- A** Contracting HPV greatly increases the risk of developing AIDS.
- B** Having the vaccination will prevent cervical cancer.
- C** HPV can be treated with antibiotics but cervical cancer cannot.
- D** HPV has been linked to about 70% of cases of cervical cancer.

Your answer

[1]

Q5. (June 2018)

22 Methamphetamine is a drug.

Scientists are investigating the use of antibodies as a treatment to control the negative effects of the drug.

(a) What is an antibody?

.....
..... [2]

(b) As the human body does not naturally make antibodies against methamphetamine, scientists are using mice to make antibodies.

Describe how large amounts of the antibodies can be made using monoclonal antibody techniques.

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.....
..... [4]

(c) These antibodies would **not** work against other drugs.

Explain why.

.....
.....
..... [2]

- 4 Many human diseases are caused by risk factors.

Food and drink can be major risk factors.

Which disease does **not** have food or drink as a major risk factor?

- A Type 1 diabetes
- B Cirrhosis of the liver
- C Type 2 diabetes
- D Cardiovascular disease

Your answer

[1]

Q7. (June 2019)

- 6 Which row on the table is correct for HIV?

	Destroyed by antibiotics	Causes cervical cancer	Sexually transmitted
A	✓	X	X
B	X	X	✓
C	X	✓	✓
D	✓	✓	✓

Your answer

[1]

Q8. (June 2019)

- 9 Which is a definition of cancer?

- A An infection of foreign cells which divide uncontrollably.
- B Body cells that divide uncontrollably many times.
- C Body cells that lose the ability to divide and make stem cells.
- D Pathogens that grow and divide unchecked.

Your answer

[1]

Q9. (June 2019)

10 What does a vaccine contain that protects a person from infection?

- A** Antibiotics that will attach to antigens.
- B** Antigens that will stimulate antibody production.
- C** Antibiotics that kill pathogens.
- D** Antivirals that destroy viruses.

Your answer

[1]

Q10. (June 2019)

12 New drugs are tested using preclinical trials.

Which statement describes a preclinical trial?

- A** One group of volunteers are given a placebo, another group the drug.
- B** The drug is tested on human cells.
- C** Volunteers are given a placebo only.
- D** Volunteers are given the new drug.

Your answer

[1]

Q11. (June 2019)

20 Some people get very painful headaches called migraines.

Scientists think that this is caused by a protein in the brain called CGRP.

Levels of the CGRP protein are higher in the brains of people who get migraines.

Doctors are trying to find a treatment to prevent migraines.

They have produced an antibody against the CGRP protein.

(a) Describe how antibodies are usually made in the human body.

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.....

..... **[2]**

(b) The doctors test the antibody treatment on migraine patients.

The patients are divided into two groups:

- One group is given an injection of the antibody
- The second group receives an injection of a placebo.

They record the mean number of days each patient had migraines before and after treatment.

The table shows their results.

Treatment	Mean number of migraine days per patient before treatment	Mean number of migraine days per patient after treatment	Percentage decrease in migraine days per patient
antibody injection	9.1	4.4	
placebo	9.1	6.4	29.7

(i) Explain why a placebo group is used in drug testing.

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..... **[3]**

- (ii) Calculate the percentage decrease in migraine days in the patients that had the antibody injection.

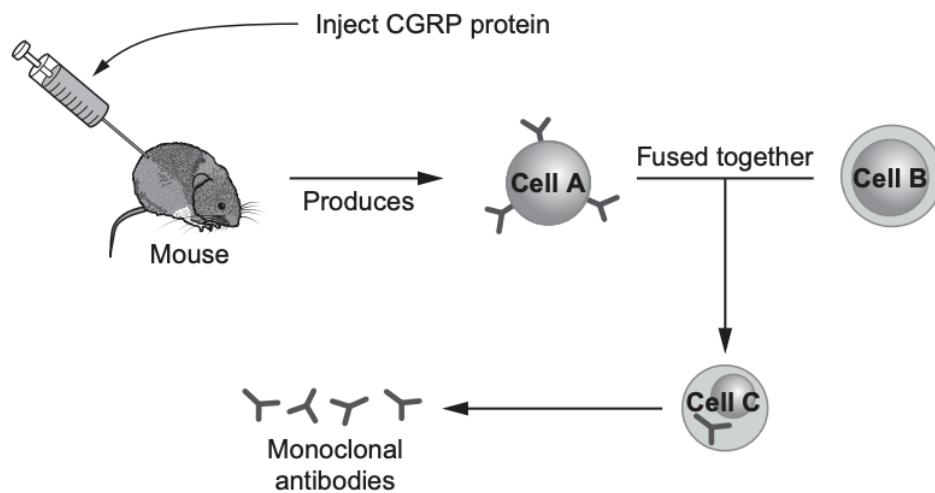
Give your answer to 1 decimal place.

Percentage decrease = %
[3]

- (c) The antibodies used in the investigation were monoclonal antibodies.

They can be made by injecting CGRP protein into a mouse.

The diagram shows this process.



Draw lines to identify each type of cell shown in the diagram.

Cell A	Cancer cell
Cell B	Lymphocyte
Cell C	Hybridoma

[2]

4 Which of these is a use of monoclonal antibodies?

- A** Detecting antigens in pregnancy testing.
- B** Removing cholesterol from blocked arteries.
- C** Sterilising instruments used in operations.
- D** Vaccinating people against type 2 diabetes.

Your answer ☐

[1]

Q13. (June 2022)

8 Which is a description of an antigen?

- A** A chemical group on the surface of a pathogen.
- B** A chemical that kills bacteria or stops them dividing.
- C** A drug that is used to kill viruses.
- D** A protein molecule made by white blood cells.

Your answer ☐

[1]

Q14. (June 2022)

10 Which statement is correct about HIV/AIDS?

- A** AIDS is a virus that weakens the immune system.
- B** HIV and AIDS are alternative names for the same disease.
- C** HIV is a pathogen and AIDS is a set of infections.
- D** HIV is a virus that produces toxins which kill an infected person.

Your answer ☐

[1]

Q15. (June 2022)

11 New medicines can be tested in different ways.

Which is the main reason for testing a new medicine using tissue culture?

- A** To predict the effects on body systems.
- B** To see if it affects other organs.
- C** To see if it harms cells.
- D** To see if it reduces symptoms.

Your answer ☐

[1]

Q16. (June 2022)

21 Measles is an infectious disease caused by a virus.

A vaccine is available to protect people against measles.

(a) Explain how vaccinations can protect people against diseases such as measles.

.....

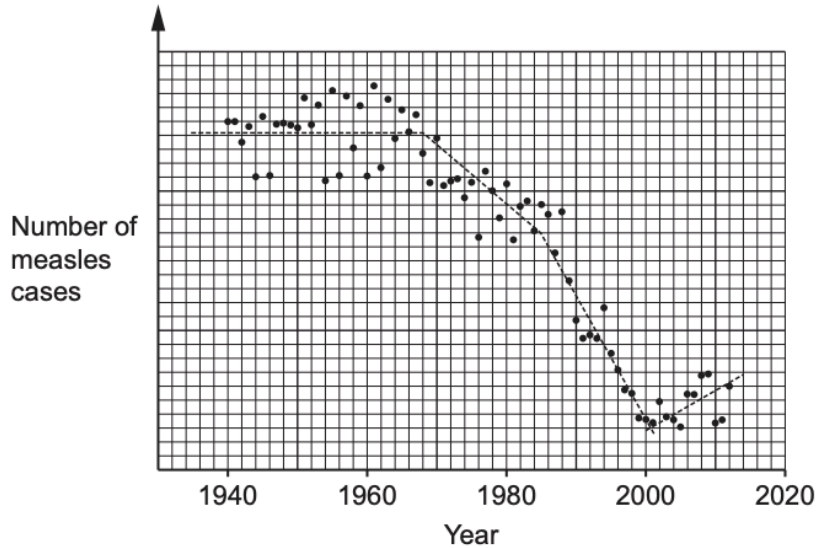
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..... **[3]**

(b) The graph shows the number of cases of measles in the UK from 1940 to 2012.



In 1968, vaccinations against measles started for children.
Since then, there have been two other significant events that have affected the number of measles cases.

Use the graph to suggest a year when each event occurred.
Give **one** reason for your choice of year for each event.

- (i) The measles vaccine was given as a triple vaccine called MMR. This was more convenient because MMR vaccinated children for three diseases at the same time.

Year

Reason

..... [2]

- (ii) A report claiming a link between the MMR vaccine and an increased risk of the disorder called autism.

Year

Reason

..... [2]

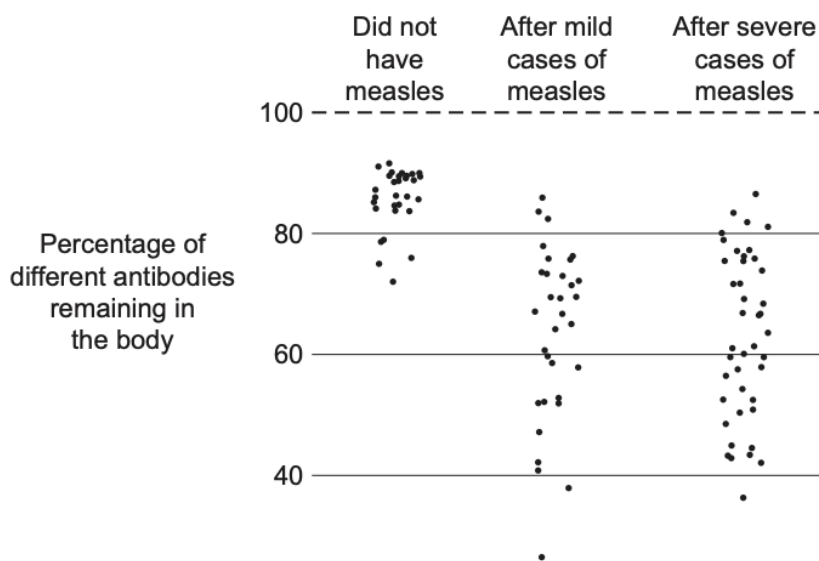
- (c) A study looked at how measles infections can affect the number of antibodies for other pathogens in a person's body.

The study included three groups of children:

- children who did not have measles
- children with mild cases of measles
- children with severe cases of measles.

The study measured the percentage of different antibodies remaining in the children six weeks after infection.

The diagram shows the results. The result for each child is marked with a dot.



Most people recover from measles but may get ill again with different symptoms afterwards.

How do the findings shown in this diagram explain this after-effect of a measles infection?

.....

.....

..... **[2]**

- 9 Different cells are used in the production of monoclonal antibodies.

Which cells produce the monoclonal antibodies?

- A Hybridoma cells
- B Plasma cells
- C Tumour cells
- D White blood cells

Your answer

[1]

Q18. (June 2023)

- 10 The table shows some different treatments for cardiovascular disease.

Which treatments for cardiovascular disease work by directly reducing blood pressure?

Treatment	Main method of action
antiplatelets	reduce the action of platelets
beta blockers	block the effects of adrenaline
nitrates	widen blood vessels
statins	reduce cholesterol levels in the blood

- A Antiplatelets and beta blockers
- B Beta blockers and nitrates
- C Nitrates and antiplatelets
- D Statins and nitrates

Your answer

[1]

Q19. (June 2023)

12 Which of these treatments is **not** an example of genomic medicine?

- A** Advising people who have certain alleles to make changes in their lifestyle
- B** Designing drugs that are specific to a person's alleles
- C** Removing a female's ovaries if she has alleles that make her more likely to develop ovarian cancer
- D** Using genetic engineering to produce new medicines

Your answer

[1]

Q20. (June 2023)

13 Scientists are using stem cells to try and cure cystic fibrosis.

They are trying two methods:

- 1) using stem cells from cloned embryos
- 2) converting skin cells from a donor into adult stem cells.

What is the advantage of the **second** method?

- A** Adult stem cells are less likely to be infected by viruses.
- B** Adult stem cells can form a wider range of tissues.
- C** Embryos will not need to be destroyed.
- D** Stem cells produced from donor skin cells are less likely to be rejected.

Your answer

[1]

Q21. (June 2023)

18 Multiple sclerosis is an auto-immune disease that destroys nerve cells.

The body's immune system usually only destroys invading cells but in auto-immune diseases the body starts to destroy its own cells.

(a) Describe **two** ways that the body's immune system destroys invading cells.

1

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2

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[2]

(b) Suggest **two** reasons why multiple sclerosis is so difficult to treat.

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.....

[2]

Q22. (June 2024)

10 All types of white blood cell contain a nucleus.

Which function of white blood cells does **not** require a nucleus?

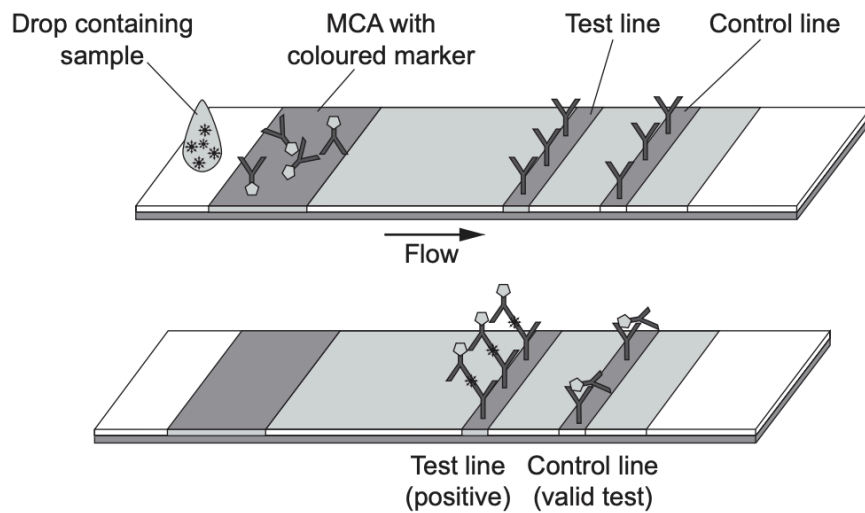
- A** Changing shape to squeeze out of capillaries
- B** Dividing by mitosis after detecting a pathogen
- C** Producing antibodies which are made of proteins
- D** Producing enzymes to digest pathogens

Your answer

[1]

Q23. (June 2024)

- 13 The diagram shows how monoclonal antibodies (MCA) are used in a test to detect pathogens.



Which statement describes how the tests work?

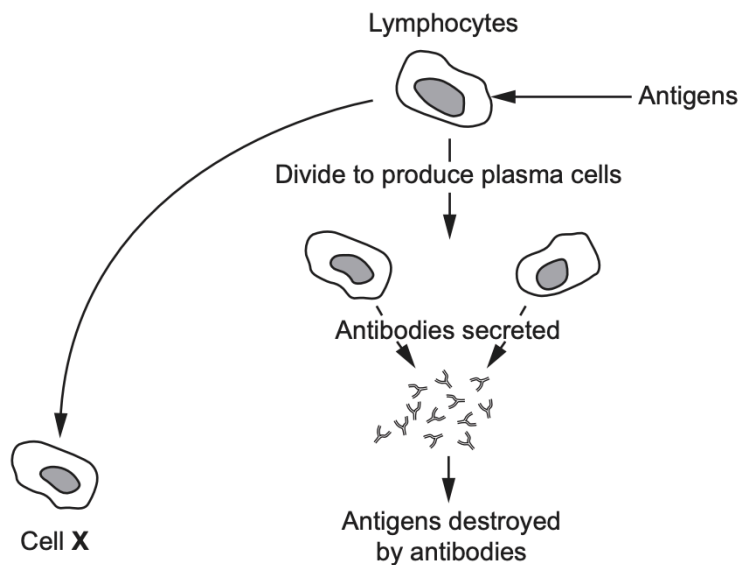
- A MCA carry the antigens along to bind with other antibodies on the test line.
- B MCA have antibiotics attached that combine with both the test and control antibodies.
- C The coloured marker combines with antigens and with antibodies on the test line.
- D The drop contains antibodies that get carried along by the MCA.

Your answer

[1]

Q24. (June 2024)

15 The diagram shows how lymphocytes in the immune system respond to antigens.



What is the function of cell X?

- A Cell X will live for many years and engulf foreign bacteria and viruses.
- B Cell X will produce antibodies that will destroy plasma cells.
- C Cell X will respond rapidly if the antigen reinfects the body again.
- D Cell X will respond to antigens from different pathogens.

Your answer

[1]

Q25. (June 2024)

17 Antibiotics and antiseptics are both used to kill bacteria.

(a) Which is a correct statement about antiseptics and antibiotics?

Tick (✓) **one** box.

Antibiotics are not used inside the body, but antiseptics are.

☐

Antibiotics are used inside the body, but antiseptics are not.

☐

Antibiotics are used on living tissue and antiseptics on non-living tissue.

☐

Antibiotics are used on non-living tissue and antiseptics on living tissue.

☐

[1]

(b) Disinfectants also kill bacteria.

Some students do an experiment to see how well four different disinfectants (**A, B, C** and **D**) kill bacteria.

This is the method they use:

- Mix 2 cm³ of each disinfectant solution with liquid nutrient agar.
- Pour each of the mixtures into separate Petri dishes and allow to set.
- Spread bacteria on the surface of the agar.
- Put each Petri dish in an incubator.

(i) Describe how the students should spread bacteria on the surface of the agar.

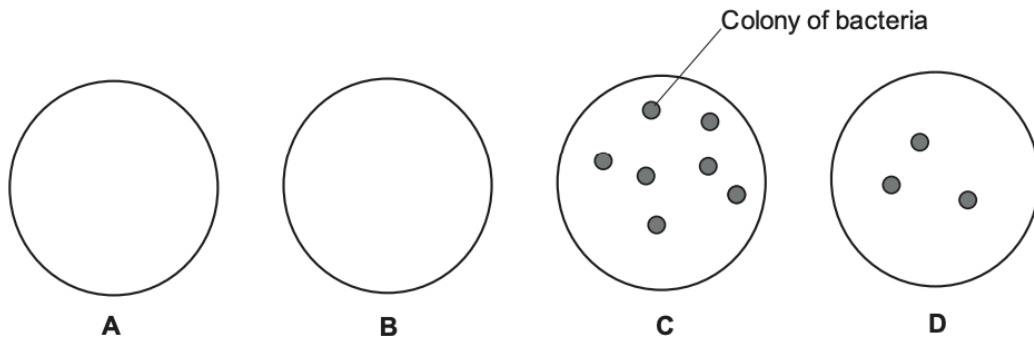
.....
.....
..... [2]

(ii) The students' teacher told them **not** to seal the lid on the Petri dishes all the way round with tape.

Explain why.

.....
.....
..... [2]

(c) The diagrams show the Petri dishes after 3 days.



(i) Explain **two** conclusions the students can make about disinfectants **B**, **C** and **D** from these results.

- 1
- 2

[2]

(ii) One of the students said that disinfectant **A** is equally effective at killing bacteria as disinfectant **B**.

Explain how the students could improve their experiment to test if that is true.

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-
-
-

[2]

21 Acrylamide is a chemical that is formed when bread is toasted.

(a) Experiments have shown that significant doses of acrylamide can cause cancer in animals.

(i) Describe the effects of cancer on cells.

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.....
..... [2]

(ii) Some scientists concluded that, 'acrylamide could also cause cancer in humans'.

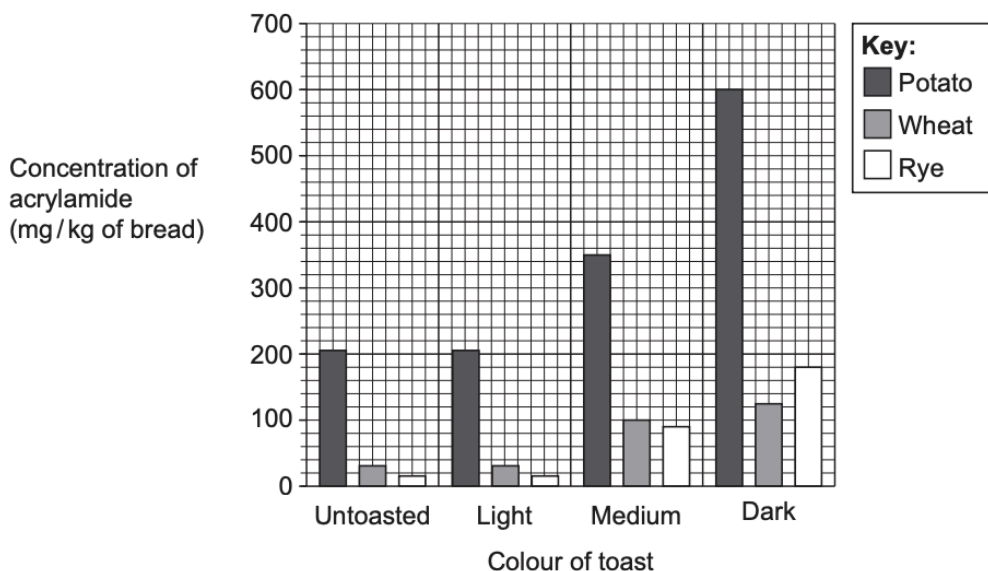
Other scientists are **not** sure about the effect of acrylamide on humans, despite the results of the animal experiments.

Suggest **one** reason why.

.....
..... [1]

(b) Scientists measured the concentration of acrylamide in toast made from three different types of bread: potato, wheat and rye.

They heated the bread for different lengths of time to get different colours of toast.



- (i) Give **two** conclusions that the scientists could make from their investigation.

1

.....

2

.....

[2]

- (ii) The daily recommended maximum intake for acrylamide is 195 mg.

A slice of toast has a mass of 50 g.

A person eats toast that is dark and made from potato bread.

Calculate the maximum number of **whole** slices of toast the person can eat without exceeding the recommended maximum intake.

Use the graph.

Number of whole slices = [3]

- (iii) Give **one** reason why another group of scientists would find it difficult to replicate the experiment using just the information in the graph.

.....

..... [1]

- (c) During toasting, acrylamide is made from a chemical called asparagine.

Asparagine is produced in plant cells by an enzyme called asparagine synthetase.

The gene coding for asparagine synthetase needs to be switched on by other proteins.

- (i) Complete these sentences about how genes are expressed.

Use words from the list.

coding DNA	denaturing	non-coding DNA
nucleus	ribosomes	transcription
translation	tRNA	

Gene expression can be switched on by the action of other proteins on

When a gene is expressed, occurs which makes mRNA.

The mRNA then moves to the

Proteins, such as asparagine synthetase are then made by the process of [4]

- (ii) Scientists want to produce a variety of wheat that contains less asparagine.

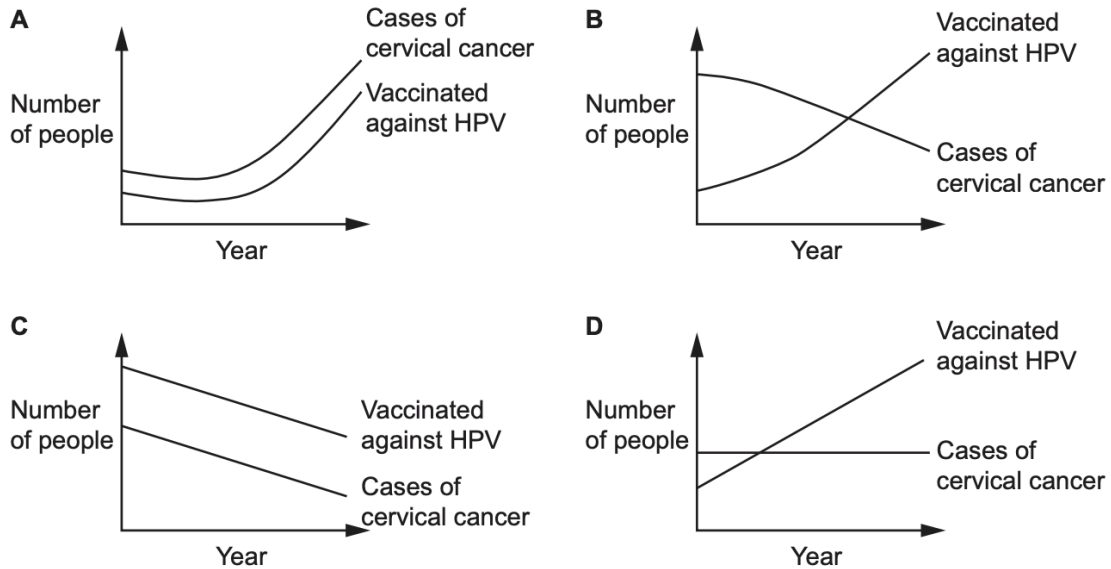
This is done by preventing expression of the gene that codes for asparagine synthetase.

Describe the difference between this process and genetic engineering.

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.....
..... [1]

2 People can be vaccinated against HPV.

Which graph shows the correct link between the number of people vaccinated and the number of people with cervical cancer?



Your answer

[1]

Q28. (June 2025)

3 What is an adaptation of **white** blood cells?

- A They can change shape to squeeze out of blood vessels into tissues.
- B They have many ribosomes to produce antibiotics.
- C They lack a nucleus so that they can engulf bacteria.
- D They produce enzymes to make blood clot.

Your answer

[1]

Q29. (June 2025)

8 Which of these diseases is caused by a bacterium?

- A** AIDS
- B** Barley powdery mildew
- C** Crown gall disease
- D** Tobacco mosaic disease

Your answer

[1]

Q30. (June 2025)

13 Clinical testing is used for new medicines.

What is a feature of clinical testing?

- A** Uses animals
- B** Uses cell cultures
- C** Uses computer models
- D** Uses placebos

Your answer

[1]

Q31. (June 2025)

14 What is **not** a proven use for monoclonal antibodies?

- A** Gene therapy
- B** Pregnancy tests
- C** Targeting cancer cells
- D** Testing for cancer

Your answer

[1]

Q32. (June 2025)

16 Many different bacteria can cause disease.

(a) State the name given to any organism that causes disease.

..... [1]

(b) A patient in hospital has a bacterial disease.
A doctor tells the patient:

'Some time ago, bacteria entered your body.

Your body detected chemicals on the surface of the bacteria.

This made your body produce protein molecules to help kill the bacteria.

I will give you a tablet containing a medicine that will also kill the bacteria.

You should not get this disease again because cells in your body will now provide you with immunity.'

(i) The boxes contain descriptions used by the doctor and some biological terms.

Draw **four** lines to connect each **description** to its correct **biological term**.

Description

Biological term

chemicals on the surface of the
bacteria

antibiotics

proteins produced by the body

antibodies

medicine given by the doctor to
kill the bacteria

antigens

cells that provide immunity

antiseptics

white blood cells

[4]

- (ii) The doctor would change the type of medicine given to the patient if the disease was caused by a virus.

State the change the doctor would make.

Give a reason for your answer.

Change

Reason

.....

[2]

Q33. (June 2025)

21 People can have their DNA tested.

The table shows five different types of DNA test and the purpose of each test.

Type of DNA test	Purpose of test
A	identifying which part of the world a person's ancestors came from
B	identifying the best drug to treat a genetic disorder
C	identifying genes that might increase the chance of developing a disease
D	identifying any recessive alleles that are not being expressed
E	finding DNA that has come from a cancerous tumour

(a) Which type of test, **A**, **B**, **C**, **D** or **E**, is identifying risk factors?

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[1]

(b) Which type of test, **A**, **B**, **C**, **D** or **E**, will **not** affect the person being tested but might be useful if they are planning to have children?

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[1]

(c) Test **E** can test for a cancerous tumour.

Describe how cancerous tumours form.

.....

.....

..... [2]

(d) Deciding whether to take test **C** can be a difficult decision for some people.

Suggest **one** possible reason why.

.....

..... [1]

- 10** The table shows estimated data about the global population and the number of deaths from HIV and tuberculosis (TB).

	Year	
	2000	2017
Total population in millions	6143.5	7464.0
Number of people with HIV in millions	36.1	36.8
Percentage of total population with HIV	0.6	0.5
Total number of HIV related deaths in millions	3.0	1.0
Total number of TB deaths in millions	2.2	1.6
Number of TB deaths in people with HIV in millions	0.5	0.3

Which is a correct conclusion from the data in the table?

- A** Half of HIV related deaths were due to TB in 2000.
- B** HIV became more life-threatening between 2000 and 2017.
- C** People with HIV are more likely to die from TB than people without HIV.
- D** The percentage of HIV in the population has increased between 2000 and 2017.

Your answer

[1]

Q35. (Nov 2020)

- 11** Doctors are able to offer a diagnosis and treatment targeted to a patient's genome, known as genomic medicine.

Which is an example of the type of treatment used in genomic medicine?

- A** Comparing patients' phenotypes so the best treatment can be given.
- B** Designing drugs that are specific to a particular variant of a gene.
- C** Using genetic engineering to produce new drugs.
- D** Using monoclonal antibodies to destroy pathogens.

Your answer

[1]

Q36. (Nov 2020)

13 When a person has measles they are unlikely to be ill again with the disease for many years.

What is the reason for this?

- A** Antigens from the pathogen remain in the body.
- B** Memory cells remain in the blood and can release antibodies.
- C** The disease can now be treated with antibiotics.
- D** White blood cells engulf the pathogens before antibodies are made.

Your answer

[1]

Q37. (Nov 2020)

- 20 Fig. 20.1** is a diagram of an antibody molecule. Antibodies are protein molecules. The ends of the antibody molecule bind with a particular antigen molecule.

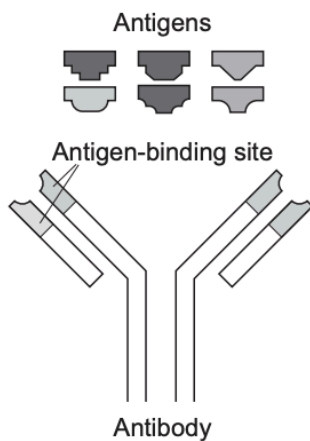


Fig. 20.1

- (a) Explain why a different antibody molecule is needed for each antigen.

.....

 [2]

- (b) Large quantities of one type of antibody can be made by the process shown in Fig. 20.2.

These antibodies are called monoclonal antibodies.

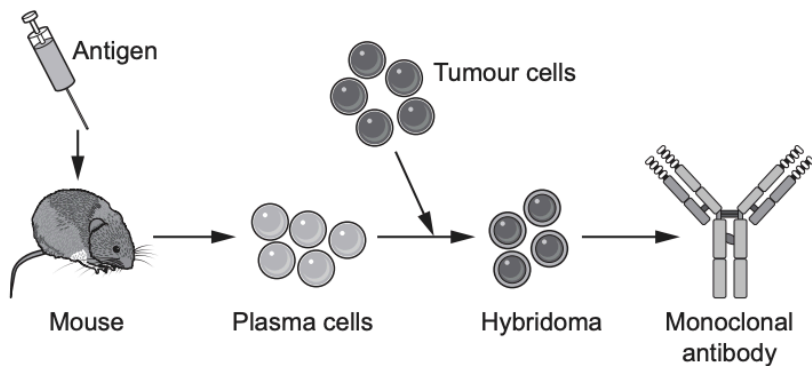


Fig. 20.2

- (i) Give **two** uses of monoclonal antibodies.

1
 2

[2]

- (ii) Why are tumour cells used in this process?

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..... [1]

- (c) Two scientists discovered a different method of making monoclonal antibodies.

They put genes that code for many different antibodies into viruses. The viruses then make the antibodies on their surfaces.

If an antigen attaches to an antibody, the scientists use the gene for this antibody to genetically engineer bacteria. The bacteria are then used to make large quantities of the antibody.

- (i) Describe how scientists could use the antibody gene to genetically engineer bacteria to make many copies of the antibody.

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.....
.....
.....
.....
..... [4]

- (ii) Many people would prefer to use antibodies made using bacteria and viruses, rather than the method shown in **Fig. 20.2**.

Suggest an explanation for this.

.....
.....
..... [2]

- (iii) In 2018, the scientists were awarded the Nobel Prize for their work.

Explain why their work had to be peer reviewed before they were awarded the prize.

.....
.....
..... [2]

- 7 Before surgery, a doctor will wipe the skin of the patient with a chemical to kill bacteria.

Which type of chemical is the doctor likely to use?

- A Antibiotic
- B Antigen
- C Antiseptic
- D Antiviral

Your answer

[1]

Q39. (Nov 2021)

- 8 Which of these is a step in the process used to make monoclonal antibodies?

- A Fusing hybridoma cells with lymphocytes (plasma cells).
- B Fusing tumour cells with lymphocytes (plasma cells).
- C Injecting antibodies into an animal such as a mouse.
- D Injecting tumour cells into an animal such as a mouse.

Your answer

[1]

Q40. (Nov 2021)

- 9 What is the purpose of a placebo in a clinical trial?

- A To calculate the lowest effective dose of the medicine.
- B To make sure the results of the trial are reproducible.
- C To see if the effects of the medicine are due to the expectations of the patient.
- D To see if the effects of the medicine last for a long period of time.

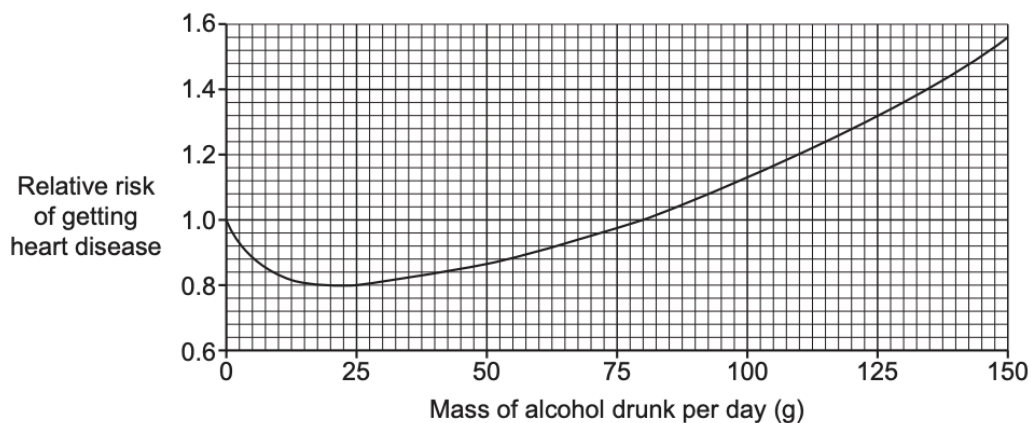
Your answer

[1]

Q41. (Nov 2021)

- 12** Scientists studied how the mass of alcohol drunk per day affects the relative risk of getting heart disease. The graph shows the results of their study.

relative risk = $\frac{\text{the number of people getting heart disease who drink each mass of alcohol}}{\text{the number of people getting heart disease who drink no alcohol}}$



Which conclusion can be made from this graph?

- A** Drinking 80g of alcohol a day does not increase the risk of heart disease.
- B** Drinking above 80g of alcohol per day reduces the risk of heart disease.
- C** Drinking alcohol has little effect on the risk of heart disease.
- D** Drinking any mass of alcohol increases the risk of heart disease.

Your answer

[1]

Q42. (Nov 2021)

19 Cancer is caused by changes in cells.

(a) Describe the effects that cancer has on cells.

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.....

..... [2]

(b) Cells usually become cancerous due to damage to their DNA.

Scientists have found a gene called *BRCA*. This gene usually produces a protein that repairs damage in DNA.

(i) There are 3×10^7 females in the UK and 1 in 400 of them has a mutation in their *BRCA* gene.

60% of women with this mutation are likely to develop breast cancer.

Calculate how many females in the UK could develop breast cancer due to a mutation in the *BRCA* gene.

Give your answer in **standard form**.

Number of females = [3]

(ii) Cancer can occur in the cells of the breast.

This type of cancer is often caused by breast cells being stimulated by the hormone oestrogen.

Use this information to suggest **two** possible treatments for breast cancer.

1

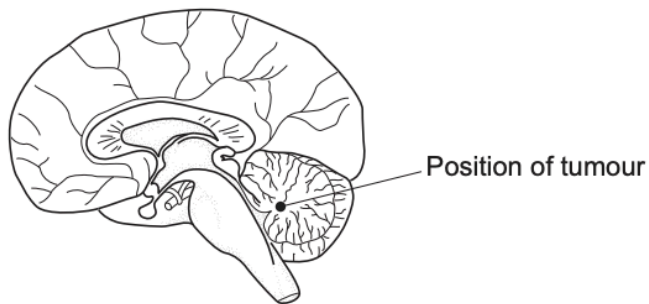
.....

2

..... [2]

(c) Cancer can also occur in the brain.

The diagram shows the position of a tumour in the brain.



Explain why operating to remove this tumour could produce side effects.

Include in your answer **one** of the possible side effects.

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.....

.....

..... [2]

Q43. (Nov 2021)

- (ii) The female flies often bite people and feed by sucking up blood.

Before they start feeding, they inject proteins into the skin. These proteins block sensory receptors in the skin.

Suggest how blocking sensory receptors using these proteins might help the fly.

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..... [2]

- (c) After the fly has finished eating, the person has an immune response against the proteins. Antibodies are produced.

Describe how antibodies would help the body destroy the proteins.

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..... [2]

- (d) Scientists are trying to reduce fly numbers.

They found bacteria living in the guts of the flies that digest the algae that the flies eat.

They also found that the gut of Blandford flies is much more acidic than the gut of other flies. The Blandford flies get nutrients from the digested algae in return for providing an acidic habitat for the bacteria to live in.

- (i) What name is given to the type of relationship shown by the fly and bacteria?

..... [1]

- (ii) The scientists have developed a poison that becomes active in low pH.

Explain why this poison could kill the Blandford fly but not harm other types of fly.

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.....

.....

..... [2]

- (b) This type of CJD, caused by a dominant allele, is called genetic CJD.

There is another type of CJD called sporadic CJD.

Scientists think that sporadic CJD can just suddenly occur in the brain without a genetic cause.

Give **one** reason why both these types of CJD are called non-communicable diseases.

.....
..... [1]

- (c) CJD occurs when a protein made in the brain changes shape. This protein then attaches to other proteins, stopping them from working.

Scientists are working on a treatment for CJD. They have made an artificial antibody which they will inject into people with CJD.

- (i) Explain why the body will not make its **own** antibodies against the CJD protein.

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..... [2]

- (ii) The artificial antibodies have been tested on mice.

Suggest **two** reasons why some people argue against the testing of medicines on animals.

1
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2
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[2]