

GCSE Combined Science: Trilogy

Worksheet: Vaccination

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Vaccination

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

01

In a town of 40 000 people, 92% have been vaccinated against meningitis C.

01.1

Calculate the number of people in the town who have **not** been vaccinated against meningitis C.

Number of people =

[2 marks]

0 2

In the UK, children are offered a programme of vaccinations against several diseases during childhood.

0 2 . 1

What is the purpose of a childhood vaccination programme?

Tick (✓) **one** box.

To treat children who already have a disease

☐

To give children antibiotics against future infections

☐

To make children immune to serious diseases before they are exposed to the pathogens

☐

To identify which children are allergic to a pathogen

☐

[1 mark]

0 2 . 2

Complete the sentence.

A person whose body can destroy a pathogen quickly, before they become ill, is said to be to that disease.

.....

.....

.....

[1 mark]

0 2 . 3

Give **two** reasons why babies are vaccinated against serious diseases at a young age, rather than waiting until they are older.

.....

.....

.....

.....

[2 marks]

0 3

In a town of 80 000 people, 70% have been vaccinated against mumps.

0 3 . 1

Calculate the number of people in the town who have been vaccinated against mumps.

.....

.....

.....

.....

Number of people =

[2 marks]

0 4

Vaccination can stop people becoming ill with some infectious diseases.

0 4 . 1

What does a vaccine contain?

Tick (✓) **one** box.

Antibiotics that kill the pathogen

☐

Antibodies against the pathogen

☐

Dead or inactive forms of the pathogen

☐

Painkillers to reduce the symptoms

☐

[1 mark]

0 4 . 2

Which type of blood cell responds to a vaccine?

.....

.....

.....

.....

[1 mark]

0 4 . 3

What do these cells produce after vaccination?

.....

.....

.....

.....

[1 mark]

0 4 . 4

Name **one** disease that most young children in the UK are vaccinated against.

.....

.....

[1 mark]

0 5

Each autumn, people over 65 years old in the UK are offered a vaccine against influenza (flu). The flu virus often changes the proteins (antigens) on its surface, so a new vaccine is made each year.

0 5 . 1

Explain why a new vaccine is needed each year.

.....

.....

.....

.....

[2 marks]

0 5 . 2

Suggest why people over 65 are offered the vaccine but most young adults are not.

.....

.....

[1 mark]

0 5 . 3

In one area, 18 400 of the 23 000 people over 65 were vaccinated.
Calculate the percentage of people over 65 who were vaccinated.

.....

.....

.....

.....

Percentage = %

[2 marks]

0 5 . 4

Suggest why the vaccine is given in autumn, before the winter.

.....

.....

[1 mark]

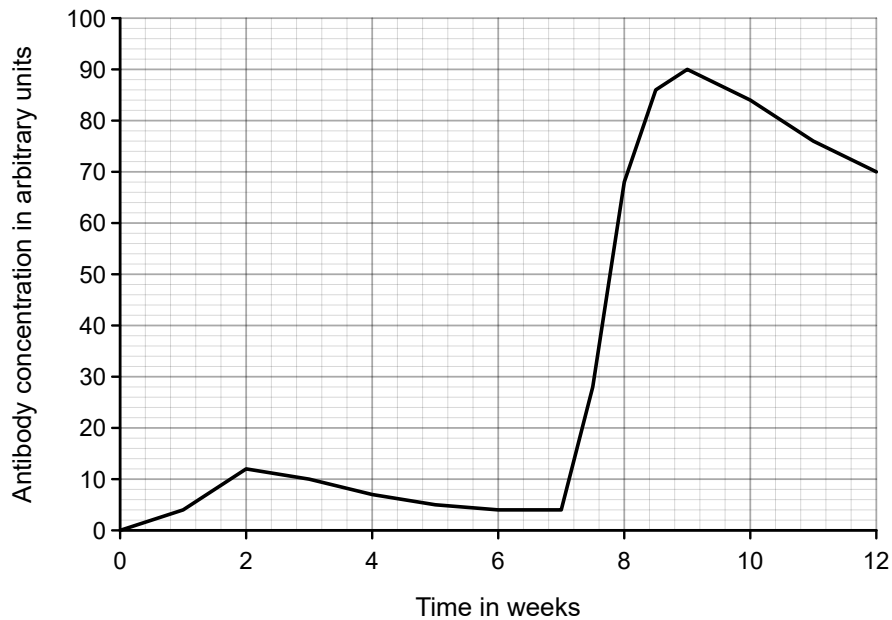
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0 6

A person was vaccinated against a disease at week 0. The same person was infected by the pathogen that causes the disease at week 7.

Figure 1 shows the concentration of antibodies against the pathogen in the person's blood.

Figure 1



0 6 . 1

What was the maximum antibody concentration after vaccination?

.....

.....

.....

Antibody concentration = arbitrary units

[1 mark]

0 6 . 2

Calculate how many times greater the maximum antibody concentration was after the infection than after the vaccination.

.....

.....

.....

.....

Number of times greater =

[2 marks]

0 6 . 3

Give **two** differences between the antibody response after vaccination and the antibody response after infection.

.....

.....

.....

.....

[2 marks]

0 6 . 4

The person did not become ill after the infection at week 7.
Explain why.

.....

.....

.....

.....

[2 marks]

0 7

A child is vaccinated against a disease caused by a bacterium.

0 7 . 1

Explain how vaccination stops the child becoming ill if the same bacterium enters the child's body in the future.

.....

.....

.....

.....

.....

.....

.....

.....

[4 marks]

0 7 . 2

Explain why the vaccine itself does not make the child ill.

.....

.....

[1 mark]

0 7 . 3

The vaccine does not protect the child against diseases caused by other pathogens.
Explain why.

.....

.....

.....

.....

[2 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Vaccination · 32 marks

Question 1 (2 marks)

01.1 [2 marks]

Answer: 3200

- $40\,000 \times 8 \div 100$ (1)
 - 3200 (people) (1)
-

Question 2 (4 marks)

02.1 [1 mark]

Correct: To make children immune to serious diseases before they are exposed to the pathogens

02.2 [1 mark]

Answer: Immune

- immune (1)
-

02.3 [2 marks]

- babies have not yet built up immunity to many diseases, so are at high risk if exposed early in life (1)
- some diseases can be very serious or fatal in young babies (1)
- early vaccination protects them before they are likely to be exposed to the pathogen (1)

Any 2 of the points above.

Question 3 (2 marks)

03.1 [2 marks]

Answer: 56 000

- $80\,000 \times 70 \div 100$ (1)
 - 56 000 (people) (1)
-

Question 4 (4 marks)

04.1 [1 mark]

Correct: Dead or inactive forms of the pathogen

04.2 [1 mark]

Answer: White blood cells

- white blood cell (1)
-

04.3 [1 mark]

Answer: Antibodies

- antibodies (1)
-

04.4 [1 mark]

Answer: Measles

- measles (1)
- any other correct example, e.g. mumps / rubella / polio / tetanus / diphtheria / whooping cough (1)

Any 1 of the points above.

Question 5 (6 marks)

05.1 [2 marks]

- antibodies are specific to (the shape of) one antigen (1)
 - antibodies made after last year's vaccine may not bind to the changed antigens (1)
-

05.2 [1 mark]

- older people are more likely to become seriously ill / die from flu (1)
-

05.3 [2 marks]

Answer: 80%

- $18\,400 \div 23\,000 \times 100$ (1)
 - 80 (%) (1)
-

05.4 [1 mark]

- it takes time (a few weeks) for the white blood cells to respond / for protection to develop before flu spreads in winter (1)
-

Question 6 (7 marks)

06.1 [1 mark]

Answer: 12 arbitrary units

- 12 (arbitrary units) (1)

06.2 [2 marks]

Answer: 7.5 times

- maximum after infection = 90 (arbitrary units) / 90 ÷ 12 (1)
- 7.5 (1)

Notes: An answer of 7.5 scores 2 marks. Allow ECF from the previous part.

06.3 [2 marks]

- antibodies were produced faster after infection (1)
- a much higher concentration of antibodies was produced after infection (90 compared with 12) (1)
- the antibody concentration stayed high for longer after infection (1)

Any 2 of the points above.

06.4 [2 marks]

- white blood cells recognised the pathogen / responded quickly (because of the vaccination) (1)
 - (so) large amounts of antibodies were made quickly and the pathogens were destroyed before they could cause illness (1)
-

Question 7 (7 marks)

07.1 [4 marks]

- the vaccine contains a dead / inactive form of the bacterium (1)
- (this) stimulates white blood cells to produce (specific) antibodies (1)
- if the same bacterium enters the body, white blood cells respond quickly (1)
- (and) produce the correct antibodies rapidly / in large amounts (1)
- (so) the bacteria are destroyed before they can reproduce / cause illness (1)

Any 4 of the points above.

07.2 [1 mark]

- the bacteria in the vaccine are dead / inactive, so they cannot reproduce / cause disease (1)

07.3 [2 marks]

- antibodies are specific (to one antigen / pathogen) (1)
 - other pathogens have different antigens, so the antibodies do not bind to them (1)
-