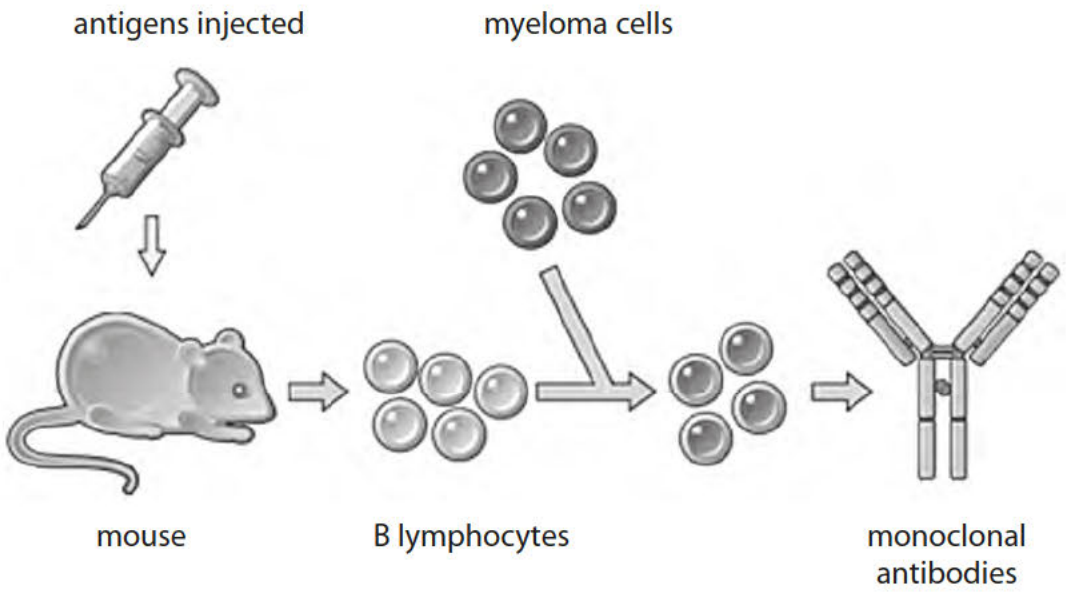
1 The diagram shows some stages in the production of monoclonal antibodies.



(a) (i) Complete the sentence using words from the box.

(2)

memory lymphocytes	exponential	ybridomas
immune	aseptic	yeloma cells

Injecting antigens into the mouse produces an .....

response resulting in the production of antibodies and .

..... .

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The cells produced when B lymphocytes and myeloma cells combine are

(1)

- ☐ **A** antibodies
- ☐ **B** hybridomas
- ☐ **C** memory lymphocytes
- ☐ **D** platelets

(iii) Describe **two** ways in which monoclonal antibodies are used in medical diagnosis.

(2)

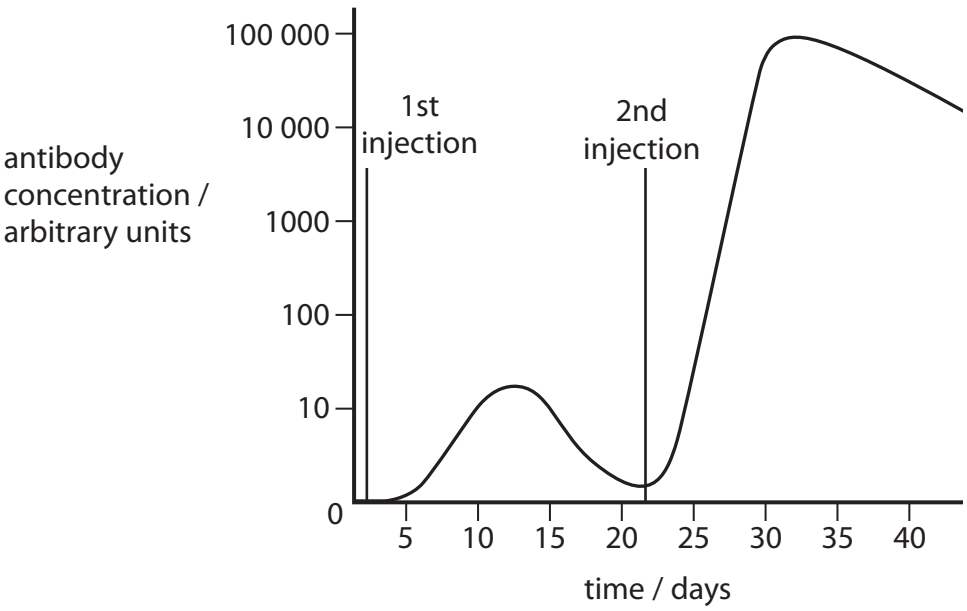
1 .....

.....

2 .....

.....

(b) The graph shows the antibody concentration in a mouse after the first and second injection of the same antigens.



(i) Compare the antibody response after the first injection with the antibody response after the second injection.

(2)

(ii) Suggest how this secondary response to antigens benefits the mouse.

(1)

(iii) omplete the sentence by putting a cross (☒) in the box next to your answer.

Injecting patients with antigens forms the basis of vaccination.

This was first developed by

(1)

☒ **A** Diane Fossey

☒ **B** Edward Jenner

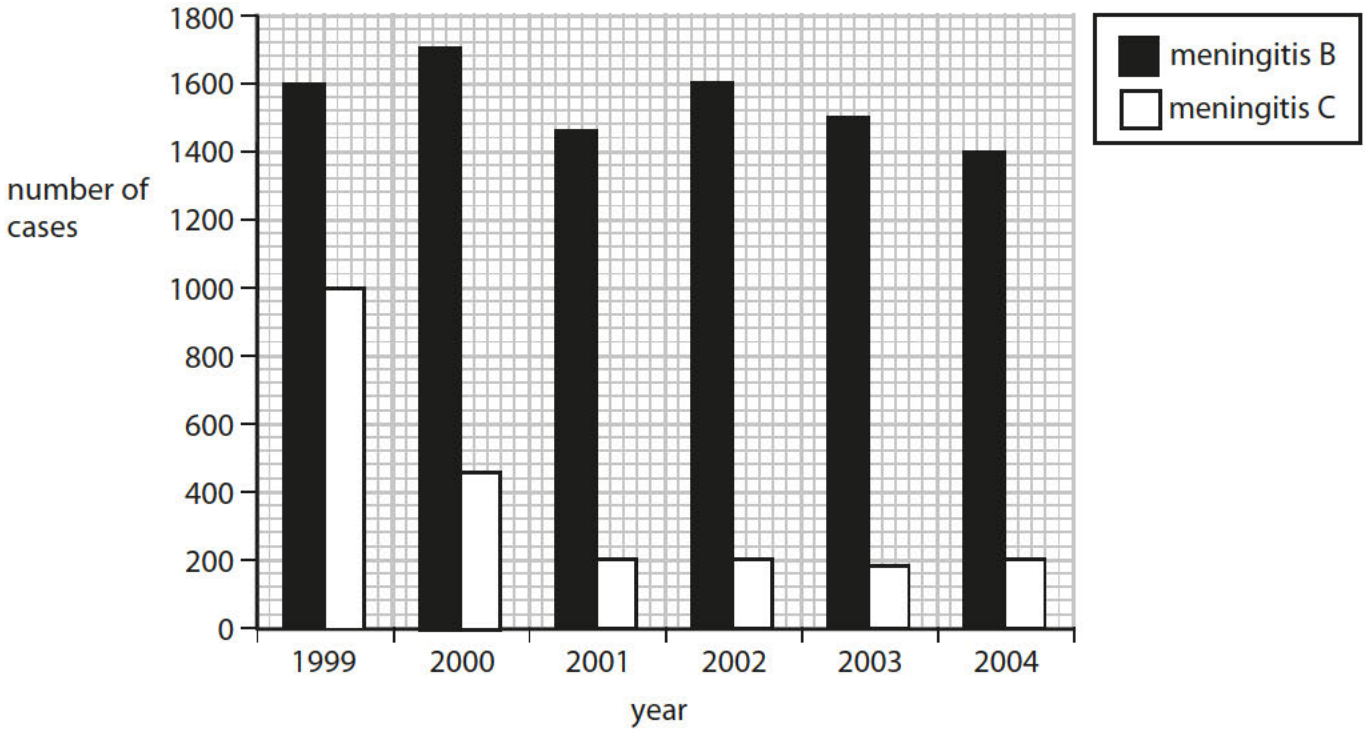
☒ **C** Louis Pasteur

☒ **D** Mary Leakey

(Total for Question 1 = 9 marks)

2 Meningitis B and meningitis C are caused by bacteria.

The graph shows the number of cases of meningitis B and meningitis C in England, from 1999 to 2004.



(a) (i) Use the graph to calculate the change in the total number of cases of meningitis in 1999 compared with 2004.

(2)

answer = ...

(ii) Immunisation against meningitis C was introduced in 1999.

Describe the effects the immunisation had on the number of cases of both types of meningitis.

(2)

.....

.....

.....

.....

(b) Complete the sentence by putting a cross (☒) in the box next to your answer.

The molecules on pathogens which cause an immune response are called

(1)

☒ **A** antigens

☒ **B** bacteria

☒ **C** hybridomas

☒ **D** lymphocytes

(c) (i) Monoclonal antibodies can be produced in large quantities.

Describe the steps in producing monoclonal antibodies.

(3)

.....

.....

.....

.....

.....

.....

(ii) Explain the advantage of using monoclonal antibodies to treat cancer.

(2)

.....

.....

.....

.....

(Total for Question 2 = 10 marks)

3 (a) Athlete's foot fungus is a pathogen.

(i) Describe how athlete's foot fungus is spread.

(1)

.....

.....

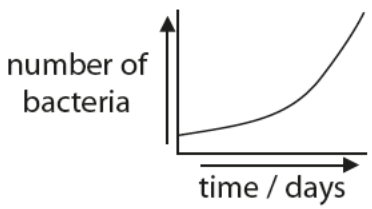
(ii) State the type of medication that can be used to treat this pathogen.

(1)

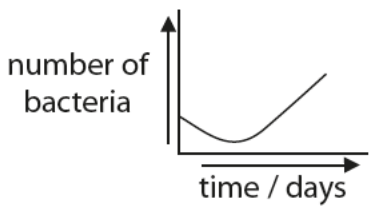
.....

(b) The graphs show the effect of three different antibiotics on bacterial growth.

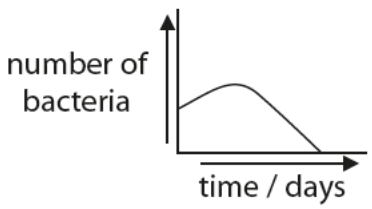
antibiotic A added



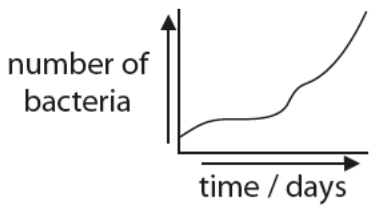
antibiotic B added



antibiotic C added



no antibiotic added



(i) Which of these is most effective at reducing the number of bacteria?

Put a cross (☒) in the box next to your answer.

(1)

☐ **A** antibiotic A

☐ **B** antibiotic B

☐ **C** antibiotic C

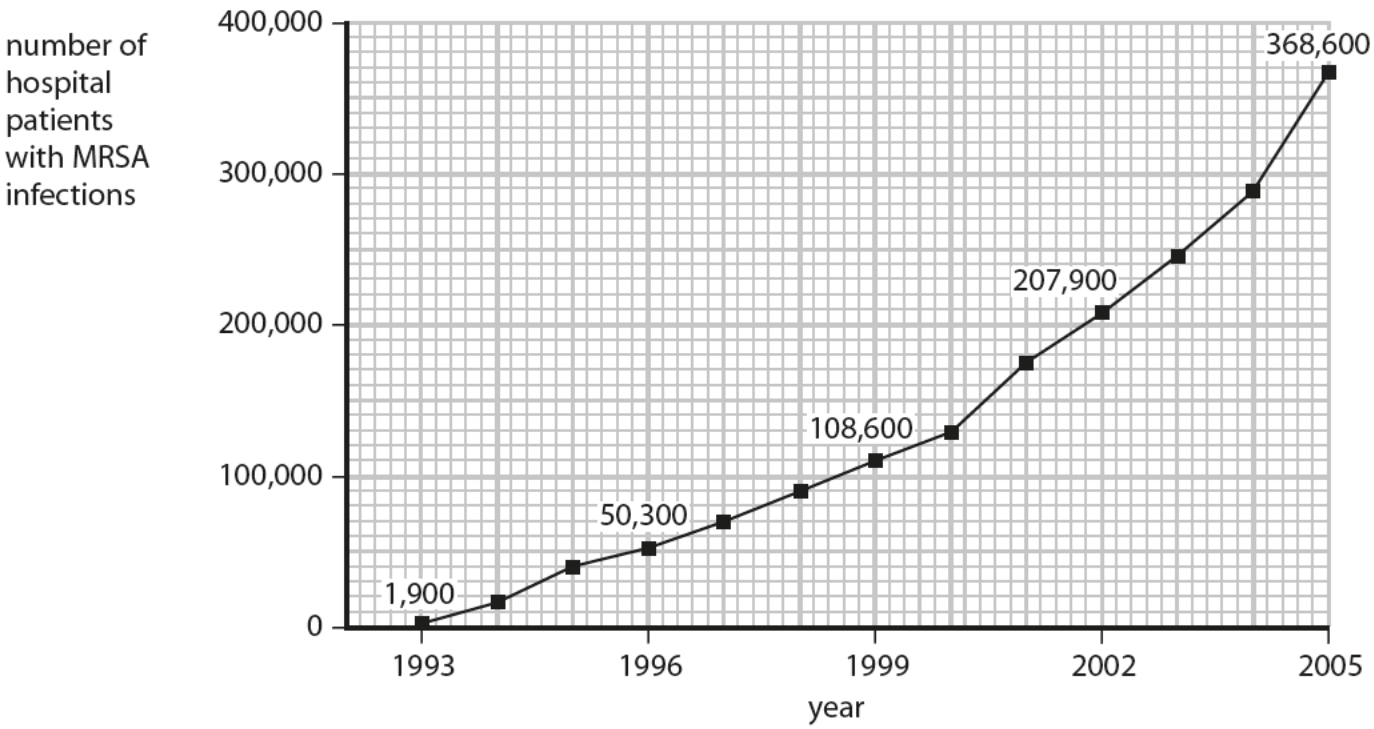
☐ **D** no antibiotic

(ii) Explain how chemical defence mechanisms in the body reduce the chance of infection.

(3)

*(c) MRSA is a bacterial infection.

The graph shows the number of cases of hospital patients with MRSA infections from 1993 to 2005.



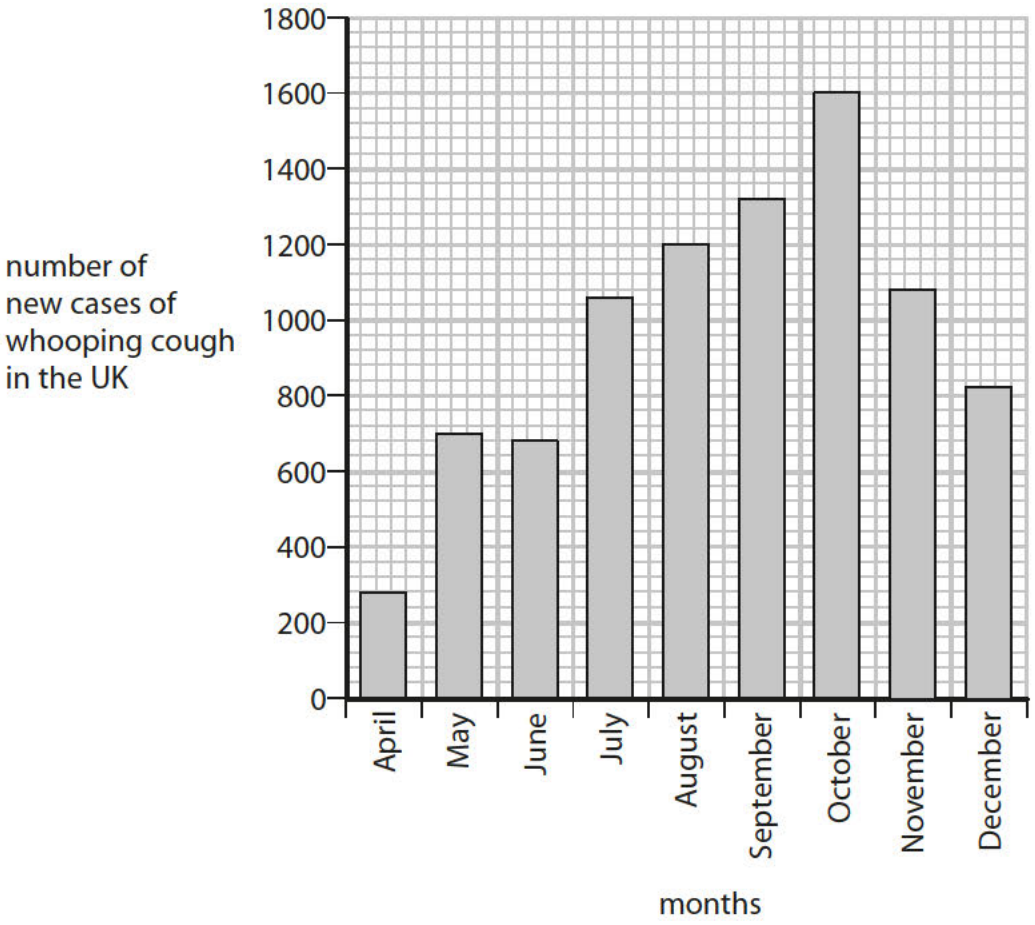
Explain the trend in the graph, even though the patients were treated with antibiotics.

(6)

(Total for Question 3 = 12 marks)

4 In 2012 there was an outbreak of whooping cough in the UK.

The graph shows the number of new cases of whooping cough in the UK from April to December 2012.



(a) (i) Describe the trend shown in the graph from April to December.

(1)

.....

.....

(ii) In September 2011 there were 168 cases of whooping cough in the UK.

Calculate the difference in the number of cases of whooping cough in September 2011 and September 2012.

(2)

..... cases

(b) Whooping cough is caused by the bacterium *Bordetella pertussis*, which grows rapidly in the human body.

State the term used to describe the rapid growth of a bacterial population.

(1)

.....

(c) Children in the UK can be immunised against whooping cough.

Suggest why outbreaks of whooping cough still occur in the UK.

(2)

.....

.....

.....

.....

.....

(d) Describe the response of the human body to immunisation.

(3)

.....

.....

.....

.....

.....

.....

.....

(Total for Question 4 = 9 marks)

5 Infertility can be treated by increasing the chance of ovulation occurring.

Ovulation is controlled by hormones.

(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The hormone that stimulates the maturation of follicles in the ovary is

(1)

- ☐ **A** FSH
- ☐ **B** LH
- ☐ **C** oestrogen
- ☐ **D** progesterone

(ii) Infertility treatments, including the use of hormones, can stimulate ovulation.

Explain **one** disadvantage of treating infertility by using hormones to stimulate ovulation.

(2)

.....

.....

.....

.....

.....

(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Ovulation during pregnancy is prevented by high levels of

(1)

- ☐ **A** FSH
- ☐ **B** LH
- ☐ **C** insulin
- ☐ **D** progesterone

(b) Monoclonal antibody technology is used in pregnancy tests and in the treatment of cancer.

(i) Explain how monoclonal antibodies are used to test for pregnancy.

(3)

(ii) The use of monoclonal antibodies to treat cancer has advantages over the use of traditional chemotherapy and radiotherapy.

Explain the benefits of using monoclonal antibodies to treat cancer.

(2)

(iii) Name the type of cell that produces the monoclonal antibodies used to treat cancer.

(1)

(Total for Question 5 = 10 marks)