(b) The table lists structures found in some cells.
Place ticks in boxes to show which structures are found in bacterial cells and which are found in human skin cells.
One row has been completed for you.

(3)

Structures	Bacterial cell	Human skin cell
nucleus		
DNA		
cytoplasm	✓	✓
cell wall		

(c) Viruses can also cause diseases in humans.

Many viruses contain RNA as their genetic material.

Which statement describes the structure of RNA?

(1)

☒ **A** a double-stranded helix containing the bases ATGC

☒ **B** a double-stranded helix containing the bases AUGC

☒ **C** a single-stranded helix containing the bases ATGC

☒ **D** a single-stranded helix containing the bases AUGC

(Total for question = 8 marks)

Q2.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Various diseases are caused by microorganisms. Some diseases can be treated by using antibiotics.

(a) (i) Which of these is the name given to any microorganisms that cause disease? **(1)**

☒ **A** bacteria

☒ **B** fungi

☒ **C** pathogens

☒ **D** protozoa

(ii) Explain why it is not possible to treat Ebola using antibiotics.

(2)

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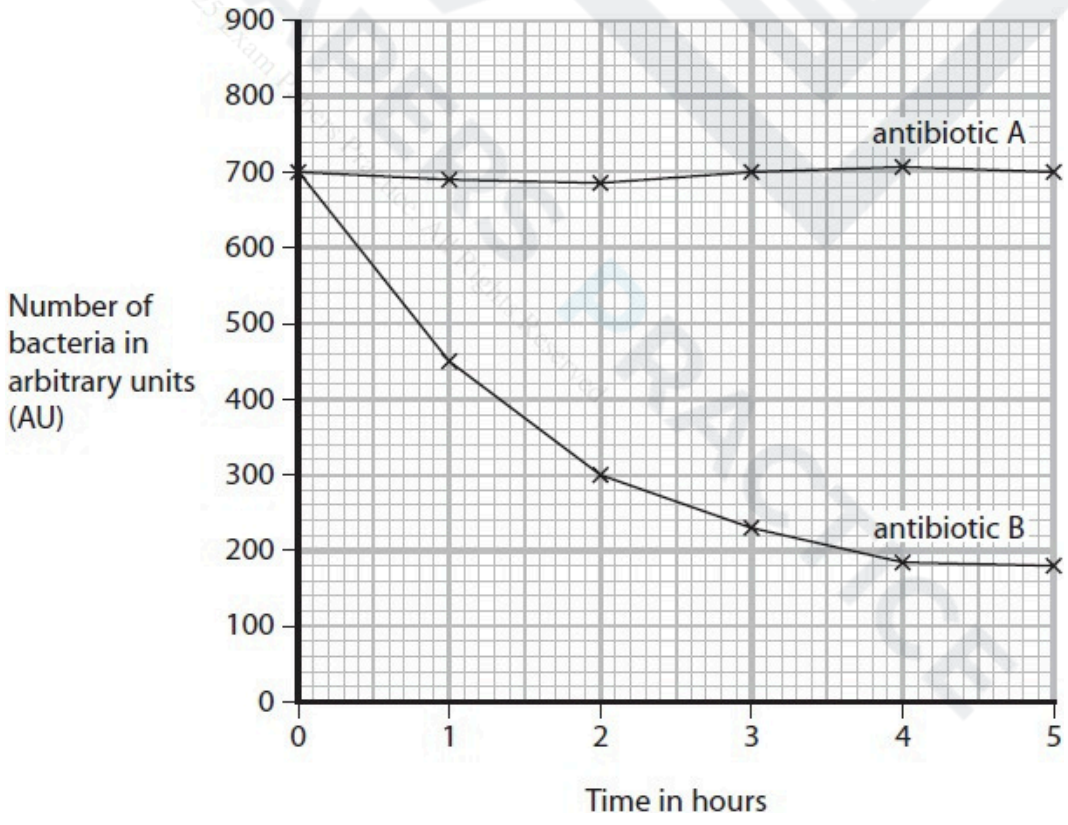
..... (b)

The graph shows the effect of two different antibiotics on the growth of a population of bacteria.



(i) Calculate the mean rate of change of the bacterial population for antibiotic B during the five hours.
Give your answer to 2 significant figures.

(3)

mean rate of change = ... AU per hour

(ii) A bactericidal antibiotic kills bacteria.

A bacteriostatic antibiotic prevents bacteria from reproducing.

Explain which antibiotic is bactericidal.

Use data from the graph to help your answer. **(2)**

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..... (iii)

Discuss which antibiotic would be better to use to treat any disease caused by the bacteria. **(3)**

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(Total for question = 11 marks)

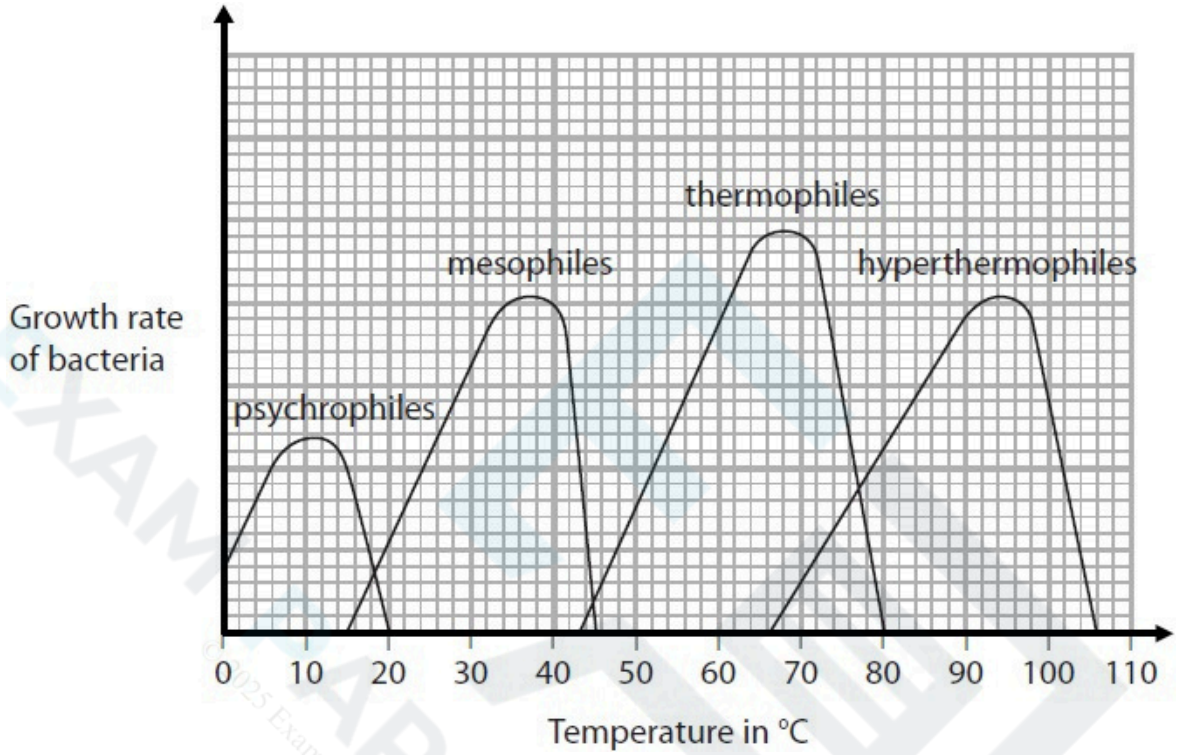
Q3.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

(a) Some bacteria in food can affect the digestive system and cause poor health.

Storing food at the correct temperature can reduce the growth of these bacteria.

The graph shows the growth rate of four groups of bacteria at different temperatures.



(i) Food kept in a fridge shows signs of contamination by bacteria.

Which group of bacteria is most likely to have caused this contamination? **(1)**

- ☒ **A** psychrophiles
- ☒ **B** mesophiles
- ☒ **C** thermophiles
- ☒ **D** hyperthermophiles

(ii) Explain how cooking food at 65°C will affect thermophiles. **(2)**

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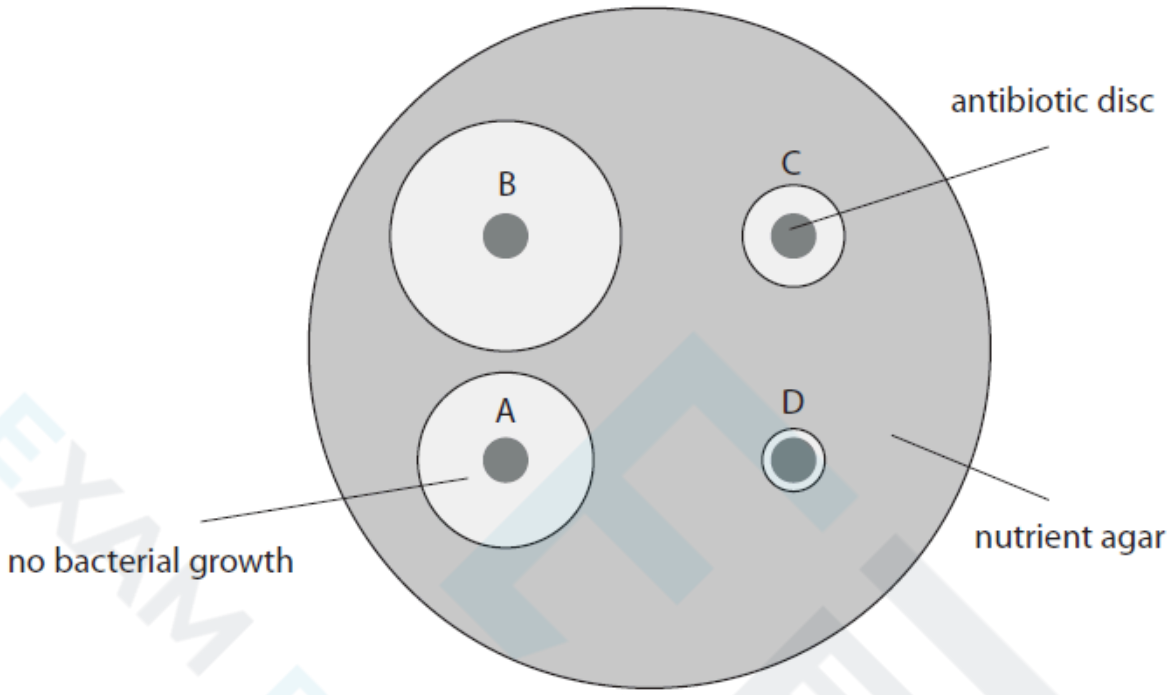
(b) A student investigates the effect of different antibiotics on the growth of bacteria. She uses this method.

- streak bacteria onto nutrient agar in a Petri dish
- place discs of different antibiotics, A, B, C and D, onto the nutrient agar
- incubate the Petri dish in a warm oven for one week



(i) Explain how the student could determine the effectiveness of each antibiotic.

(2)

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(ii) Explain safety precautions the student should take in this investigation.

(6)

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(Total for question = 11 marks)

Q4.
Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

In 1916, an American doctor, Joseph Goldberger, noticed symptoms of a mystery disease that were common among his patients. These symptoms included headaches, swollen tongues, skin rashes, upset stomachs and mental illness. In one American state, North Carolina, 40% of the 30 000 people living in this area died from this mystery disease.

Goldberger investigated whether the symptoms of the mystery disease were caused by pathogens. His investigation involved injecting himself with the blood from one patient, eating the skin rash of another and swallowing fluid taken from the intestines of a third. Goldberger did not get the disease, although he did suffer from nausea and diarrhoea.

Goldberger concluded that the symptoms shown by the patients were not caused by an infectious disease. He decided that they were more likely to be caused by the poor diet of the patients.

(a) Calculate the number of people in North Carolina who died from this mystery disease (lines 4 to 5).

(2)

number of deaths = ...

(b) State the meaning of the term pathogens (line 7).

(1)

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(c) The people were suffering from a deficiency disease called pellagra, which is caused by a

lack of vitamin B in the diet.

State why deficiency diseases such as pellagra are not infectious diseases.

(1)

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(d) Describe a method that Goldberger could use to show that the symptoms of his patients were caused by a lack of vitamin B in their diet.

(3)

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(e) Scurvy is another deficiency disease. Scurvy affects the production of a protein called collagen. Collagen is a component of many body tissues including cartilage. Explain why a person with scurvy often experiences pain when walking.

(2)

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(Total for question = 9 marks)

Q5.

Garlic plants contain a substance called allicin. This substance is thought to have antibacterial properties.
A student investigates the antibacterial effect of garlic.
This is the student's method.

- label three test tubes A, B and C
- add 10 cm3 of milk into each of the tubes
- add a sample of the bacterium E. coli into tubes B and C using aseptic techniques
- crush the garlic in water to form garlic juice
- add 1 cm3 of garlic juice to tube C
- shake all three tubes and leave to incubate for two hours
- place a sample from tube A into the centre of Petri dish A, from tube B into the centre of Petri dish B and from tube C into the centre of Petri dish C
- incubate the three Petri dishes for five days
- each day measure the diameter of any bacterial growth that has occurred

The table shows the student's results.

Petri dish	Diameter of bacterial growth in mm				
	day 1	day 2	day 3	day 4	day 5
A	0	1.7	3.0	4.6	7.1
B	0	4.2	8.4	15.1	36.5
C	0	0	0	0	0

(a) (i) State three control variables in the student's investigation.

(3)

1 .....

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2 .....

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3 .....

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(ii) State the dependent variable in the student's investigation.

(1)

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(b) (i) Calculate the mean daily increase in the diameter of the bacterial growth for dish A and

dish B.

(2)

mean daily increase for dish A ..... mm/day
mean daily increase for dish B ..... mm/day

(ii) Explain the difference between the mean daily increases in the diameter of the bacterial growth for dish A and
dish B.

(4)

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(c) Explain what is meant by an aseptic techniques for the transfer of bacteria.

(2)

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..... (d) Suggest what further tests the student should do to show that garlic can be used as an effective general

antibacterial agent.

(2)

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(Total for question = 14 marks)

Q6.

(a) What type of microorganism causes gonorrhoea?

(1)

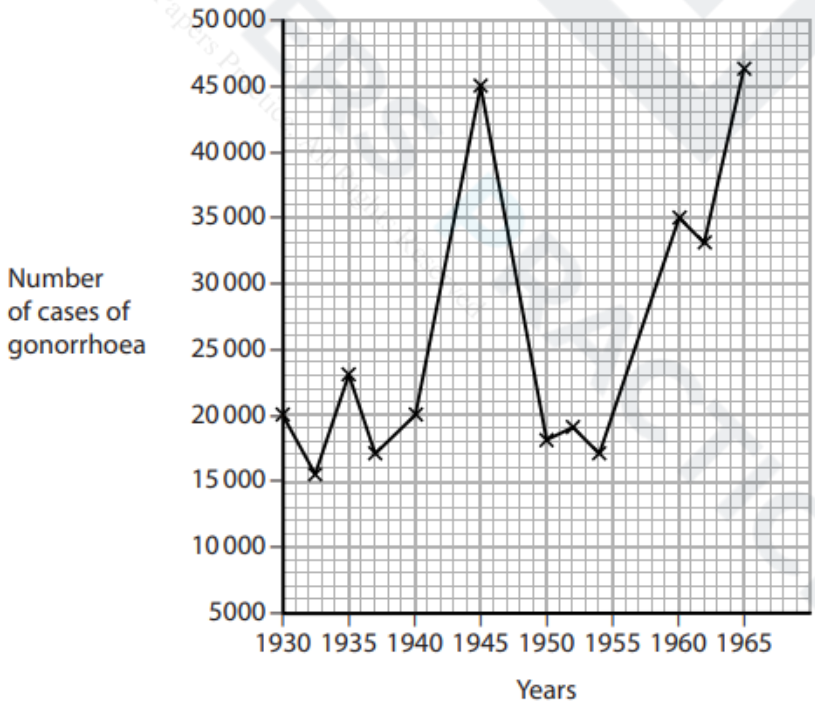
☒ **A** bacterium

☒ **B** fungus

☒ **C** protozoan

☒ **D** virus

(b) The graph shows the number of cases of gonorrhoea treated in UK clinics between 1930 and 1965.



(i) Find the number of cases of gonorrhoea in 1945.

(1)

number of cases = ...

(ii) Describe the trend in the number of cases of gonorrhoea between 1954 and 1965.

(2)

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(c) (i) State **two** ways to reduce the chances of catching gonorrhoea.

(2)

1 .....

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2 .....

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(ii) State **one** treatment for gonorrhoea.

(1)

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(d) Explain why oral contraceptives are ineffective in preventing the spread of sexually transmitted diseases.

(2)

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(Total for question = 9 marks)

Q7.

(a) Different types of organisms cause diseases.

Diseases are transmitted in different ways.
The table lists three diseases.
Complete the table by giving the type of organism that causes each disease and the method of transmission for each disease.

(6)

Name of disease	Type of organism	Method of transmission
malaria		
poliomyelitis		
typhoid		

(b) Explain why it is not possible to treat athlete's foot using antibiotics.

(2)

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(Total for question = 8 marks)

Q8.
Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Treatment of Ebola

Ebola is caused by an RNA virus. There is no proven treatment available for Ebola. However, whole blood collected from someone who has recovered from infection has been used as a treatment. The results have been promising in a small group of Ebola patients.

Guidance for national health authorities and blood transfusion services describes the stages needed to collect whole blood (CWB) or plasma (CP) from Ebola-recovered patients. This can be used for transfusion to patients as a treatment for early Ebola.

The guidance states how to

- identify people who have recovered from Ebola as potential blood donors
- screen donors' blood for A, B, O and Rhesus groupings
- screen donors' blood for transfusion-transmissible infections
- collect blood and care for donors
- obtain agreement of Ebola patients for the treatment
- identify patient's blood grouping
- store and transport CWB and CP to the places where transfusions are to be given
- select Ebola patients for transfusion
- transfuse the blood into the patient

Donated CWB should never be frozen and should be stored between 2 °C and 6 °C.

CWB and CP donations should be transfused to the Ebola patients using standard transfusion procedures.

(a) (i) Explain what is meant by an RNA virus (line 1). **(2)**

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(ii) The table lists five diseases. Put a tick (✓) next to the diseases that should be tested for in the donors' blood.

(2)

Disease	Blood tested (✓)
anaemia	
cystic fibrosis	
gonorrhoea	
HIV	
scurvy	

(iii) Explain why it is necessary to identify the blood group of the blood collected from donors

who have recovered
from Ebola (line 9).

(3)

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(iv) Suggest why donated CWB should never be frozen (line 17).

(2)

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(v) Explain how the blood of people who have recovered from Ebola is likely to be effective in treating the disease.

(2)

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(b) The nitrogenous base composition of another virus was found to be adenine 13%, guanine 26%, uracil 20% and

cytosine 41%.

Explain how these figures prove that this is a virus with a single strand of RNA.

(3)

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(Total for question = 14 marks)

Q9.

(a) Give two differences between whole blood and plasma.

(2)

1 .....
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2 .....
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(b) Ebola is an infectious disease. One symptom of Ebola is blood loss. The World Health Organisation (WHO) has a procedure for treating Ebola. This is the WHO's procedure.

- find a person who has recovered from Ebola
- observe this person to make sure that they are disease free for 28 days
- take blood from this person and test the blood for other diseases
- separate the plasma from the blood
- transfer this plasma to another person who has Ebola

Explain how the WHO procedure helps to treat a person who has Ebola.

(6)

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(Total for question = 8 marks)

Q10.

P. vivax is one of several parasites that can cause malaria.

(a) Explain how P. vivax is transmitted from one person to another.

(3)

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(b) The table shows the total number of deaths from malaria and the number of deaths caused by P. vivax.
It shows the data for five different regions of the world in 2015.

Region of the world	Q	R	S	T	U
Total number of deaths from malaria	191 000	800	3800	14 400	1200
Number of deaths caused by *P. vivax*	1000	500	1400	4900	700

(i) Compare the number of deaths caused by P. vivax with the total number of deaths from malaria in regions Q and R.
Include calculations to support your answer. **(3)**

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..... (ii)
Suggest one reason why the number of deaths from malaria varies across the different regions.

(1)

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..... (c)

Scientists are developing a vaccine to protect against malaria. Explain how vaccinating individual people will help to protect a whole population from malaria.

(3)

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(d) P. vivax reproduces by asexual reproduction and sexual reproduction. Explain why it is an advantage for a species to reproduce by both methods.

(3)

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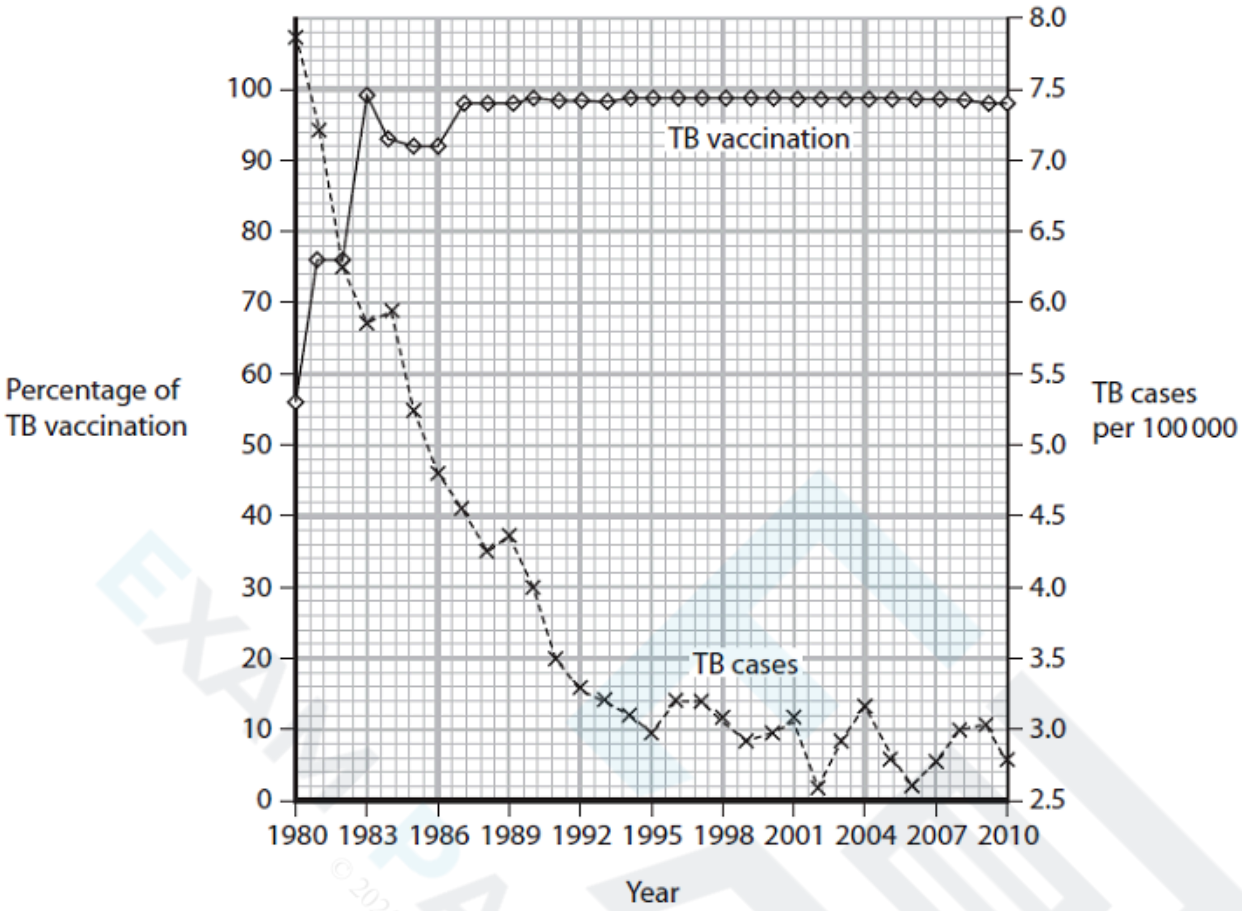
(Total for question = 13 marks)

Q11.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

The graph shows the percentage of people vaccinated against tuberculosis (TB) in a country between 1980 and 2010.
It also shows the number of cases of tuberculosis in that country.



(a) (i) Tuberculosis is caused by the same type of organism as typhoid.

What is the type of organism? **(1)**

☒ **A** bacterium

☒ **B** fungus

☒ **C** protozoan

☒ **D** virus

(ii) Describe the relationship between the percentage vaccination and the number of cases of TB.

(4)

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(b) The population of this country in 2010 was 3.45 million. Calculate the number of cases of tuberculosis in this country in 2010.

(3)

number of cases = ...

(c) Explain how vaccination can give a person immunity to a disease.

(5)

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(Total for question = 13 marks)