Keeping healthy – 2022 GCSE 21st GCSE Biology B

1. May/2022/Paper_J257/03/No.4

Diseases can be described as communicable or non-communicable.

(a) Explain what is meant by communicable diseases **and** non-communicable diseases.

Give examples of **both** types of disease in your answer.

Communicable diseases .....

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Non-communicable diseases .....

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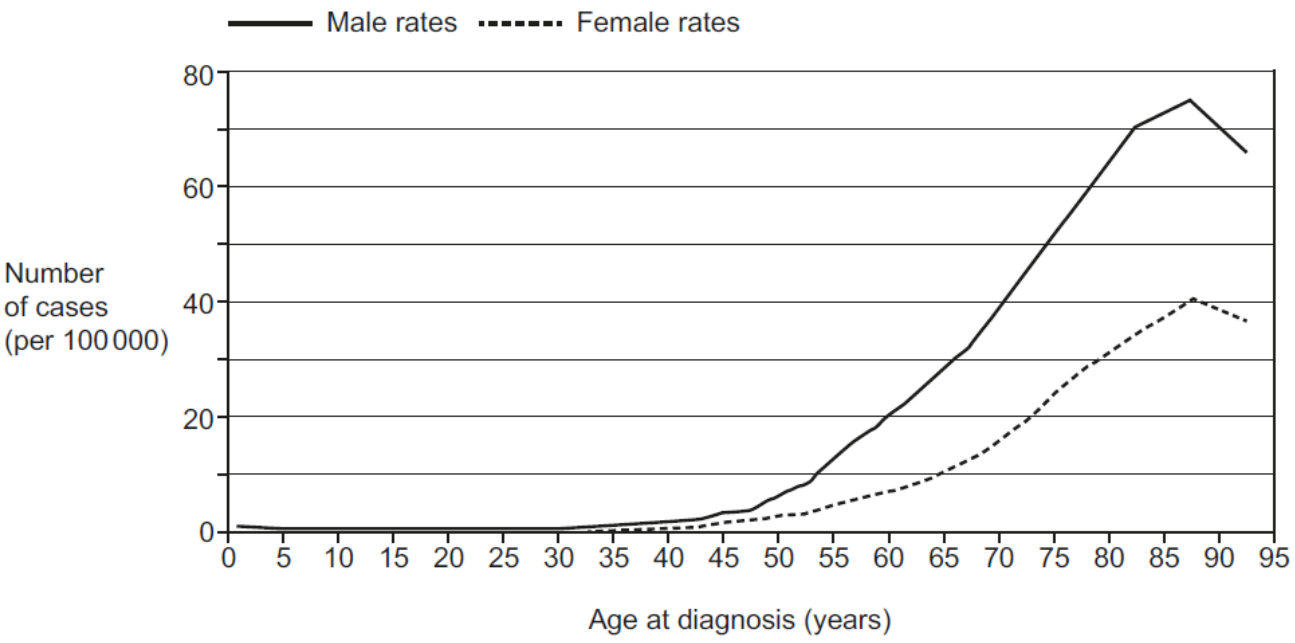
..... **[3]**

(b) The graph shows the number of cases of liver disease in people in the UK.



Give **two** conclusions that can be made from the graph.

Conclusion 1 .....

.....

Conclusion 2 .....

.....

[2]

(c) There are several causes of liver disease.
These causes include obesity, alcohol consumption and some viral diseases.

(i) Which of these causes can be prevented by vaccination?

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

(ii) Different types of disease can interact.
Explain what this statement means.

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

2. May/2022/Paper_J257/04/No.4

Bacteria can become resistant to antibiotics.

(a) Charlie investigates whether a type of bacteria can grow in different antibiotics.

- Charlie uses aseptic techniques to add a drop of liquid containing the bacteria to the centre of each of four Petri dishes.
- Each Petri dish already contains a different antibiotic.
- The four Petri dishes are incubated for 24 hours.

The appearance of the four Petri dishes after incubation is shown in **Fig. 4.1**.

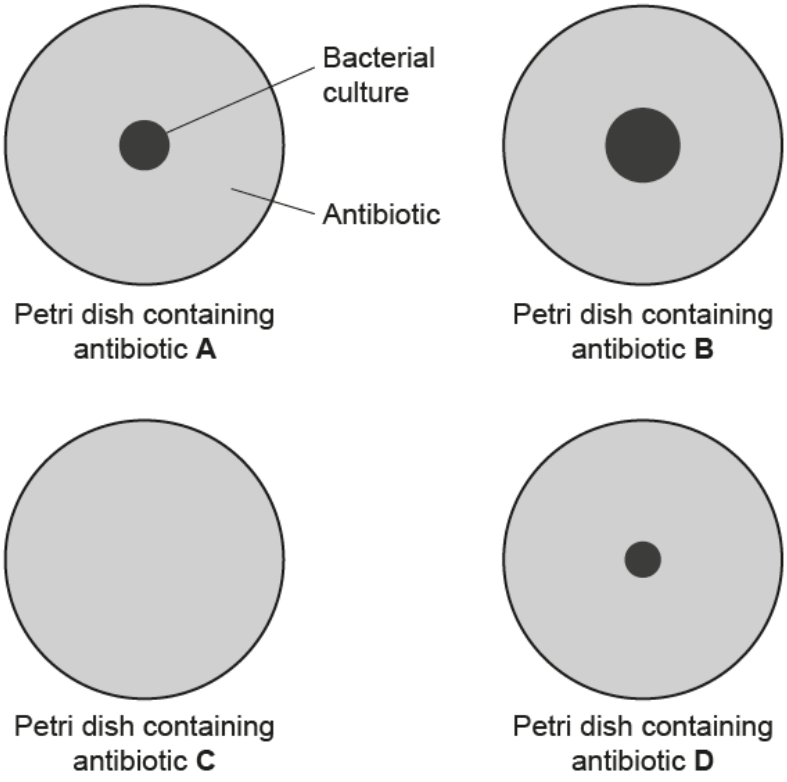

Fig. 4.1

(i) In the Petri dish containing antibiotic **B**, the bacterial culture has a radius (r) of 5 mm.

Calculate the area of the bacterial culture in this Petri dish.

Use the equation: area = $3.14 \times r^2$

Area = ... mm^2 **[2]**

(ii) Which antibiotic would be the **best** choice to treat a sick patient who was infected with this type of bacteria?

Describe the evidence in **Fig. 4.1** that supports your choice.

Antibiotic .....

Evidence .....

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[3]

(b) **Fig. 4.2** shows the number of infections (rounded to the nearest 100) with antibiotic-resistant bacteria in England over four years.

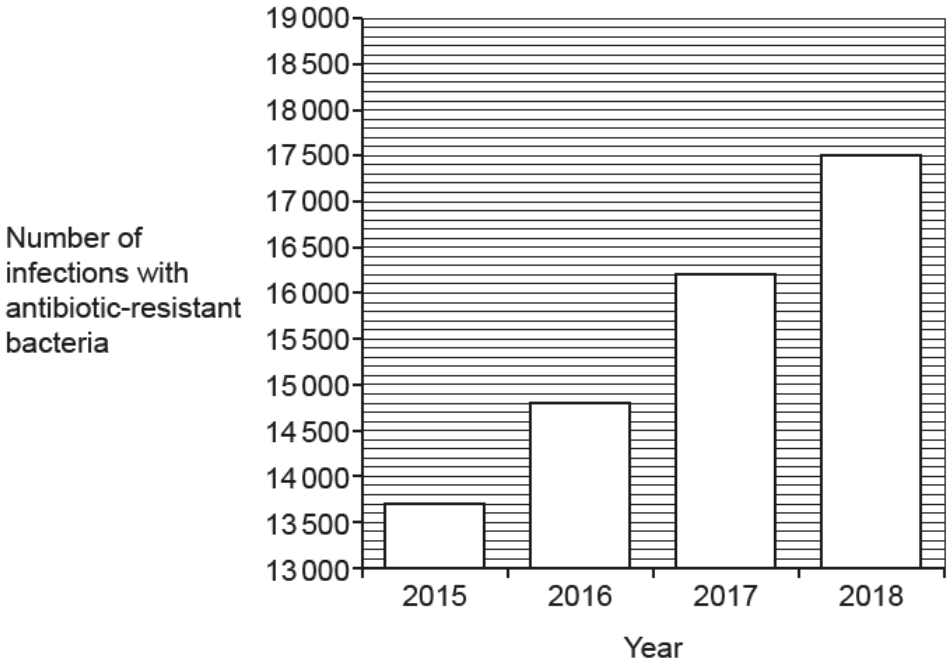

Fig. 4.2

(i) Calculate the percentage increase in the number of infections with antibiotic-resistant bacteria from 2017 to 2018.

Give your answer to **1** significant figure.

Percentage increase = ... % **[3]**

(ii) Predict what the number of infections with antibiotic-resistant bacteria might have been in 2019.

Explain your answer.

Prediction .....

Explanation .....

.....

.....

[3]

(c) A bacterium can become resistant to an antibiotic if it receives a plasmid from another bacterium.

(i) Explain what a plasmid is.

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

(ii) Explain how receiving a plasmid causes a bacterium to become resistant to an antibiotic.

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

(iii) Explain how a bacterium could become resistant to an antibiotic **without** receiving a plasmid.

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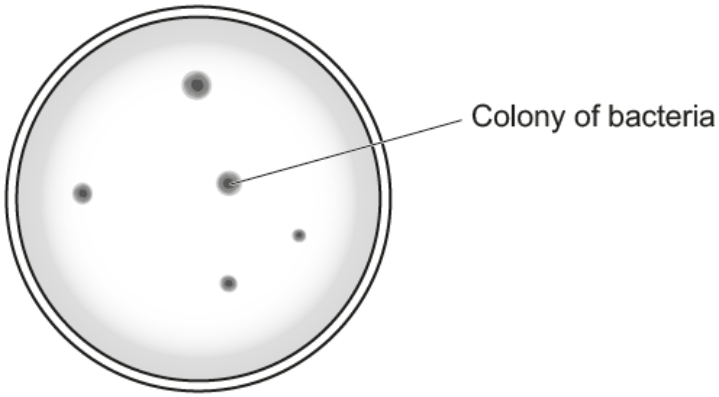
..... **[2]**

3. May/2022/Paper_J257/01/No.7

Anika is investigating the growth of bacteria.

She takes a sample from a yoghurt drink that contains live bacteria and spreads it on an agar plate.

Anika incubates the agar plate for 3 days. After three days bacterial colonies have grown, as shown in the diagram.



Anika uses a light microscope to look at the bacterial colonies.

(a) The image Anika can see under the microscope is blurry.

Describe how she should change the microscope to get a better image.

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

(b) **(i)** There can be millions of bacteria in one colony.

Assume each colony on the agar plate has 2 million bacteria.

Use the diagram to estimate the total number of bacteria on the agar plate.

Estimated number of bacteria on the agar plate = ... **[1]**

(ii) Explain why this estimated number is **not** accurate.

.....

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

(c) Where is the genetic material in a bacterial cell found?

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

4. May/2022/Paper_J257/02/No.3

Antibiotics are used to treat some diseases.

(a) Beth has influenza.

Which **two** statements explain why antibiotics will **not** cure Beth's influenza?

Tick (✓) **two** boxes.

Antibiotics do not work against bacteria.	☐
Antibiotics do not work against viruses.	☐
Bacteria can become resistant to antibiotics.	☐
Beth's influenza was caused by a virus.	☐
Beth's influenza was caused by bacteria.	☐
Influenza mutates quickly.	☐

[2]

(b) Leo has cardiovascular disease.

Explain why antibiotics will **not** help to cure Leo's cardiovascular disease.

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

(c) Many bacteria have become resistant to antibiotics.

Suggest why the spread of antibiotic-resistant bacteria is dangerous.

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

(d) Information about four different antibiotics is given in **Table 3.1**.

Antibiotic	Year when antibiotic was discovered	Year when bacteria resistant to the antibiotic appeared
A: Carbapenems	1985	1993
B: Macrolides	1948	1985
C: Penicillin	1928	1940
D: Tetracycline	1948	1953

Table 3.1

(i) Which antibiotic had the **shortest** amount of time between the discovery of the antibiotic and the appearance of resistant bacteria?

Tick (✓) **one** box.

Antibiotic **A** ☐ **B** ☐ **C** ☐ **D** ☐

Amount of time = ... years

[2]

(ii) Scientists can make changes to existing antibiotics. The scientists hope that it will take a long time for bacteria to develop resistance to the changed antibiotics.

Which antibiotic in **Table 3.1** is the best choice for scientists to make changes to?

Tick (✓) **one** box.

Antibiotic **A** ☐ **B** ☐ **C** ☐ **D** ☐

Give a reason for your choice.

Reason .....

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[2]

(e) **Fig. 3.1** shows the number of infections (rounded to the nearest 100) with antibiotic-resistant bacteria in England over five years. The data for two of the years have **not** been plotted.

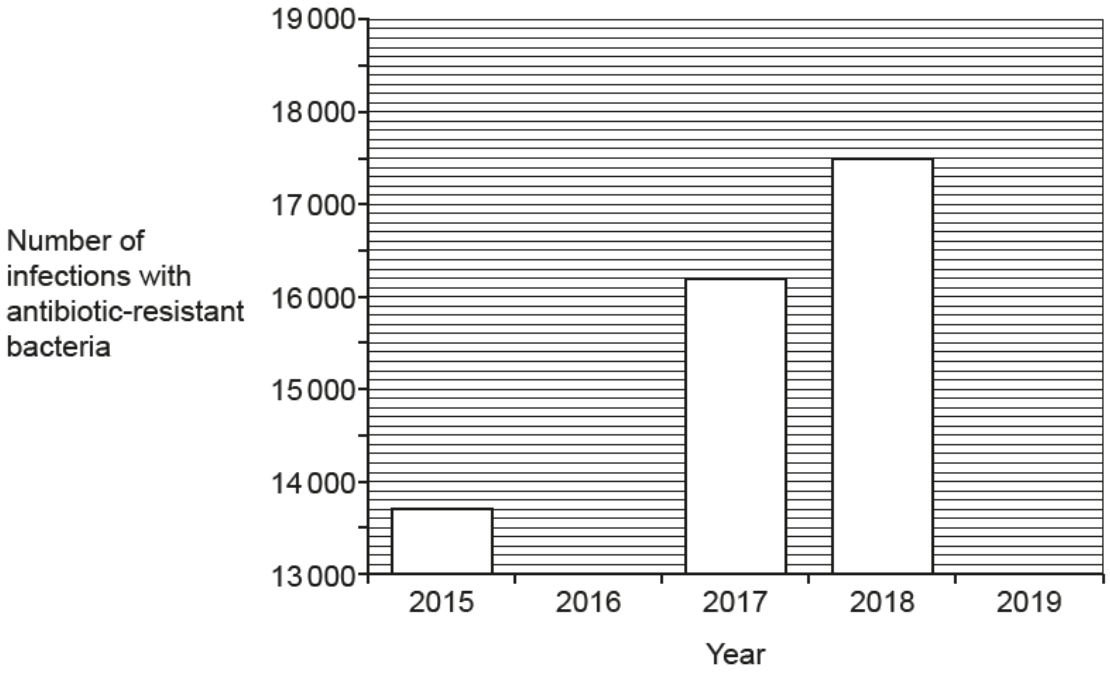

Fig. 3.1

(i) The number of infections with antibiotic-resistant bacteria in 2016 was 14 800.

Plot the data for 2016 on **Fig. 3.1**. **[1]**

(ii) Four students predict what the number of infections with antibiotic-resistant bacteria might have been in 2019. Their predictions are shown in **Table 3.2**.

Student	Prediction for 2019
Alex	23 000
Amit	18 600
Ling	16 000
Taylor	17 500

Table 3.2

Which student's prediction do you think is most likely to be correct?

Explain your answer.

Student .....

Explanation .....

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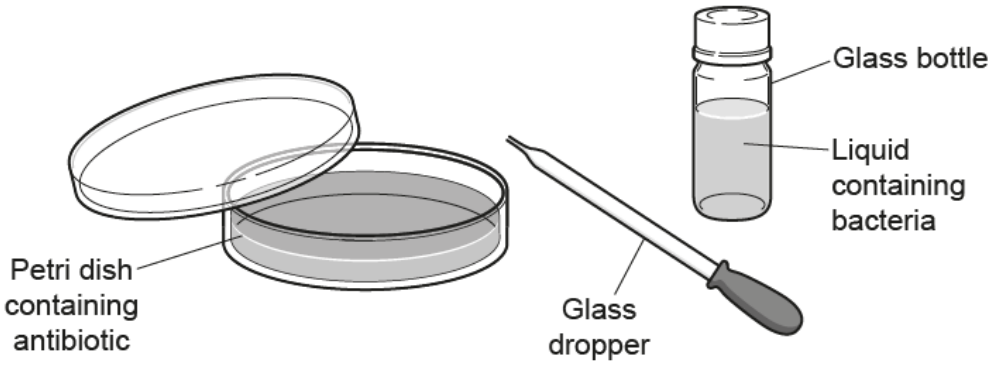
[3]

(f) Charlie investigates whether different antibiotics can affect the growth of a type of bacteria. The diagram shows the apparatus they use.



Charlie places a drop of liquid containing the bacteria in the centre of each of four Petri dishes. Each Petri dish already contains a different antibiotic.

The method Charlie uses is shown in **Fig. 3.2**.

1. Remove the lid from the Petri dish.
2. Remove the lid from the glass bottle containing bacteria.
3. Wipe the glass dropper with tissue to clean it.
4. Use the glass dropper to transfer a drop of liquid containing bacteria from the bottle to the centre of the Petri dish.

Fig. 3.2

(i) Describe **four** ways to improve Charlie's method to include aseptic techniques.

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

(ii) Charlie uses proper aseptic techniques to add a drop of liquid containing the bacteria to the centre of each Petri dish.

Fig. 3.3 shows the Petri dishes after they were incubated for 24 hours.

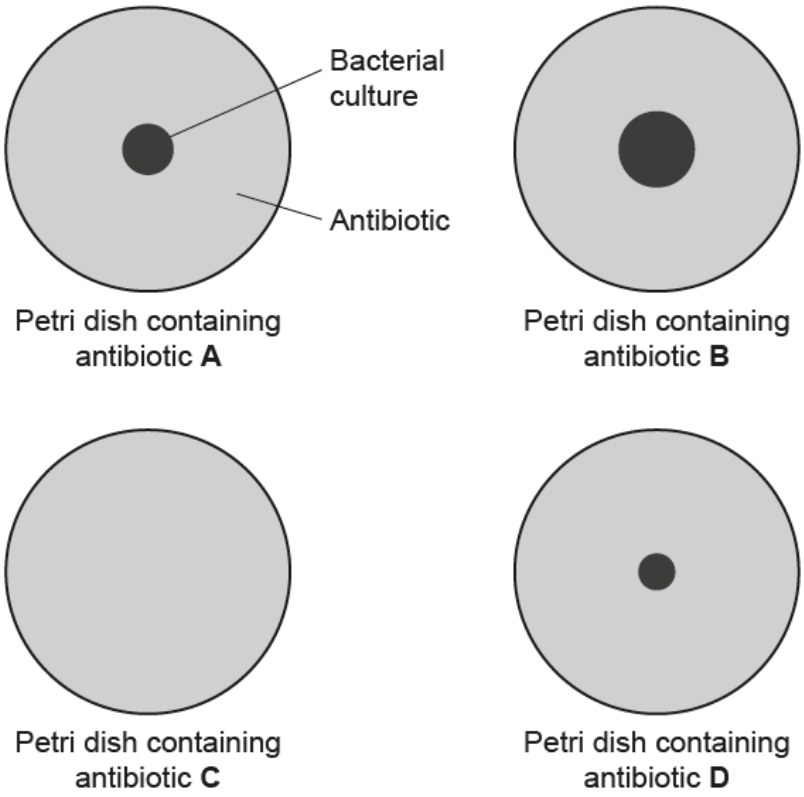

Fig. 3.3

In the Petri dish containing antibiotic **B**, the bacterial culture has a radius (r) of 5 mm.

Calculate the area of the bacterial culture in this Petri dish.

Use the equation: area = $3.14 \times r^2$

Area = ... mm^2 **[2]**

(iii) Charlie concludes that the bacteria are resistant to all of the antibiotics **except** antibiotic **C**.

Describe the evidence in **Fig. 3.3** that supports Charlie's conclusion.

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

5. May/2022/Paper_J257/02/No.5

Malaria is a disease that can be deadly. Around the world, there are hundreds of millions of cases of malaria every year.

The pathogen that causes malaria is spread by mosquitoes.

(a) Which type of pathogen causes malaria?

Put a (ring) around the correct answer.

Bacterium **Fungus** **Protist** **Virus**

[1]

(b) Mosquitoes can be killed with insecticide. However, in the case of mosquitoes that spread malaria, many of the mosquitoes have become resistant to insecticide.

The insecticide resistance was caused by a mutation in the mosquitoes' DNA.

Which statement about mutations is true?

Tick (✓) **one** box.

All mutations affect the organism's phenotype. ☐

All mutations are harmful. ☐

Mutations cannot be passed on to the organism's offspring. ☐

Mutations create new genetic variants. ☐

[1]

(c) The mutation that causes insecticide resistance is now very common in the mosquito population.

Statements **A**, **B**, **C** and **D** can be used to explain why the mutation has become so common. The statements are **not** in the correct order.

A	Insecticide was used in some places where the mosquitoes lived.
B	More mosquitoes in the next generation inherited the mutation.
C	Mosquitoes with the mutation were not killed.
D	These mosquitoes were able to produce more offspring.

(i) Write the letters of the statements in the correct order to explain why the mutation has become so common.

[3]

(ii) What is the name of the process described by statements **A**, **B**, **C** and **D**?

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

(d) Scientists have genetically engineered a fungus to allow it to make a protein that is usually only made by spiders.

(i) Describe what is meant by a 'genetically engineered fungus'.

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

(ii)* The spider protein made by the genetically engineered fungus can kill mosquitoes. Scientists could release the fungus in areas where malaria is common.

Explain the possible benefits **and** risks of releasing the fungus.

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..... **[6]**