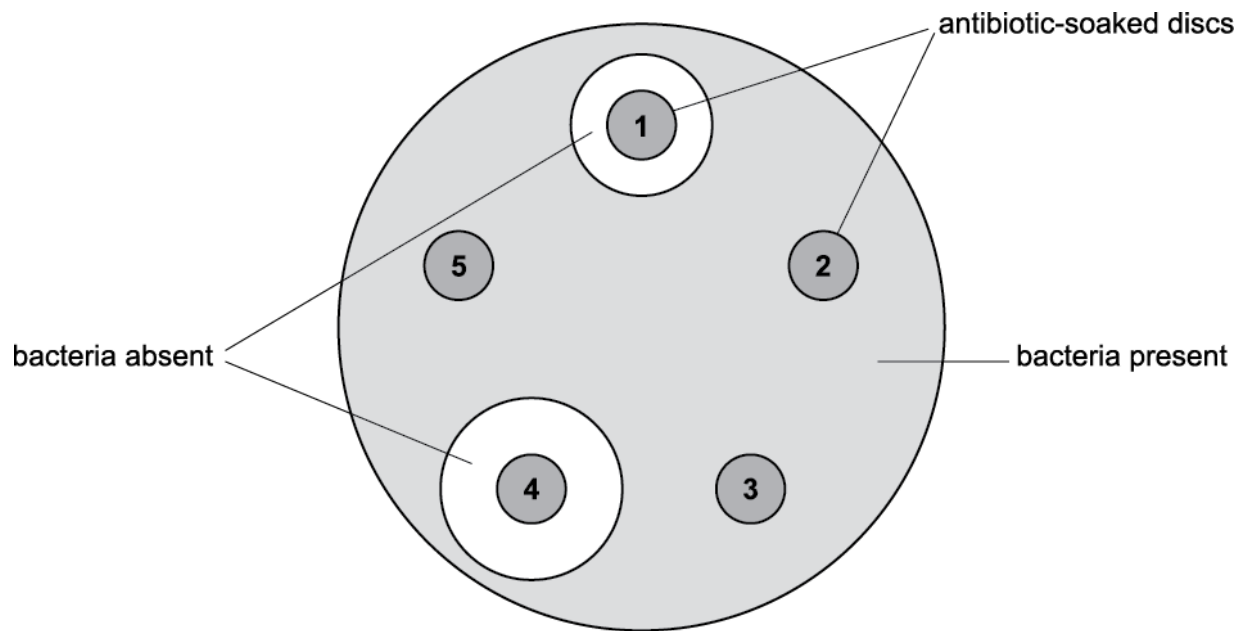


1. The Kirby-Bauer test is used to determine the sensitivity of bacteria to various antibiotics.

A sample of bacteria was swabbed across an agar plate. Five antibiotic-soaked discs were then placed on the agar.

The diagram below shows the appearance of the plate after incubation overnight.



Key

- 1 = vancomycin
- 2 = amoxicillin
- 3 = cefoxitin
- 4 = minocycline
- 5 = methicillin

Which of the following statements is/are correct?

- 1 Vancomycin and minocycline show bactericidal, but not bacteriostatic, activity.
- 2 The tested bacteria could be MRSA.
- 3 The result for amoxicillin, cefoxitin and methicillin could be due to mutation of bacterial genes.

- A 1, 2 and 3 are correct
- B Only 1 and 2 are correct
- C Only 2 and 3 are correct
- D Only 1 is correct

Your answer

[1]

2. Which of the options, A to D, is a cellular target of a bacteriostatic antibiotic?

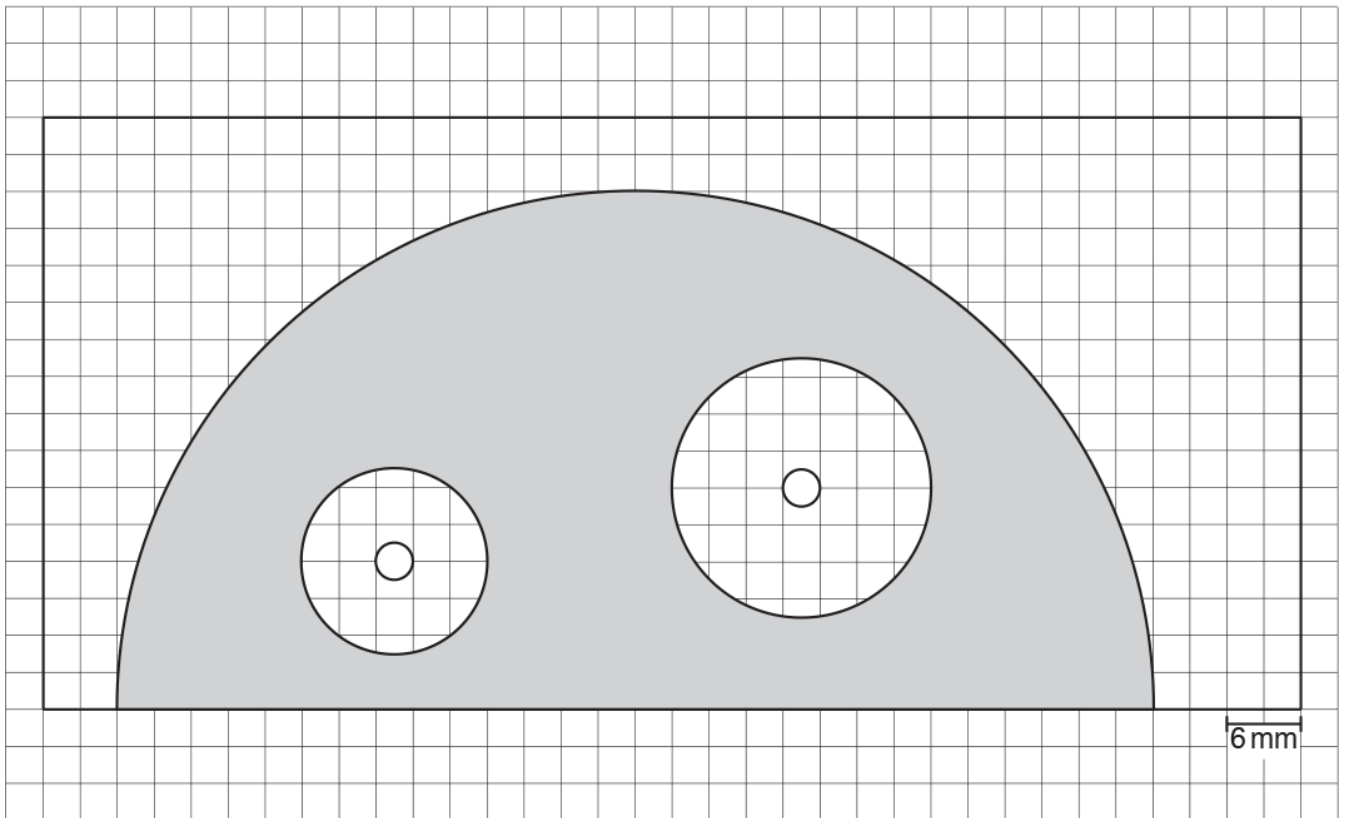
- A cell wall
- B plasma membrane
- C 70S ribosome
- D 80S ribosome

Your answer

[1]

3. A group of students was investigating the effect of different antibiotics on the growth of colonies of the bacterium, *Escherichia coli*.

The results are shown below.



Which of the options, A to D, is the inhibition zone of the **least effective** antibiotic?

- A 1 385 mm²
- B 707 mm²
- C 346 mm²
- D 177 mm²

Your answer

[1]

4. Carbapenems are a class of broad-spectrum antibiotics.

In recent years, there has been an increase in the number of carbapenem-resistant strains of bacteria.

Which of the statements, A to D, would contribute to an increase in the number of carbapenem-resistant strains of bacteria?

- A some bacteria develop immunity to carbapenems
- B increased use of carbapenems in animal feed to prevent infection
- C increased use of carbapenems causes mutations in the bacteria
- D some bacteria have plasmids containing genes for carbapenems

Your answer

[1]

5. Scientists are producing a vaccine against a disease-causing bacterium.

The table below shows the locations and mutation rates of four proteins, A to D, in the bacterium.

	Protein location	Mutation rate (per amino acid)
A	cell membrane	2.1×10^{-4}
B	cell wall	4.3×10^{-4}
C	pilus	7.7×10^{-4}
D	ribosome	1.8×10^{-4}

Which of the proteins, A to D, is most suitable as the basis of a vaccine against this bacterium?

Your answer

[1]

END OF QUESTION PAPER

Mark Scheme

Question			Answer/Indicative content	Marks	Guidance
1			C ✓	1	
			Total	1	
2			C ✓	1	Examiner's Comments Less than half of all candidates were correctly able to identify the target of bacteriostatic antibiotics, the most common error being option A – the cell wall.
			Total	1	
3			D	1	Examiner's Comments This required a straightforward calculation of area and if candidates recalled their knowledge of inhibition zones in Kirby-Bauer tests they would only have had to perform one calculation to achieve the correct response, option D.
			Total	1	
4			B	1	Examiner's Comments Antibiotic resistance in bacteria is a commonly misunderstood concept and only higher ability candidates appeared able to pick out the correct option for this question.
			Total	1	
5			B	1	Examiner's Comments Candidates realised that a vaccine would be more useful against a protein with a low mutation rate. However, very few appreciated that the vaccine would only work if the protein were on the outside of the bacterial cell. The correct answer was therefore B.
			Total	1	