

38 How does penicillin affect bacteria?

- A** It inhibits DNA replication by binding to nucleotides.
- B** It inhibits translation by preventing tRNA binding to ribosomes.
- C** It is a competitive inhibitor of an enzyme in cell wall synthesis.
- D** It is a competitive inhibitor of an enzyme in protein synthesis.

37 Scientists investigated the sensitivity and resistance of a bacterium called *Clostridium difficile* to four antibiotics. Colonies of bacteria were grown on agar plates for 24 hours, after which a different antibiotic was added to each plate. The number of bacterial colonies that died, stopped growing and continued growing were then counted. A bacterial colony is a group of bacterial cells that have multiplied from one bacterium.

Which antibiotic would be the best to treat a person infected with *Clostridium difficile*?

	antibiotic	number of colonies that died	number of colonies that stopped growing	number of colonies that continued growing
A	ampicillin	2	5	13
B	clindamycin	4	8	6
C	metronidazole	13	6	1
D	cefoxitin	9	5	4

4 Bacteria can be classified according to the type of cell wall they have.

Gram-negative bacteria have a cell wall with an outer layer known as the outer membrane.

Gram-positive bacteria do not have an outer membrane, but have a much thicker peptidoglycan layer than Gram-negative bacteria.

Fig. 4.1 is a diagram of a section through the cell wall of a **Gram-negative** bacterium.

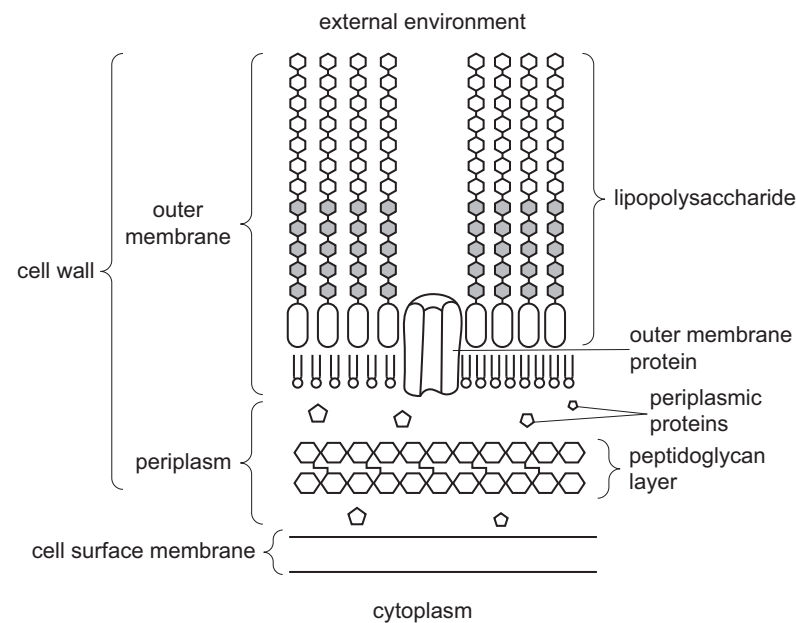


Fig. 4.1

(a) With reference to Fig. 4.1, outline the similarities **and** differences between the outer membrane of a Gram-negative bacterial cell and the cell surface membrane of a **eukaryotic** cell.

[3]

(b) Pathogenic and non-pathogenic Gram-negative bacteria can produce extracellular vesicles. Fig. 4.2 summarises how two types of extracellular vesicle, OMVs and O-IMVs, are formed.

O-IMVs are formed from the outer membrane and the cell surface membrane. O-IMVs can contain ATP and DNA.

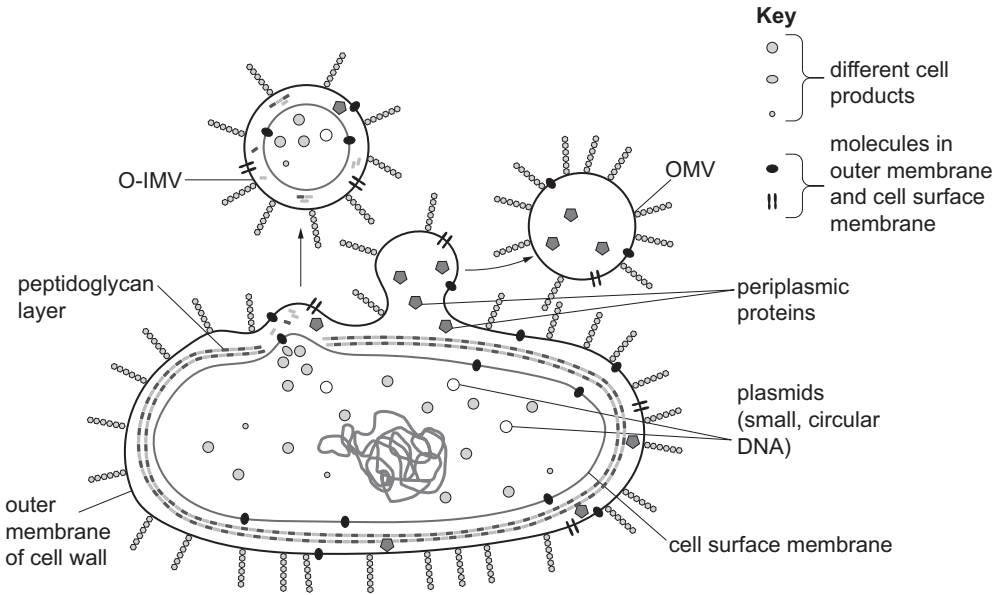


Fig. 4.2

- (i) With reference to Fig. 4.2, suggest why fewer O-IMVs are formed than OMVs.
- [1]
- (ii) Suggest why ATP is found within O-IMVs but **not** in OMVs.
- [1]
- (iii) Suggest **and** explain why the discovery that O-IMVs contain DNA has implications for antibiotic resistance.
- [2]

5 Inhibitors are substances that prevent biological processes in a variety of different ways.

Table 5.1 shows some antibiotics, their modes of action and the diseases which they are used to treat.

Table 5.1

antibiotic	mode of action	disease
erythromycin	binds to ribosomes to inhibit translation	cholera
penicillin	enzyme inhibitor	tetanus
rifampicin	inhibits the function of RNA polymerase in transcription	tuberculosis

- (a) Suggest why erythromycin can inhibit translation in the bacterium that causes cholera **and not** inhibit translation in humans who are infected with this pathogen.
- [2]
- (b) State why penicillin does **not** act on human cells.
- [1]
- (c) Explain **one** way in which rifampicin may inhibit the action of RNA polymerase in transcription.
- [1]