Q1.

(a) Complete the table below to show whether the feature of DNA is associated with the DNA molecule found in each of these locations.

Tick (✓) the appropriate boxes.

Feature of DNA	**Location of DNA molecule**		
	Prokaryotic cell	Nucleus	Chloroplast
Is circular			
Contains four different types of nucleotide			
Is associated with histones			

(3)

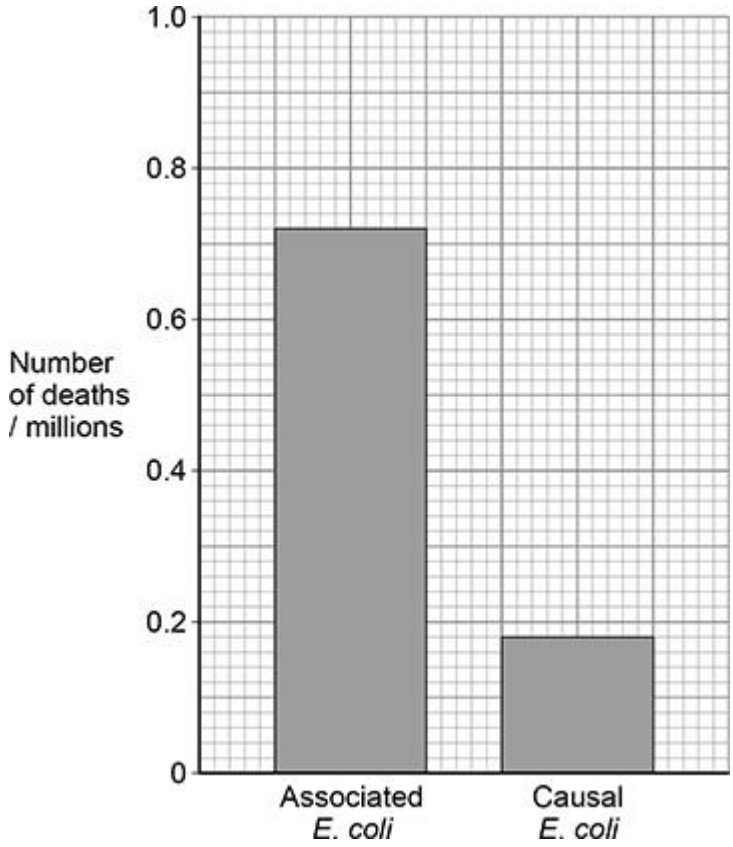
Some strains of the bacterium, *Escherichia coli*, are known to be resistant to antibiotics.

Scientists analysed data recording the deaths of people in hospitals across the world during 2019.

They used the data to find how many of the bodies of people who died in hospitals contained antibiotic-resistant *E. coli* bacteria and whether the *E. coli* were:

- **not** the cause of death (**associated** *E. coli*)
- the cause of death (**causal** *E. coli*).

The graph below shows their results.



(b) Using the graph above, a student calculated that out of all the people who died when antibiotic-resistant *E. coli* were present, 25% of those deaths involved **causal** *E. coli*.

The student's calculation is **incorrect**.

Use the graph above to calculate the correct percentage of deaths involving **causal** *E. coli* in people who died when infected with antibiotic-resistant *E. coli*.

Identify the mathematical step the student performed incorrectly in their calculation.

Correct answer _____ %

Incorrect mathematical step _____

_____

(3)

(c) Which method is most likely to be successful in **decreasing** the frequency of antibiotic-resistant bacteria in populations of people?

Tick (✓) **one** box.

Give people lower doses of antibiotics to treat disease.	☐
Test more people to determine if they are infected with antibiotic-resistant bacteria.	☐
Vaccinate more people to reach herd immunity against bacteria that cause diseases common in human populations.	☐

(1)

(Total 7 marks)

Q2.

(a) Describe the primary structure of all proteins.

_____

_____

_____

_____

_____

_____

(2)

(b) This question is about the genetic code.

Define **universal**, **non-overlapping** and **degenerate**.

Universal _____

_____

_____

Non-overlapping _____

_____

_____

Degenerate _____

_____

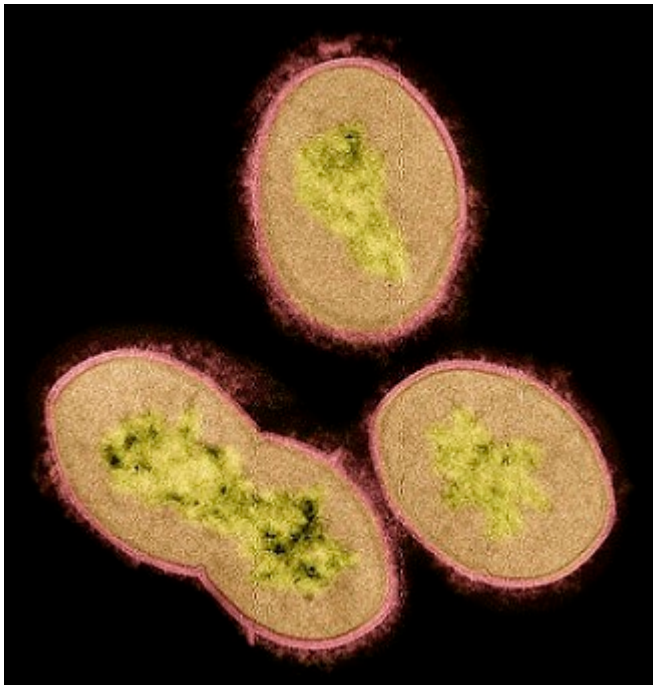
_____

(3)

(Total 5 marks)

Q3.

The figure below shows a transmission electron microscope (TEM) image of three *Streptococcus* bacteria.



(a) Describe how the appearance of the area containing DNA in a TEM image of a eukaryotic cell would differ from that shown in the figure.

_____

_____

_____

_____

_____

_____

(2)

(b) Describe **one** difference between the structure of DNA in a prokaryotic cell and in a eukaryotic cell.

_____

_____

_____

(1)

(c) *Streptococcus* bacteria can infect the lungs when air is breathed in and cause lung disease.

Describe the mechanism of breathing that causes air to enter the lungs.

(3)

(d) Some strains of *Streptococcus* bacteria are more likely to cause lung disease than other strains.

Strains that do not cause lung disease are quickly destroyed by phagocytes. Phagocytes are stimulated when they bind to murein on *Streptococcus* bacteria.

Each strain of *Streptococcus* bacteria has a capsule of different thickness from the others.

Suggest how *Streptococcus* bacteria with a thicker capsule are more likely to survive **and** so cause lung disease.

(2)

(Total 8 marks)