

2 Compounds containing nitrite ions ( $\text{NO}_2^-$ ) are present in many foods eaten by humans.

Scientists tested the effect of different concentrations of nitrite ions on the population growth of 5 species of bacterium. All 5 species are pathogenic and can infect the human digestive system.

For each species of bacterium, the scientists placed suspensions of the bacteria in a microwell plate. A microwell plate is a plastic plate containing 96 wells, which are similar to small test-tubes.

In each well, the scientists added:

- a suspension of the bacterial species
- a solution containing nitrite ions
- nutrient broth.

The scientists incubated the microwell plate at  $37^\circ\text{C}$  for 24 hours. After 24 hours, the scientists estimated the number of bacteria in each well by measuring optical density, using a microwell plate reader.

For each species of bacterium, the scientists repeated the experiment with several different concentrations of solution containing nitrite ions.

The scientists determined the lowest nitrite concentration at which no bacterial population growth had occurred after 24 hours.

(a) The scientists standardised temperature, pH (pH4.8) and time in the investigation.

State **two other** variables that the scientists should standardise in this investigation.

- 1 .....
- 2 .....

[2]

(b) The results of the investigation are shown in Fig. 2.1.

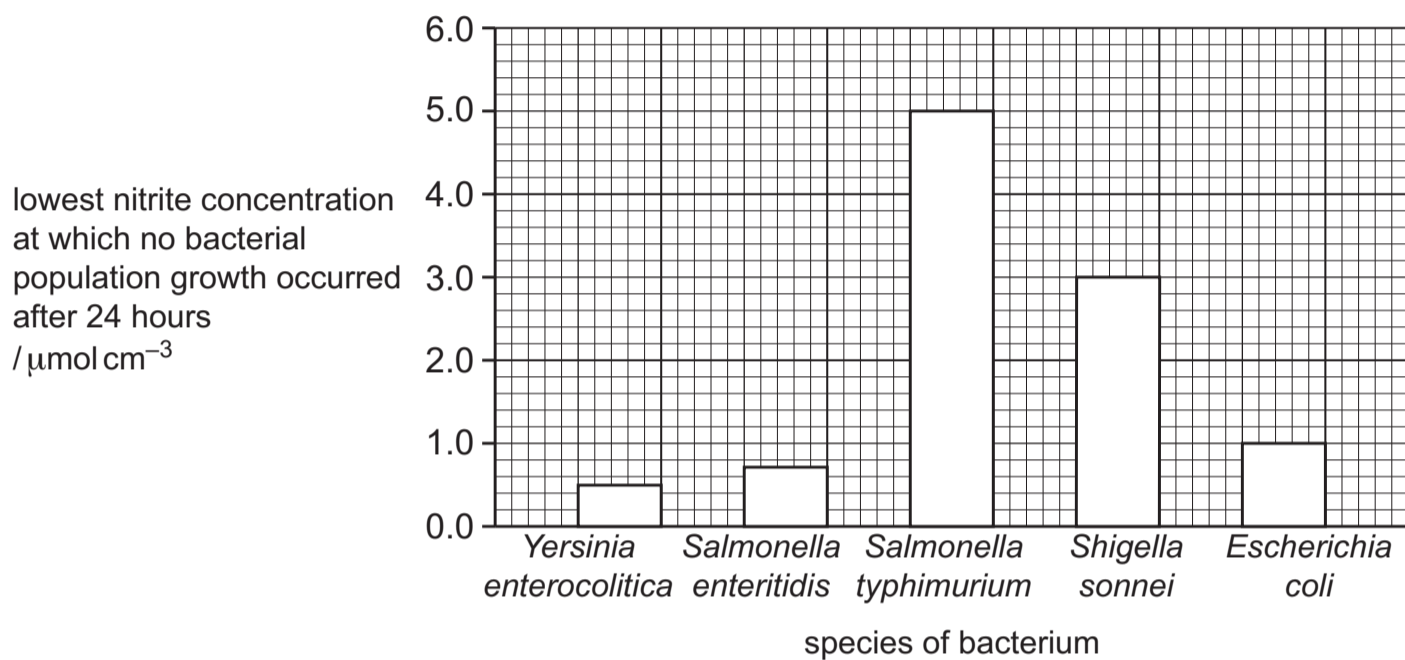


Fig. 2.1

(i) State the type of **data** represented by the species of bacterium and the lowest nitrite concentration in Fig. 2.1.

- species of bacterium .....
- lowest nitrite concentration .....

[2]

(ii) The 2 species of *Salmonella* shown in Fig. 2.1 are closely related.

Calculate the percentage difference between the results shown in Fig. 2.1 for the 2 species of *Salmonella*.

Show your working.

.....%

[3]

(iii) Use Fig. 2.1 to state:

- the species of bacterium that is most affected by nitrite ions
- the species of bacterium that is least affected by nitrite ions.

- most affected .....
- least affected .....

[1]

(c) A student looked at the results and stated:

Consuming a lot of nitrites would improve the health of people because it would help to prevent diseases in the digestive system caused by pathogenic bacteria.

Suggest **four** reasons why this conclusion might **not** be valid.

- 1 .....
- .....
- 2 .....
- .....
- 3 .....
- .....
- 4 .....
- .....

[4]

[Total: 12]