MODULE: *Cells*

Intervention Session

This session has been designed to help you to practice answering PISA questions, both paper and computer based assessments about Cells. It also helps you to practice reading and interpreting text; analysing and interpreting data; evaluating scientific inquiries; and explaining the key concepts and applying your understanding.

1. (15 minutes)

   Carry out the Cancer Research computer based assessment question on the computer. Read the information, instructions and questions carefully before selecting or typing in your answers.

   Remember that you can navigate backwards and forwards to check and change your answers.

   When you have finished, print your answers by clicking on the print icon.

2. (5 minutes)
   Read the information below and then answer the questions.

The structure of living things

Theodor Schwann

Matthias Schleiden

In 1838 two scientists were eating dinner and discussing the latest observations of living things made with a light microscope.

Suddenly they realised something. The structures they had observed inside living things were the same. A nerve cell from an animal contained many of the same parts as a leaf cell from a plant!

a. What two things had they discovered?

b. What structures do animal and plant cells have in common?

c. How do plant and animal cells differ?

d. Explain why they differ.

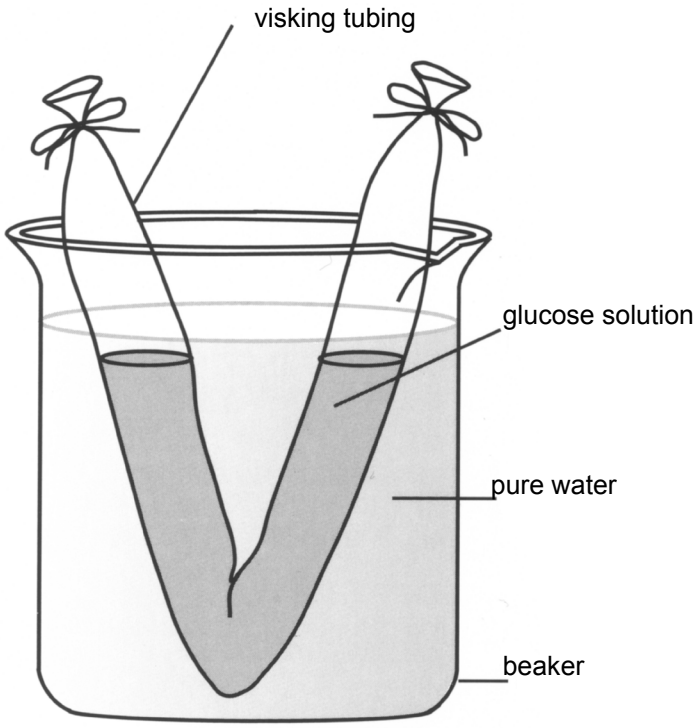
3. (20 minutes)

Read the information below and then answer the questions.

Pocket water purifier

Nanotechnologists are developing a membrane that behaves like a cell membrane. They hope the membrane will be used to purify dirty water in areas where there is a water shortage, and people do not have easy access to clean water.

The idea came from observations made while using the equipment below.



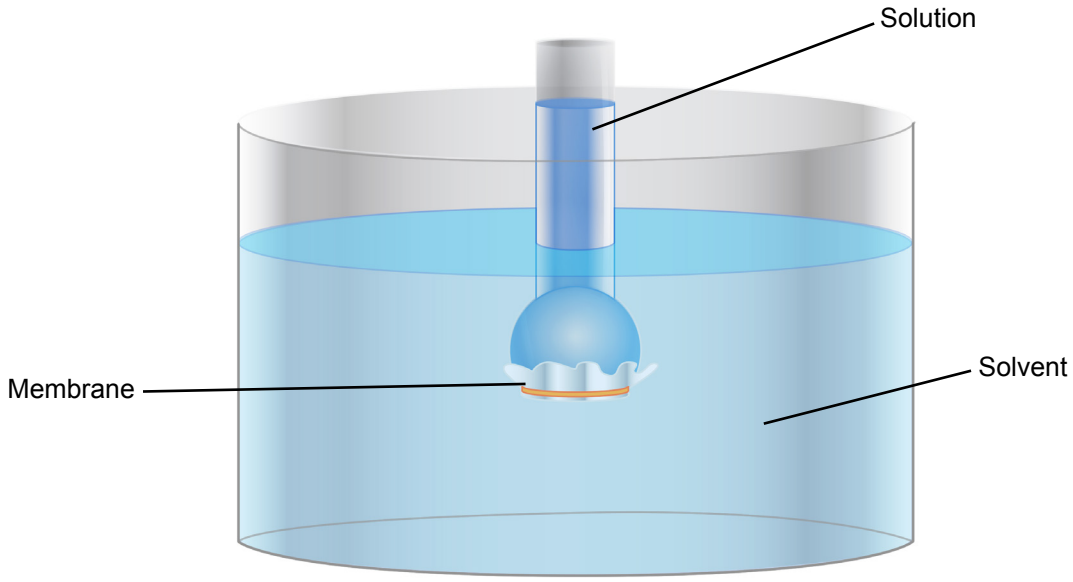
They firstly filled the Visking tubing with glucose and found that after 15 minutes there was glucose in the pure water. Next they tried sucrose instead of glucose. This time there was no sucrose in the water. However what they did notice was that the volume of liquid inside the Visking tubing had increased. This was their eureka moment!

a. What conclusion could they make from their first experiment?

b. Explain what had happened?

c. Explain what had happened in the second experiment?

d. They thought they would carry out an enquiry to find out what would happen if they changed the concentration of sugar. They changed their apparatus. This is a drawing from the research log of one of the researchers.



i. What would be the independent variable?

ii. How would they change it to see a pattern in their results?

iii. What would they measure?

iv. How would they ensure their measurements are precise?

v. What variables would they control?

vi. What would you predict will happen?

vii. Explain your prediction

4. (20 minutes)

Read the information below and then answer the questions.

MRSA

MRSA bacteria are harmless on your skin. But if they get in through a cut they may cause a fatal infection. Doctors fight most infections with antibiotics. Different antibiotics target different bacteria. But antibiotics cannot kill every type of bacteria that make us ill. These bacteria are resistant. Over the years, more and more types of bacteria – like MRSA – have become resistant to antibiotics. Sometimes, the genes in bacteria change, or mutate. This happens naturally. Most mutations are not useful to bacteria, but occasionally they make bacteria resist antibiotics.

Sam has a throat infection. He takes antibiotic tablets. The antibiotic kills nearly all the bacteria. But a few bacteria – the resistant ones – survive. These bacteria reproduce rapidly. This is natural selection.

Bacteria are more likely to become resistant if:

- lots of people take antibiotics for minor illnesses
- if people don't finish all the tablets
- if doctors prescribe the wrong antibiotics.

Resistant strains of bacteria spread quickly from person to person. This is because no one is immune to the bacteria, and there is no treatment that works. Therefore scientists are trying to find and develop new antibiotics and antiseptics.

One possibility is Cockroach brain juice. These are two investigations that have been carried out.

Hypothesis: Cockroach brain juice could cut MRSA infections in humans because it contains substances that kill bacteria.

Investigation 1

- grow two types of bacteria on agar plates
- add cockroach brain juice and leave for two hours at 37 ºC.

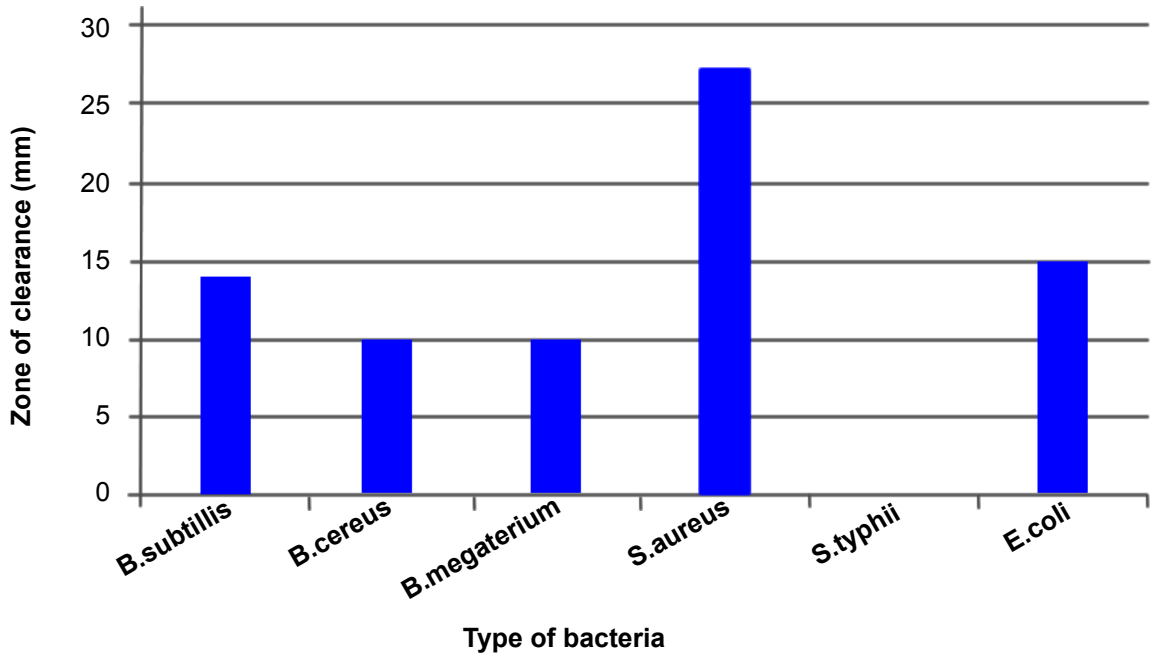
Type of bacteria	Percentage of bacteria killed
MRSA	More than 90
Escherichia coli	More than 90

If an antibiotic kills 90% of the bacteria, your body's immune system can kill the rest.

Investigation 2

- grow different types of bacteria on agar plates
- add cockroach juice and leave overnight at 37 ºC.

Results



The bigger the zone of clearance, the more bacteria are killed

a. What type of microorganism is MRSA?

- Virus
- Protozoan
- Bacterium
- Yeast

b. What do doctors normally use to treat MRSA?

c. What natural process causes resistance?

d. How have they become resistant?

e. Why do resistant strains of bacteria spread so quickly?

f. Do the results of investigation 1 support the hypothesis? Explain your answer.

g. Which bacteria does cockroach brain juice kill most?

h. Which bacteria are resistant to cockroach brain juice?

i. Do the results of investigation support the results of hypothesis? Explain your answer.

j. What do the researchers need to do to ensure the reliability of their results?

k. What would you need to know to be able to carry out the investigations?