Edexcel Biology IGCSE

2.17: Diffusion and Osmosis

Practical notes

Diffusion and Osmosis

Aim

Investigate diffusion and osmosis using living and non-living systems.

Equipment for living system

- Plant tissue eg. potato
- A cork borer
- A ruler
- A measuring cylinder
- Labels
- Boiling tubes
- A test tube rack
- Paper towels
- A sharp knife
- A while tile
- A range of salt or sugar solutions
- Distilled water
- A top-pan balance

Method for osmosis in a living system

1. Use a cork borer to cut 5 potato cylinders.
2. Trim the cylinders using a sharp knife and a ruler to the same length (about 3 cm).
3. Accurately measure and record the mass of each cylinder.
4. Measure 10 cm^3 of the 1.0M sugar solution and transfer to the first boiling tube and label.
5. Repeat step 4 for other concentrations of the solution and distilled water.
6. Add one potato cylinder (of known mass) to each boiling tube.
7. Prepare a table as seen below.
8. Add one potato cylinder to each boiling tube, making sure the mass of each cylinder is known.
9. Leave the cylinders in the boiling tubes for at least 15 minutes in a test tube rack.
10. Remove the cylinders from the boiling tubes and dry them carefully by blotting with paper towels.
11. Measure the mass of each cylinder and record your measurements in the table. Calculate the percentage changes for each cylinder.
12. Plot a graph of change in mass (in g) against the concentration of sugar solution. Find the x-intercept to determine the concentration of sugar solution that is isotonic to the potato cells.

Sources of error

Discs from different parts of the potato may have different water potentials.
The differences in the surface area of the discs may lead to different rates of osmosis.

	1.0 M sugar solution	0.75 sugar solution	0.5 M sugar solution	0.25 M sugar solution	Distilled water
Initial mass (g)					
Final mass in (g)					
Change in mass in (g)					

Safety precautions

Take care when handling cork borer and sharp knife.

Equipment for non-living system

- Beaker
- Visking tubing
- Capillary tube
- Sucrose solution
- Water
- Marker
- String

Method for osmosis in a non-living system

1. Tie one end of a visking tube with a piece of string.
2. Pour some solution into the visking tube.
3. Insert a capillary tube into one end of the visking tubing. Close the other end of the visking tubing by tying with another piece of string.
4. Use a marker to mark the initial water level in the visking tubing.
5. Use a stand and clamp or other means to fix the position of the capillary tube, and immerse the visking tubing in a beaker of distilled water.
6. Leave for 15 minutes.
7. Note the difference in water level in the capillary.

Equipment for diffusion in a non-living system

- Water
- Beaker
- Potassium permanganate crystals

Method

1. Place a few potassium permanganate crystals in a beaker of water.
2. Note the colour of the water after a period of time eg. 15 minutes.
3. Note the colour of the water after a longer period of time eg. 1 hour.

Evaluation

Potassium permanganate molecules diffuse from a region of high concentration (crystal) to a region of low concentration (surrounding water).
After a short period of time, the molecules are still diffusing throughout the surrounding water and is not equally distributed so the colour is not uniform.
The molecules will diffuse throughout the water until it reaches equilibrium, hence, over time, the colour of the water will be a uniform pale purple.

Potential hazards

Potassium permanganate is:

- a powerful oxidising agent
- harmful if swallowed
- very toxic to aquatic life with long-lasting effects.
- Stains the hands and clothing