

2.5 Evaporation and distillation

Learning objectives

After this topic you will be able to:

- explain how to use evaporation to separate mixtures
- explain how distillation works.



▲ These salt pans on the island of Gozo, Malta are formed when seawater evaporates, leaving behind salt.

Link

You can learn more about evaporation and condensation in C1 1.5 More changes of state



▲ Bolivia's salt desert.

For many centuries, people have obtained salt from seawater. How do they do this?

Evaporation separates salt from seawater. The Sun transfers energy to the water molecules and they leave the surface of the solution. When all the water has evaporated, solid salt remains.

A Describe how salt can be separated from seawater.

When else is evaporation useful?

Have you ever made copper sulfate crystals from copper oxide and sulfuric acid? First, you mix the reactants. They react to make copper sulfate solution. You filter the solution to remove extra copper oxide powder.

Then you heat the solution with a Bunsen burner. Some of the water quickly evaporates. You leave the remaining solution in a warm place. The rest of the water evaporates slowly. Solid copper sulfate crystals slowly form.



▲ Copper sulfate crystals. The more slowly the water evaporates, the bigger the crystals formed.



▲ Evaporation makes some glues dry. The solvent evaporates. A sticky substance remains, joining the surfaces.

Lithium is important for batteries. Huge amounts of lithium compounds are dissolved in water under a desert in Bolivia. The government plans to bring the solution to the surface. The water will evaporate. Solid lithium compounds will remain.

B State three uses of evaporation.

Ancient filters

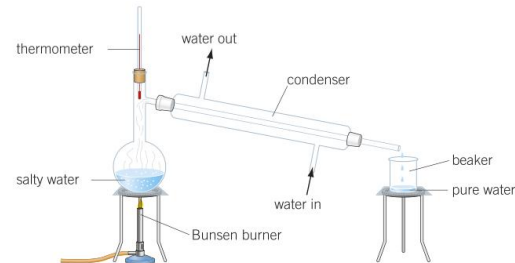
Jabir ibn Hayyan lived in Persia almost 2000 years ago. He developed some of the earliest distillation apparatus, called the alembic. Here is a diagram of his alembic. Discuss with a partner how the alembic might work. Then write a paragraph describing your ideas.



What is distillation?

Imagine you are all alone on a desert island. There is nothing to drink. How could you get drinking water from the sea?

You could use **distillation**. Distillation is a process that uses evaporation and condensation to obtain a solvent from a solution. In the laboratory you can use the apparatus below.



It works like this:

- Water in the salt solution boils.
- Steam leaves the solution.
- Steam travels through the condenser, and cools down.
- The steam condenses to form liquid water.
- Liquid water drips into the beaker.

Saudi Arabia has little rain, and no permanent rivers. The country uses distillation to obtain drinking water from seawater.

You can also use distillation to separate water from inky water.

● C2 Chapter 2: Separation techniques

Key Words

distillation

Summary Questions

- 1 The sentences below describe how distillation works. Write the sentences in a sensible order. The first, middle, and last ones have been done for you.

B The solution is heated.

E The solvent condenses.

C The solvent runs down the condenser.

A The solvent particles cool down.

D Solvent particles leave the solution.

F Solvent particles enter the condenser.

G The solvent drips into a beaker. (4 marks)
- 2 State whether you would use evaporation or distillation to obtain the substances below from their mixtures. Give a reason for each decision.

 - copper chloride crystals from a solution of copper chloride
 - propanone, the solvent in nail varnish remover
 - ethanol, the solvent in some types of glue
 - solid potassium chloride from potassium chloride solution

(4 marks)
- 3 Compare how evaporation and distillation separate mixtures. (6 marks)