2.2 Solutions

Learning objectives

After this topic you will be able to:

- describe solutions using key words
- use the particle model to explain dissolving.

Do you like coffee? When you add water to coffee powder, you make a solution. A solution is a mixture of a liquid with a solid or gas. All parts of the mixture are the same. You cannot see the separate substances.

Catherine adds sugar to water, and stirs. The sugar **dissolves** in the water. Water is the **solvent**. Sugar is the **solute**.

A State what a solution is.

▲ The mass of solution on the left is the same as the total mass of sugar and water on the right.

Does a solute disappear when it dissolves?

You cannot see sugar in a solution. But if you taste the solution, you know the sugar is there. You must never taste things in the laboratory – they might be poisonous.

Some solutions are coloured. Coffee solution is brown, and copper sulfate solution is blue. The colours show that the solute is there.

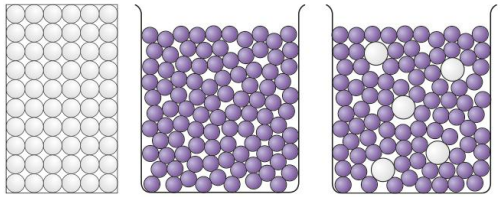
You can also use mass to find out whether something is a solution:

- The mass of one litre of pure water is 1000 g.
- The mass of a solution made by dissolving 20 g of sugar in 1000 g of water is (1000 g + 20 g) = 1020 g.

B Identify the solute in coffee solution.

How can we explain dissolving?

When sugar dissolves, water particles surround each sugar particle. The sugar particles can mix with the liquid. They are arranged randomly, and move around.



▲ Particles in solid sugar. ▲ Particles in liquid water. ▲ Particles in sugar solution.

Solution masses

Sarah dissolves 3 g of copper sulfate in 100 g of water. Calculate the mass of the solution.

Foul Fact

Some solvents can kill. Sniffing butane from deodorant causes unconsciousness, an irregular heartbeat, and frostbite.

You can use rice and beans to model particles in a solution. In the photo, rice grains represent water particles. Beans represent sugar particles.

C Describe the arrangement of particles in a solution.

Is water the only solvent?

Nail varnish does not dissolve in water. That's why it does not come off in the shower. But nail varnish does dissolve in a chemical called propanone. That's why nail-varnish remover is mainly propanone.

Some glues are solutions. They contain a sticky substance dissolved in a solvent. As the solvent evaporates, the glue dries.

Can gases dissolve?

Many gases dissolve in solvents. Carbon dioxide gas makes drinks fizzy. In the bottle, there is a solution. Carbon dioxide, sugar, and flavourings are dissolved in water. When you open the bottle, gas leaves the solution.

▲ Fizzy drinks contain dissolved carbon dioxide gas.

Modelling dissolving

Plan how to use rice and beans, and other materials, to explain dissolving to primary-school children. Draw diagrams to show what you will do, and write notes to remind you what to say.

Key Words

solution, dissolve, solvent, solute

▲ Rice and beans can model particles in a solution.

Link

You can learn more about solutes and solvents in C2 2.5 Evaporation and distillation

Summary Questions

1 Copy the sentences below, choosing the correct bold words.

When salt dissolves in water, a **solvent/solute/solution** forms. Salt is the **solvent/solute/solution** and water is the **solvent/solute/solution**. In the solution, **water/salt** particles surround the **water/salt** particles.

(5 marks)

2 Laura has three beakers. Each contains 200 cm^3 of a colourless liquid. Describe how Laura could find out which beakers contain pure water, and which contain solutions. Explain your answer.

(3 marks)

3 Draw a visual summary of the information on this page. Include examples and pictures.

(6 marks)