4 Speeding up dissolving

A solid dissolves faster when it is made into a powder, if it is stirred into the liquid or when the liquid is warmer.

It is often quite important to get substances to dissolve quickly. For example, when you make a cup of instant coffee, you want the coffee to dissolve very quickly so that the water doesn't get cold before you drink it.

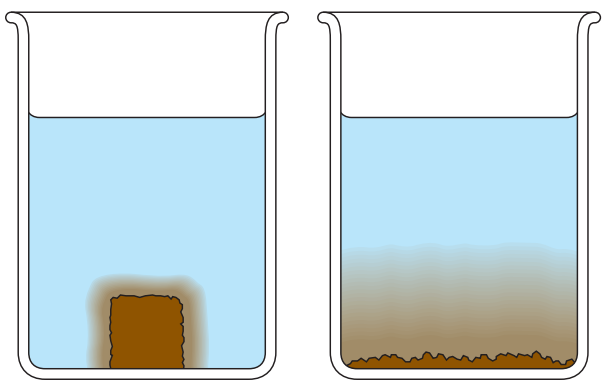
Dissolving can be speeded up in several ways. The normal ways are:

1. To crush the solid into a powder.
2. To stir the solid with the water.
3. To warm the water and the solid.

Lump or powder?

A lump of substance will dissolve much more slowly than when the same substance is made into a powder (Picture 1).

This is easy to show using two stock cubes and some warm water. If one stock cube is placed in the bottom of one container, a crumbled stock cube is placed in the bottom of a second container and an equal amount of warm water is added to each, the crumbled cube will dissolve faster.



(Picture 1) Breaking a lump down into smaller parts speeds up dissolving.

Why this happens

When something dissolves, the particles of the solid are pulled away by forces in the water. The crumbled stock cube dissolves much faster because the small pieces have a much bigger area in contact with the water than the larger cube. There are hundreds or thousands of surfaces in a crumbled cube. The large cube dissolves more slowly because the water can only get to the six sides of the cube – most of the cube remains out of reach of the water.

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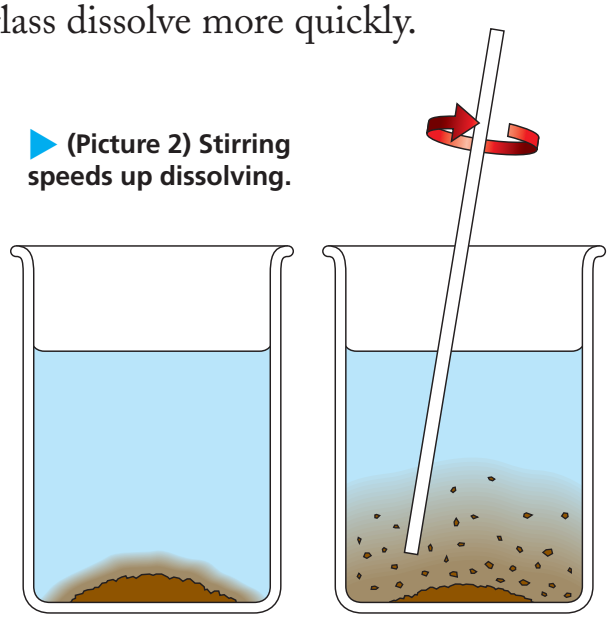
Stirring

Stirring can be as important as crumbling a lump into small pieces (Picture 2). To check this, add several spoonfuls of Demerara sugar to cold water in a glass. Add the same amount of sugar to an equal amount of cold water in a second glass.

The sugar will begin to dissolve slowly. By stirring the sugar in one of the glasses you can make the sugar in that glass dissolve more quickly.



(Picture 2) Stirring speeds up dissolving.

Why this happens

In the undisturbed glass the water next to the sugar soon takes up all the sugar it can and stops sugar-free water getting to the sugar. By stirring the water, the sugar-rich water is carried away and sugar-free water is continually swept past the sugar grains.

Temperature

You may have noticed how useful hot water is in getting some substances to dissolve. In general, the hotter the solution, the faster a substance will dissolve in it *and* the more can be dissolved (Picture 3).

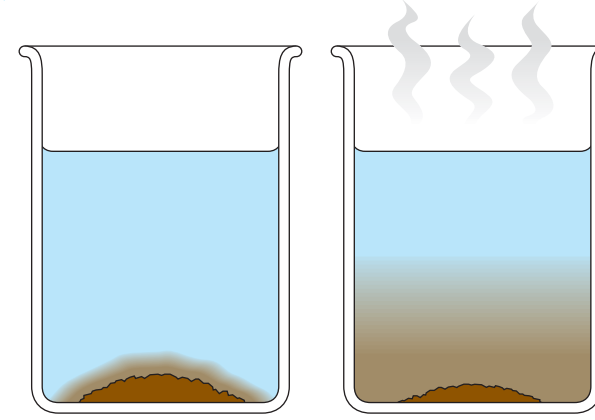
If you have two equal-sized containers it is easy to demonstrate this difference. Pour hot water into one container and an equal amount of cold water into the second. Try to insulate the hot water container, or do the experiment quickly before the water cools down. Now add a large spoonful of Demerara sugar to each container. You will find that the hot water dissolves the sugar far quicker than the cold water.

Summary

- **A powder will dissolve faster than a lump.**
- **Substances dissolve faster when they are stirred.**
- **Substances dissolve better when they are warmed.**

SAFETY Never go near boiling water. Always get an adult to help.

(Picture 3) Heat speeds up dissolving.



Why this happens

Hot water has more energy in it than cold water and so the hot water pulls the sugar apart faster.