Sherbet

Whip up this fabulously fizzy sherbet in seconds using pantry ingredients.

Materials

- Icing sugar
- Jelly crystals
- Bicarbonate of soda (bicarb)
- Citric acid
- Small bowl or container with lid
- Measuring spoons

Safety First!

- **Always wash your hands before and after preparing food (yes, this is a science experiment, but you do get to eat it too!).**
- **If you have any food allergies, intolerances or aversions, make sure to check that all products you use are safe for you to eat.**
- **Citric acid and bicarb may cause mild irritation if you get them in your eyes. Take care not to rub your eyes while making your sherbet.**

Instructions

1. Mix together the sherbet ingredients using the following measurements:
    - 1 tablespoon icing sugar
    - 1 teaspoon jelly crystals
    - ½ teaspoon citric acid
    - ¼ teaspoon bicarbonate of soda

    A little bit of sherbet goes a long way, but if you'd like to make a bigger batch, just double the quantities given.

2. Stir thoroughly, breaking up any clumps. If your container has a tight lid, put it on and shake the container to mix it.

3. Taste your sherbet and adjust the ingredients to taste. You should only add tiny amounts when adjusting, and mix thoroughly before tasting again.
    - Citric acid is very sour – it's what gives lemons and other citrus fruits their sour taste. If your sherbet is too sour, add a tiny bit more bicarb.
    - Bicarb on its own tastes soapy and bitter, so if this taste is overpowering, add more citric acid.
    - Icing sugar is just very finely ground sugar. If your sherbet isn't sweet enough, add a bit more.
    - Jelly crystals are a combination of sugar, gelatine, flavouring, and colouring. Add a bit more to give your sherbet a flavour boost.

What's happening?

Sherbet gets its delightful fizz from the combination of citric acid and bicarbonate of soda, otherwise known as bicarb. Citric acid, as its name suggests, is an **acid**, while bicarb belongs to another group of chemicals known as **bases**.

When we mix an acid and a base together, we get a **chemical reaction**. In a chemical reaction, the **molecules** of the starting chemicals (known as **reactants**) break apart and reform into new chemicals (known as **products**). In this case, the new chemicals formed are water, sodium citrate (a type of salt), and carbon dioxide gas, which escapes as tiny bubbles. We can't see all this going on, but the bubbles of gas give us a clue that a chemical reaction has taken place.

But our sherbet didn't fizz as soon as we added the two dry chemicals together. In powder (solid) form, the chemicals can't mix together as easily as when they are dissolved. When you add water, or put the sherbet in your mouth with your saliva, the citric acid and bicarb molecules can find each other more easily and react.

A chemical that helps a reaction happen, but isn't itself changed by the reaction, is called a **catalyst** – in this case, water is a catalyst that helps the reaction between citric acid and bicarb to happen.

The other two ingredients in our sherbet – icing sugar and jelly crystals – are just there to make it taste yummy. They aren't needed for the chemical reaction, but sherbet made from just citric acid and bicarb wouldn't taste very nice.

Check your understanding

1. **Which two ingredients in the sherbet are involved in the chemical reaction?**
2. **Which ingredients are not involved?**
3. **Can you think of any other chemical reactions that might happen in the kitchen?**
4. **Measure how many teaspoons of icing sugar it takes to fill up a tablespoon. A teaspoon is 5 millilitres (ml) – how many ml are in a tablespoon?**
5. **How many teaspoons of sherbet does this recipe make?**
6. **Calculate how much of each ingredient you would need if you used a metric cup (250ml) of icing sugar.**
7. **Explain your understanding of the following scientific terms: chemical, chemical reaction, molecule, reactant, product, catalyst.**

Extra: How to read a chemical formula

A substance made of more than one type of element is called a **compound**. Compounds are made up of **molecules**, which are made up of two or more atoms joined together. Some compounds, such as water, are quite simple (a water molecule contains only three atoms), but others can be extremely complex – one molecule might contain hundreds or even thousands of atoms!

A **chemical formula** is a short way of describing the chemical makeup of a compound. It tells us which elements make up the compound, and how many atoms there are of each one.

Each element also has a **chemical symbol**, which is made up of one or two letters. H is the chemical symbol for Hydrogen, and O is the chemical symbol for Oxygen. The small numbers after each of the symbols tell us how many atoms of each element are in one molecule of the chemical. So in one molecule of hydrogen peroxide (H_2O_2), there are two hydrogen (H) atoms and two oxygen (O) atoms. If a letter has no number after it, it means there is only one atom of that element in the molecule. For example, one molecule of water (H_2O) has two hydrogen atoms and one oxygen atom.

How to write a chemical equation

The shorthand ways of writing chemical formulas also help us when writing what happens in a chemical reaction. The reaction is read left to right, with the reactants (starting chemicals) on the left, and the products (chemicals you end up with) on the right. Written this way, it's known as a **chemical equation**.

For the citric acid and sodium bicarbonate reaction that happens when you eat sherbet, the chemical reaction goes like this:

Citric acid	+	Sodium bicarbonate	→	Carbon dioxide	+	Water	+	Sodium citrate
$C_6H_8O_7$	+	$3NaHCO_3$	→	$3CO_2$	+	$3H_2O$	+	$C_6H_5O_7Na_3$

There should always be the same amount of each element on each side of the equation.