EXPERIMENT MANUAL

SPARK
SCIENCE IN A FLASH

KITCHEN CHEMISTRY

THAMES & KOSMOS

WARNING — THIS SET CONTAINS CHEMICALS THAT MAY BE HARMFUL IF MISUSED. READ CAUTIONS ON INDIVIDUAL CONTAINERS AND IN MANUAL CAREFULLY. NOT TO BE USED BY CHILDREN EXCEPT UNDER ADULT SUPERVISION.

1ST EDITION 2014
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PRINTED IN TAIWAN / IMPRIMÉ EN TAÏWAN

SAFETY

Safety Rules

Read these instructions before use, follow them and keep them for reference.
Keep young children, animals and those not wearing eye protection away from the experimental area.
Always wear eye protection.
Store this experimental set out of reach of children under 7 years of age.
Clean all equipment after use.
Make sure that all containers are fully closed and properly stored after use.
Ensure that all empty containers are disposed of properly.
Wash hands after carrying out experiments.
Do not use any equipment which has not been supplied with the set or recommended in the instructions for use.
Do not eat or drink in the experimental area.
Do not allow chemicals to come into contact with the eyes or mouth.
Do not replace foodstuffs in original container. Dispose of immediately.

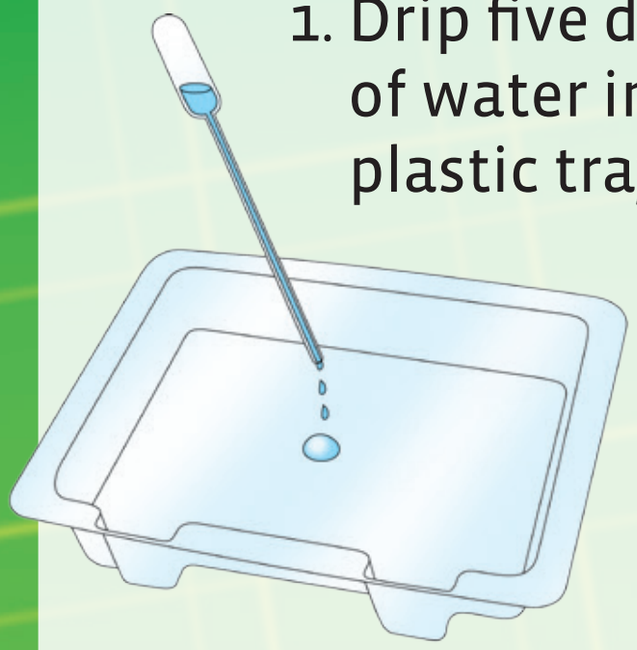
First Aid

In case of eye contact: Wash out eye with plenty of water, holding eye open if necessary. Seek immediate medical advice.
If swallowed: Wash out mouth with water, drink some fresh water. Do not induce vomiting. Seek immediate medical advice.
In case of inhalation: Remove person to fresh air.
In case of skin contact and burns: Wash affected area with plenty of water for at least 10 minutes.
In case of doubt, seek medical advice without delay. Take the chemical and its container with you.
In case of injury always seek medical advice.

WARNING!

Not suitable for children under 3 years. There is a risk of choking due to small parts that can be swallowed or inhaled.
Keep the packaging and instructions, as they contain important information.

EXPERIMENT 1: MOLECULES



1. Drip five drops of water into the plastic tray.

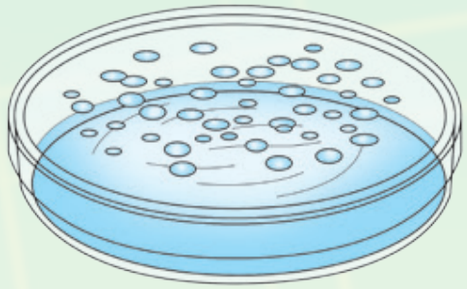
2. Move the tray around. Can you get the water drop to separate on its own?

3. Use the spatula to move the drop around and to separate it into two parts. Observe how the water behaves.

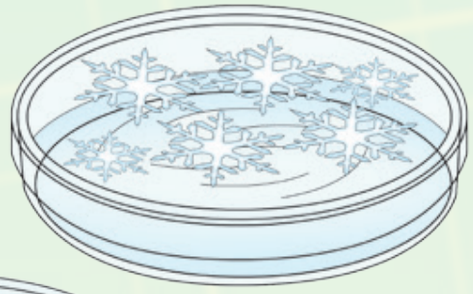
Chemistry is the study of **matter**. All matter consists of extremely small particles called **atoms and molecules**. One teaspoon of water contains about 200 billion trillion water molecules! Matter usually exists in three states: **solids, liquids, and gases**. The particles in solids move the slowest, and the particles in gases move the fastest.

EXPERIMENT 2: CHANGING STATES

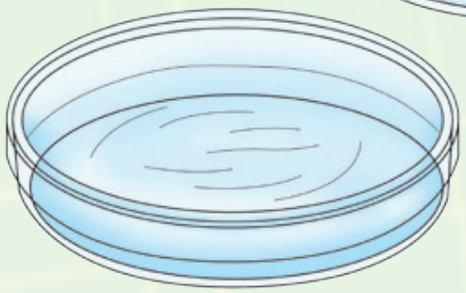
1. Fill the petri dish half full of hot tap water. Put the lid on and observe. The water evaporates and condenses on the lid.



2. Now put the petri dish in the freezer overnight. What happens?



3. Leave the petri dish out of the freezer, and it will melt again.

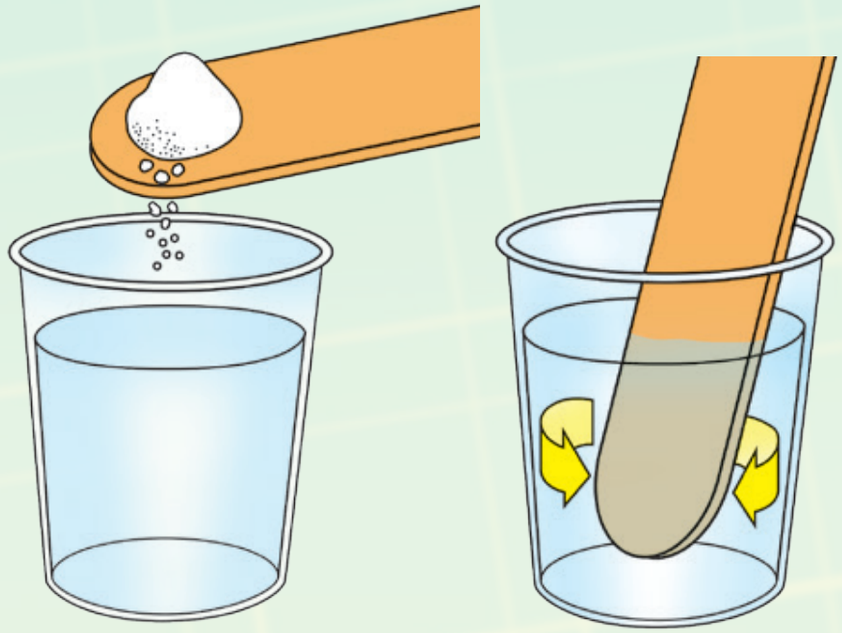


Matter changes states depending on how much energy is in it. Adding energy to atoms and molecules increases their motion and temperature. Removing energy does the opposite. **Evaporation** is when molecules in liquid have enough energy to jump off the surface and become a gas. **Condensation** is when they slow down again and become a liquid. **Freezing** is when a liquid slows down and becomes a solid. **Melting** is when the molecules speed up again and become liquid.

EXPERIMENT 3: SOLUTIONS

1. Use the spatula to put some salt into a cup of water. Stir the solution until the salt is fully dissolved.

2. Repeat with sugar instead of salt.



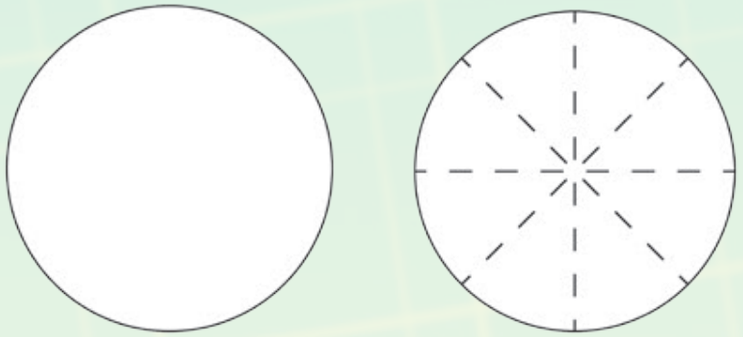
A **solution** is a mixture of substances in which the particles of one substance are evenly mixed with the particles of the other substance. Water is a particularly good solvent, because water molecules are like little magnets with positively and negatively charged sides. Molecules with positively and negatively charged sides are referred to as **polar**. The charged sides help pull molecules of solute apart to dissolve them. Some molecules, like sugar, dissolve into water without the molecule actually breaking apart, while others, like salt, break apart into their component atoms.

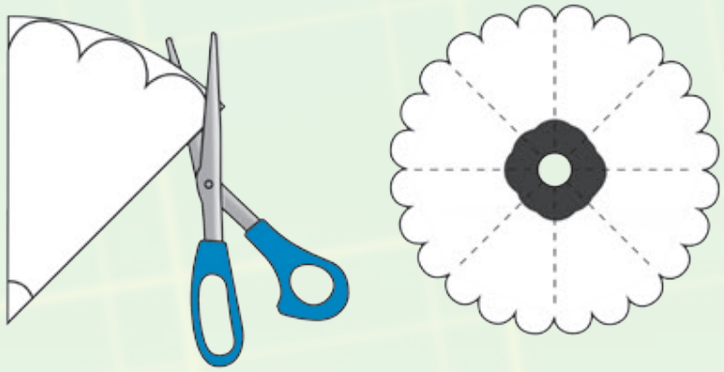
EXPERIMENT 4: CHROMATOGRAPHY

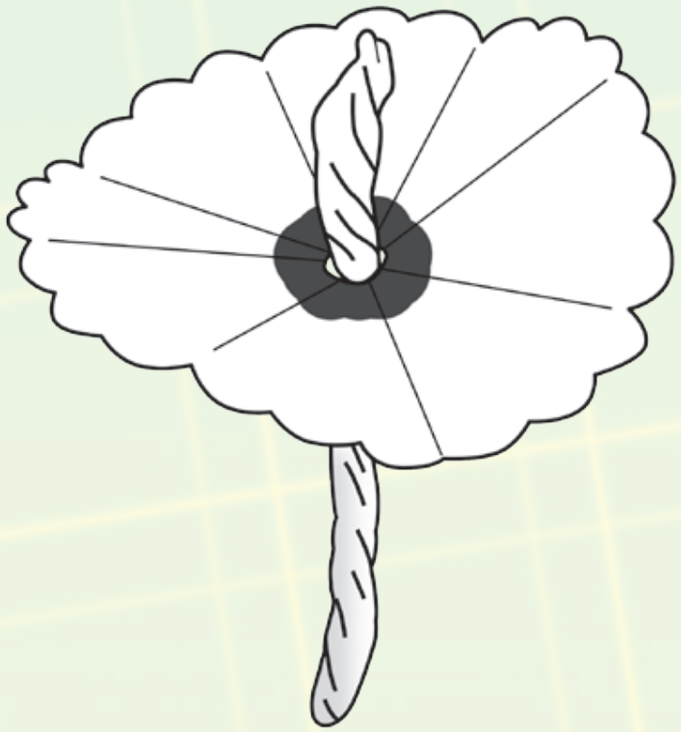
1. Fold the filter paper circle in half three times as shown. Cut the edge in a scalloped pattern as shown. Cut the tip off as well.

2. With a non-permanent, water-based marker or pen, put a lot of ink around the center hole.

3. Pull a piece of paper towel or tissue through the hole as shown.





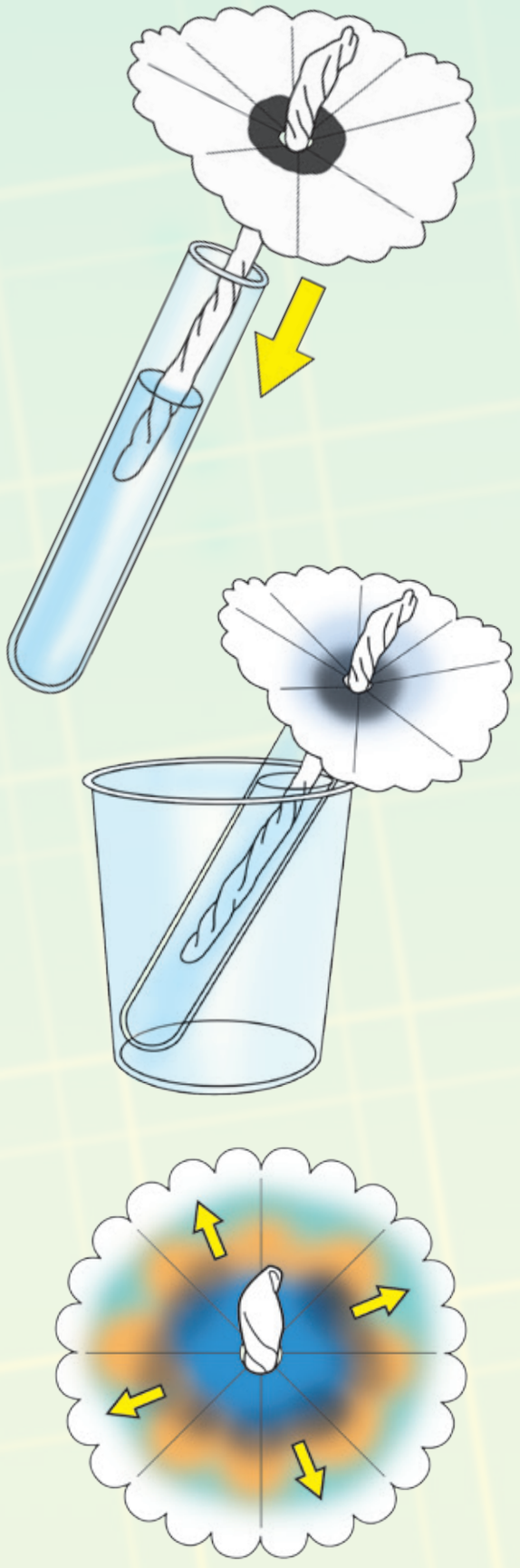


4. Put the paper towel into a test tube filled with water.

5. Stand the test tube upright in a glass or mug.

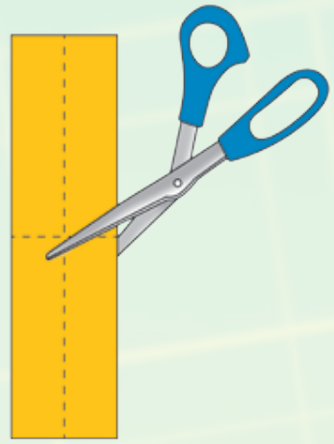
6. Watch the water travel up the paper towel and out toward the edges of the filter paper flower.

Chromatography is a method of separating chemical mixtures. In this case, the mixture is the ink. Water carries the ink through the filter paper due to capillary action. The ink separates because its different components move at different rates through the filter paper. Chemists use this technique to separate substances in order to identify their components.



EXPERIMENT 5: CHEMICAL REACTIONS

1. Cut the pH test strip into four pieces.
2. Test the pH of vinegar, water, and a solution of a pinch of baking soda in water.
3. Mix a little vinegar and a little baking soda in the test tube. Test the pH.



The color of the **pH** strip tells you the pH of a solution. It ranges from red (a pH of 1 is an **acid**) to yellow-green (a pH of 7 is **neutral**) to blue (a pH of 11 is a **base**). A physical change, such as a state change or dissolving, does not create a new substance, but a chemical change does. In a **chemical reaction**, bonds between atoms are broken and the atoms rearrange to form new bonds to make the products.