ORAU Activity

Salt Crystal Snowflake

Target Grade: Grades K-5

Time Required: 15 minutes, Let sit overnight

Standards/Topics Covered:

NGSS Standards

- **MS-ESS2-4:** Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- **5-PS1-4:** Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Central Focus:

In this activity, students will create a paper snowflake that glimmers with salt crystals. The activity could be used as a discussion starter for lessons about solutions, crystallization, evaporation, or saturation.

Background Information:

Crystals are formed in solids by a repeating arrangement of atoms, ions, or molecules. In this activity, crystals will be formed by salt (NaCl). When salt is added to the hot water, it dissolves into the water, creating a solution. Hot water is used because the molecules in hot water are moving faster than molecules in cool water. The increased motion of the water molecules makes them come in contact with more salt molecules, resulting in more dissolved salt. Because the water is hot, we can actually dissolve more salt into it than in room temperature conditions. Because it contains more salt than can be dissolved by water under normal circumstances, our solution is supersaturated. When the water from a supersaturated salt water solution begins to cool, the sodium and chloride ions can no longer remain dissolved in the water. The salt will recrystallize on whatever surface it is touching. If you leave your solution setting long enough, the water will begin to evaporate. The water changes into a gas, but the salt is left behind.

Materials

- Boiling hot water
- Mug
- Salt
- Card Stock or other heavy paper (black or dark blue will show the crystals the best)
- Shallow pan

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Instructions

- Cut the card stock into the shape of a snowflake.
- Boil water in a kettle or something you can easily pour from.
- Fill the mug about ¾ full.
- Add 2-3 teaspoons of salt to the mug and stir until it dissolves.
- Repeat the previous step as many times as possible until the salt no longer dissolves and sits at the bottom of the cup (even after stirring for a while).
- Put the snowflakes in a shallow tray or pan and carefully pour the water over the snowflakes.
- Place the tray in a sunny spot and wait for the water to evaporate!

Closure

1. What happened to the salt as it was stirred into the hot water? Did it disappear?
   The salt dissolved into the water, which means the salt was broken up into tiny pieces (sodium and chloride ions) which are now surrounded by water. They did not disappear, but are too small to be seen by our eyes alone.

2. What happened to the water over time? Did it disappear?
   The water level in the tray is lower than it was when the experiment began. It will continue to get lower if you leave the tray for longer. The water did not disappear; the water evaporated, which means it changed from a liquid to a gas. When individual water molecules received enough energy from the sun or another light source to evaporate, they became water vapor in the air. The water that was in the tray is now in the air as water vapor.

3. What was left behind on your paper at the end of the activity and why?
   The salt was left behind. As the water cooled, the water molecules move closer together, causing the dissolved sodium and chloride ions to come into contact with each other more often. This caused the salt to begin to recrystallize and it was left behind on the paper.

Modification

Pipe cleaners twisted into the shape of a snowflake can be used in place of a paper snowflake. Then, instead of laying your snowflake in a dish, suspend it by a string into a jar or cup that is filled with the saturated salt solution. The salt will crystalize on the pipe cleaner as the solution cools.