 **DECEMBER/JANUARY**

**STEM SNOWFLAKE CHALLENGE**

**Challenge**: We are bringing the snow inside!! This is a chemistry engineering challenge. The challenge is to make a snowflake using the materials below and can be done as a group or individually. When students have successfully created a crystal solution, they should then transfer it to their coffee filter, string or pipe cleaner (by pouring it over their shape they created). After waiting an hour or overnight, a snowflake should appear. Students will need to measure materials accurately using a ratio of 1:1 for water and Borax.

**Standards**: Mathematics: NY PK-8.NF.3, NY PK-8.MD.2a, NY PK-8.MD.8a, Mathematical Practices: #5, #6, #3

New York State Next Generation Science Learning Standards: PS 1-1, PS 1A, KE SS 2-1, LS 1

Engineering Design Process 7E Model

**Materials:**

* Coffee Filters (1 per group or 1 per student)
* Borax
* Water
* Scissors
* Food Coloring
* 1 large jar (more if other colors are desired)
* String or pipe cleaner (alternative to the coffee filter)
* Paper plates
* Large Saucers or plates or Styrofoam trays or plastic trays

**The Science**: Crystals form in nature when liquids cool and start to harden. They do this in a uniform and repeated pattern that forms the crystal. In this case, a supersaturated liquid that contains a dissolved mineral (Borax=a soft crystal) cools. In this challenge, a super saturated solution is created using hot water and Borax. When the water cools it comes closer together again causing the crystals to cling to the coffee filter, pipe cleaner or string.

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 **Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ School: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Response Sheet:**

**Step 1:** Fold coffee filter as many times as desired and cut on the folds to create cut out look. To connect with math standards, have students cut certain shapes in their filters. Or students can make shapes with pipe cleaners or string. **Place on a plate, saucer, or tray.**

**Step 2:** Create a Borax and water solution using a 1:1 ratio:

 We used \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cups Borax and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cups **HOT** water.

 Optional: Add food coloring

 We added \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ drops of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ food coloring.

**Draw a picture of what your snowflake looks like before you add your solution. Use crayons or colored pencils to depict what your snowflake will look like.**

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**Step 3:** Add the Borax and water solution by pouring on the plate, saucer, or tray where you placed your snowflake.

**Step 4:** You and your group should monitor when you begin seeing crystals form on your snowflake. Record the time here \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (minutes, hours)

Questions: ****

1. What shapes did you use to make your snowflake?

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1. Is the solution in the jar, including the food coloring a:

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1. How long did take for your snowflake to start showing crystallization?

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1. How many solutions did your class make?

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1. If you were to conduct this challenge again, what would you change about your process or product?

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