

## Changing States of Matter Lab

### Condensation

**Question to investigate:** What is the source of water that condenses on the outside of cold cups?

#### Materials for Each Group

- 2 Clear Plastic Cups
- Ice Cubes and Liquid Water
- Brown coffee filters
- Thermometers
- Gallon Sized Ziplock Plastic Bags



#### Procedure

1. Place water and ice cubes into two identical plastic cups, 2/3 of the way full, making sure both cups have the same amount of ice and water.
2. Immediately place one of the plastic cups into a gallon sized Ziplock bag and get as much air out of the bag as possible. Close the bag securely.
3. Allow both cups to sit undisturbed for about 10 minutes.
4. Remove the plastic cup from the bag and wipe it with a brown coffee filter, while your partner does the same with the plastic cup that sat in the air.
5. Use a thermometer to measure and record the temperature of the water in each cup.
6. Temperature of cup in plastic bag \_\_\_\_\_ °C    Temperature of cup in air \_\_\_\_\_ °C

#### Analysis?

1. Judging by how much water was on each coffee filter, which cup had the most moisture on the outside of the cup? \_\_\_\_\_
2. Why do you think one cup had more moisture on it than the other cup? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
3. Some people think that the moisture that appears on the outside of a cold cup is water that has leaked through the cup. How does this demonstration prove that this idea is not true? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
4. When you breathe on a cold window in the winter, the window gets tiny droplets of moisture on it or “fogs up.” Using what you know about condensation, explain why you think the cold window gets foggy. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
5. When you breathe out in the winter, you see “smoke or fog,” which are really tiny droplets of liquid water. Using what you know about condensation, explain why you think this happens. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

6. Does it have to rain in order for dew to develop on grass in the morning? Explain: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Deposition

**Question to Investigate:** How can you cause water vapor to change to frost?

### Materials for Each Group

- Empty Metal Can
- Ice
- Paper Towel
- Rock or Pool Salt
- Metal Spoon
- Thermometer



### Procedure

1. Dry the outside of a can with a paper towel.
2. Place 2 heaping spoons of salt in the bottom of the can, then fill the can about halfway with ice.
3. Add another 2 heaping spoons of salt.
4. Add more ice until the can is almost full, then add another 2 spoons of salt.
5. Hold the can securely and mix the ice-salt mixture with a metal spoon for about 1 minute.
6. Remove the spoon and observe the outside of the can. Do not touch it yet.
7. Wait 3–5 minutes.
8. Use a thermometer to measure the temperature of the ice inside the can. \_\_\_\_\_ °C

### Analysis

1. Look at and touch the outside of the can. What do you observe? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
2. Where and when do you often see frost occur? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
3. Judging by the temperatures in the cups with ice and the temperature in the can with ice and salt, in what temperature range would liquid dew form and in what temperature range would frost form?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# Sublimation, Melting, and Evaporation

**Question to Investigate:** How does sublimation differ from melting and evaporation?

## Materials:

- Dry Ice
- Ice
- Water
- Heat Lamps

## Procedure

1. Place dry ice, regular ice, and water into three separate petri dishes.
2. Place each petri dish under a heat lamp.
3. Observe and record what happens to each substance over time.

Water Observation: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Regular Ice Observation: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Dry Ice Observation: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Analysis:

1. How did sublimation of dry ice differ from the melting of regular ice? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
2. How did the sublimation of dry ice differ from the evaporation of water? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# Freezing and Deposition

**Question to Investigate:** How does freezing differ from deposition?

Think back to the deposition part of the lab and compare it to your experience with freezing water to make ice cubes. How do the finished products differ in appearance?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# Changing States of Matter

Directions: Label the following diagram with the terms: evaporation, condensation, freezing, melting, sublimation, deposition.

