UNIT: JCI BUILDING SYSTEMS

MELT DOWN!- measuring thermal energy transfer

Your Mission:

You’ve been hired as a Thermal Detective! Your job is to investigate how fast heat sneaks into different materials and melts ice. Test two cups—one plain and one insulated—and observe how the materials affect the melt-down speed. Ready to chase that thermal energy? Let’s go!

Focus: **FOCUS:** Heat, Insulation & Energy Transfer

Materials:

* 2 ice cubes (same size)
* 2 small plastic cups or containers
* Stopwatch or timer
* Ruler or graduated cylinder (to measure melted water)
* Thermometer (to measure room temperature)
* Lining material (e.g., foil, cotton balls, paper, or cloth)
* Paper towels (for spills and cleanup)

STUDENT DIRECTIONS:

**STEP 1: Test the Uninsulated Cup**

1. Place one ice cube in a plain, empty plastic cup (no lining).
2. Start your timer the moment the ice touches the cup.
3. Every 5 minutes, do the following:
   * Measure the water level (in cm or mL) using a ruler or graduated cylinder.
   * Observe how much ice is left.
   * Record the surrounding temperature using a thermometer.
4. Stop timing once the ice has completely melted.

**STEP 2: Test the Insulated Cup**

1. Line a second cup with one material (foil, paper, cotton balls, etc.).
2. Place the same size ice cube in the lined cup.
3. Repeat the exact steps as Part 1:
   * Start the timer.
   * Measure and record melted water every 5 minutes.
   * Note temperature and time until fully melted.

DATA TABLE TEMPLATE:

| **Time (min)** | **Water Level – Uninsulated (mL)** | **Water Level – Insulated (mL)** | **Observations** |
| --- | --- | --- | --- |
| 0 |  |  |  |
| 5 |  |  |  |
| 10 |  |  |  |
| ... |  |  |  |
| Final Melt Time | \_\_\_\_\_\_ min | \_\_\_\_\_\_ min |  |

REFLECTION:

1. Which cup's ice cube melted faster?  
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. How did the lining material affect the heat transfer?  
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. What was happening to the thermal energy in each system?  
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. If you could try again with a different material, what would you choose and why?  
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Standards Alignment

NGSS: HS-PS2-4 STEL: STEL 1E, STEL 4F, STEL 7A, STEL 9F CCSS: CCSS.MATH.CONTENT.HSF.IF.C.7, CCSS.MATH.CONTENT.HSN.Q.A.1, CCSS.MATH.CONTENT.HSN.Q.A.2, CCSS.MATH.PRACTICE.MP2, CCSS.MATH.PRACTICE.MP4