Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period \_\_\_\_\_Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Do You Want to Build a Snowman - FREEZING

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **5 4** | | **3 2 1** | | | | | **0** | **Late** |
| Extremely thorough, complete, and detailed.  ☺ | | * **Procedures Detailed** * **Data / Graphing** * **Conclusion** | | | * Improve **Neatness** * Parts left **undone** | | Not complete enough to grade. | Complete But Late or Redone |
| **Predict** to the right what you think a time vs. temperature graph will look like when you start with room temperature water and put it in a freezer. | | | | **Predict in this box:**  Temp  Time | |  | | | |
| **Materials:** | | **Drawings of setup (label)** | | | | | |
| Graduated cylinder  Water  2 Thermometers  *(glass & digital)*  100 mL beaker  250 mL beaker  Ice  Water  25-30 grams salt (2 Tbsp)  pipette | |  | | | | | |

**Procedures:** *(****Check off as you go!)***

1. \_\_\_\_\_Put **200mL** of **ice** (from the cooler) into your 250mL beaker.
2. \_\_\_\_\_Measure 1 Tablespoon of salt and pour on top of ice.
3. \_\_\_\_\_Add ~50 ml of sink water into the ice/salt mixture—(water should be at or a little above the

200 mL mark on beaker)—you now have an ice/salt/water mixture.

1. \_\_\_\_\_**WITH A WOODEN STIRRER**, **GENTLY** stir the ice/salt/water mixture.
2. \_\_\_\_\_I will give you the **starting temperature** of the ice bath in the **250mL beaker** which you
3. will **record** on next page.
4. \_\_\_\_\_**Put some water from the sink into your 100 mL** beaker.
5. \_\_\_\_\_**With your pipette**, measure (suck up) ~**3.0 mL water** from your **100mL** beaker AND **add**

**to** **the graduated cylinder.**

6. \_\_\_\_\_Put **digital thermometer** in the graduated cylinder & **measure temperature**

**at 0 min (start). STOP HERE for a teacher check before moving to the next step.**

7. \_\_\_\_\_Place the **graduated cylinder CAREFULLY in the 250 mL beaker** of ice/salt/water mixture.

8. \_\_\_\_\_Record temperatures (of graduated cylinder) **every 30 seconds for 20 minutes** (or until told

to clean up).

9. \_\_\_\_\_Record the **ENDING TEMPERATURE** of your **ice bath in your 250 mL** beaker.

10. \_\_\_\_\_**CLEAN UP**-Dump ice/salt/water mixture into the sink & set up your lab tray for next class.

**Data Table for FREEZING POINTS**

**TEMPERATURE OF ICE BATH: starting:\_\_\_\_\_\_\_\_\_\_\_** **°C ending:\_\_\_\_\_\_\_\_\_\_\_** **°C**

**Temperature oC**

|  |  |
| --- | --- |
| **Time (minutes)** | **3.0 mL** |
| **0 (start)** |  |
| **0.5** |  |
| **1.0** |  |
| **1.5** |  |
| **2.0** |  |
| **2.5** |  |
| **3.0** |  |
| **3.5** |  |
| **4.0** |  |
| **4.5** |  |
| **5.0** |  |
| **5.5** |  |
| **6.0** |  |
| **6.5** |  |
| **7.0** |  |
| **7.5** |  |
| **8.0** |  |
| **8.5** |  |
| **9.0** |  |
| **9.5** |  |
| **10.0** |  |
| **10.5** |  |
| **11.0** |  |
| **11.5** |  |
| **12.0** |  |
| **12.5** |  |
| **13.0** |  |
| **13.5** |  |
| **14.0** |  |
| **14.5** |  |
| **15.0** |  |
| **15.5** |  |
| **16.0** |  |
| **16.5** |  |
| **17.0** |  |
| **17.5** |  |
| **18.0** |  |
| **18.5** |  |
| **19.0** |  |
| **19.5** |  |
| **20.0** |  |
| **TIME TO REACH FREEZING** |  |

GRAPH 1: **Freezing Point LINE**

TITLE: FREEZING WATER

28

26

24

22

20

18

16

14

12

10

8

6

4

2

0

-2

-4

-6

-8

-10



0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Temp 0C

Time minutes

**Label the words below clearly on your graph.**

**Liquid Only Freezing Point Ice and liquid Freezing Stops Ice cools**

**ANALYSIS: FREEZING POINTS**

|  |  |
| --- | --- |
| **Question** | **Answer** |
| 1. *Why does the water in the graduated cylinder get colder as it sits in the ice bath?*   *Words to use:*  ***ice bath, graduated cylinder*** | Heat energy is transferred from the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. |
|  | *(Think of the ice bath as the freezer.)* |
| 1. *Was this process an endothermic or exothermic process?* | This process is an example of an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  process as the heat energy was ***exiting or entering*** (circle one) the water as it turned from a liquid to a solid. |
| 1. *Why did we put salt in the ice bath?*   *Words to* ***choose*** *from—you will* ***not*** *use ALL of these words:*  ***hotter or colder,***  ***absorb (take in) or remove*** | Salt helps make the ice bath \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than the freezing point of water. This is important so the ice bath can \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ enough energy from the water for it to freeze. |
| 1. *When water is freezing (going from liquid to solid), why does the temperature stay the same?*   *Words to* ***choose*** *from—you will* ***not*** *use ALL of these words:*  ***the same or different***  ***motion or attraction***  ***motion or attraction*** | During freezing, the temperature stays \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because all energy change is used to form ice crystals. In other words, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the molecules doesn’t change but the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ does. |
| 1. *What was the freezing point of the ice for you?* |  |
| 1. *What reasons might the freezing point not be EXACTLY 0° Celsius in our lab?* |  |

**Teacher Notes:**

**Go around and check ice bath in beaker—should be ideally -6 or -8.**

**If not, pour some salt into their beaker.**

**When the test tube temperature is -4, students can try to supercool by flicking the bottom or test tube.**