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BOILING SALTWATER LAB – PROCEDURES SHEET (Hotplate)

Directions: ***Choose a reader to lead the group by reading all the steps out loud while you do the lab.*** *Each person will need a Data Sheet to write steps of the scientific method, record data, and answer questions.*

Materials: *Make sure you have the following materials:*

-electric hotplate (plugged in and power strip on)
-100-ml beaker with 20-ml of salt
-Two 250-ml beakers with 150-ml of tap water
-temperature probe & LabPro interface unit
-ring stand w/ ring
-tongs
-stirring rod
-laptop computer

Lab Safety Items:

You will be handling HOT items and glassware. Keep in mind the following safety items:

a) The hotplate and beakers WILL BE HOT!
- *Do not touch the hotplate top to see if it is on.*
- *Always use the tongs to handle glassware that is on the hotplate.*
- *Keep papers and clothing clear of hotplate.*
- *Do not remove a beaker from the hotplate until instructed by teacher.*

b) *Keep computer equipment and wires away from hotplate, water and salt.*

I. STATEMENT OF THE PROBLEM: ***Does salt water boil at a different temperature than tap water? If you think it does, will it boil at a higher or lower temperature?***

Copy the above *"Statement of the Problem"* onto your Data Sheet.

II. FORM A HYPOTHESIS: Suggest a *"Hypothesis"* for this problem and write it on your Data Sheet. Also, predict the maximum temperature (in degrees Celsius) that the saltwater will reach (HINT: Distilled water boils at around 100° Celsius).

III. TEST THE HYPOTHESIS: Carefully read the procedures and follow each step.

Experiment Procedure:

1. Fill a 250-ml beaker to the 150-ml mark with the provided tap water.
2. With the hotplate OFF, position the beaker with water on the hotplate as directed by your teacher. Insert the thermometer into the beaker and insure that the thermometer is not resting on the side of the glass, but is near the middle of the beaker. Also, the thermometer should be approximately 5 mm off the bottom. This can be changed by adjusting the ring stand height.

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3. Collect 20-ml of salt in the 100-ml beaker. Make sure that this beaker is "bone dry" prior to collecting your salt. **DO NOT POUR SALT INTO WATER YET!** Set it to the side for later use.
4. On the computer, open the Vernier Software program, "Logger Pro 3.3".
5. Click on the second button from the right that looks like a clock. Highlight and change "Length" to 2000 then click "Done".
6. Click on the button on the upper right side that says "Collect", and immediately turn the hotplate on **HIGH.** Continue collecting data until the water boils and the temperature stabilizes.
7. When the water boils and the temperature stabilizes (stays the same) for nearly 200 seconds, then turn the hotplate off, but **DO NOT STOP COLLECTING DATA.**
8. Allow the water to cool to 97 degrees Celsius.
9. Hold the beaker with the tongs, and slowly add the 20-ml of salt to the beaker on your hotplate, then stir with the metal stirring stick.
10. Immediately turn the hotplate dial to High again.
11. Continue collecting data until the water boils and the temperature stabilizes again for nearly 200 seconds. Then turn the hotplate off, but **DO NOT STOP COLLECTING DATA UNTIL** the temperature decreases approximately 5 degrees from the maximum.
12. Then click the "STOP" button on the computer screen to stop collecting data.
13. Allow the beaker to cool on the hotplate and **DO NOT REMOVE THE BEAKER OR THE THERMOMETER FROM THE HOTPLATE**.
14. To record and analyze the data click on the lowest part of your graph then hold and drag to the right until you pass the first high temperature peak. Then click on the "STAT" button and record on **"DATA TABLE 1"** the minimum temperature and time and also the maximum temperatures and time for the **"CONTROL SETUP"**.
15. Now click and drag again, but over the second curve and find the STAT information for the saltwater. Record minimum and maximum readings for temperature and time on **DATA TABLE 2.**
16. Read the "Directions" for the **"ANALYZE RESULTS"** and **"CONCLUSION"** sections and begin answering the questions.