Name: _____

Is It Getting Hot In Here?

HOW DOES A THERMOMETER WORK?

Problems

What will happen to the level of a liquid in a hollow tube as the temperature changes? Does changing the amount of liquid in a flask affect how quickly that liquid rises or falls within a hollow tube?

Research

Answer the following True or False questions:

True/False Thermometers only detect increases in heat.

True/False Temperature is a measure of internal energy.

True/False Celsius is the only scale for measuring temperature.

True/False Celsius, Fahrenheit and Kelvin are all temperature scales.

True/False When things heat up, their atoms move slower.

True/False The atoms in a gas are closer together than the atoms in a liquid.

Identification of Variables

Identify the **Independent Variables**, **Dependent Variable**, **Constants** and **Control** of this experiment:

Independent Variables	
Dependent Variable	
Constants	
Control	

Hypotheses

If the flask gets warmer, then the liquid in the tube will _____ .
(go up / not change / go down)

If the flask gets colder, then the liquid in the tube will _____ .
(go up / not change / go down)

If there is less liquid in the flask, then the liquid in the tube will move _____ .
(faster / the same / slower)

Procedure

1. To do this experiment, your team will need:
   - A 500 milliliter flask filled with 400 milliliters of water
   - A 500 milliliter flask filled with 200 milliliters of water
   - 2 rubber stoppers with hollow tubes inserted through each one
   - 2 clear plastic centimeter scales
   - Clear tape
   - A bowl filled with 500 milliliters of ice water
2. Tape one of the clear plastic centimeter scales to each of the hollow tubes. The smallest number on the scale should be next to the rubber stopper while the largest number on the scale should be near the top of the hollow tube.
3. Place the two stoppers into the two flasks so that the tubes are in the water. Some water will move up the straw as you do this. Try to keep the water level in the straw as **low** on the scale as possible.
4. Begin part one of the experiment with the flask containing 400 milliliters of water. Do not play with the other flask while you conduct the experiment.
5. Use the plastic centimeter scale to measure how high the water is in the tube. Record this **initial height** on the **Getting Warmer** data chart.
6. When you are told, have one team member place both of their hands on the flask. The instructor will tell you to record the height of the water in the tube every 30 seconds. Record the height of the water in the tube for a total of 4 minutes **or** until the water gets too high to read. Keep your hands on the flask at all times.
7. Repeat steps 4 and 5 with the flask containing 200 milliliters of water.
8. Give both flasks time to cool to room temperature. Once cooled, reseat the stoppers so that the water level in the tube as **high** as possible.
9. Begin part two of the experiment with the flask containing 400 milliliters of water. Do not play with the other flask while you conduct the experiment.
10. Use the plastic centimeter scale to measure how high the water is in the tube. Record this **initial height** on the **Getting Colder** data chart.
11. When you are told, have one team member place the flask into the bowl of ice water. The instructor will tell you to record the height of the water in the tube every 30 seconds. Record the height of the water in the tube for a total of 4 minutes **or** until the water gets too low to read. Keep the flask in the ice water at all times.
12. Repeat steps 10 and 11 with the flask containing 200 milliliters of water.
13. Find the **Total Change in Height** for each of the four trials by **subtracting** the **Final Height** from the **Initial Height**. If the water rose in the straw, the **Total Change in Height** will be **positive**. If the water fell in the straw, the **Total Change in Height** will be **negative**.
14. Make a bar graph of your results on the **Is It Getting Hot In Here Results Graph**.

Data Collection and Analysis

Directions: Record the height of the liquid inside each tube **every thirty seconds** over the course of four minutes. Once all of the data has been collected, find the **total change in height** by subtracting the **final height** from the **initial height**. Make a **bar graph** showing how the height of the liquid changed in each tube.

Is It Getting Hot In Here Data Chart - Getting Warmer

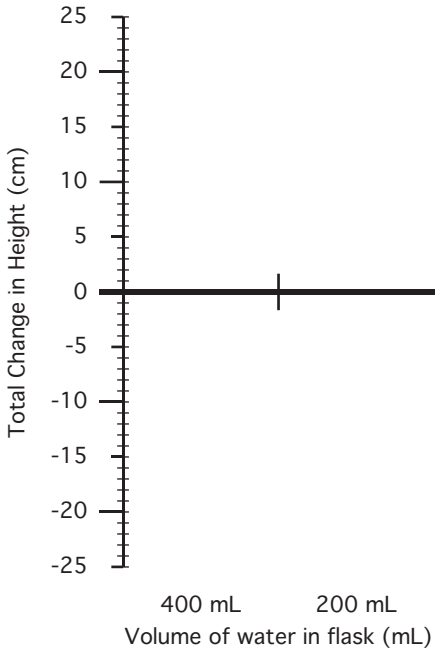
Volume of water in flask	HEIGHT of liquid inside tube at TIME (minutes:seconds)									**Total Change in Height**
	(initial height) 0:00	0:30	1:00	1:30	2:00	2:30	3:00	3:30	*(final height)* 4:00	
400 mL of water										
200 mL of water										

Is It Getting Hot In Here Data Chart - Getting Colder

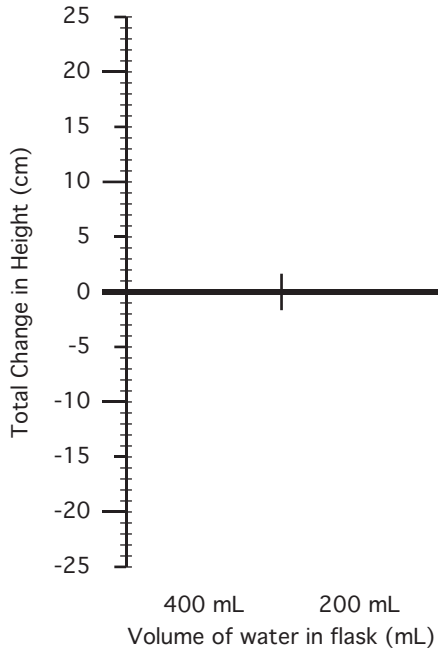
Volume of water in flask	HEIGHT of liquid inside tube at TIME (minutes:seconds)									**Total Change in Height**
	(initial height) 0:00	0:30	1:00	1:30	2:00	2:30	3:00	3:30	*(final height)* 4:00	
400 mL of water										
200 mL of water										

Is It Getting Hot In Here Results Graphs

Getting Warmer



Getting Colder



Conclusions

WHEN THE FLASK WAS HEATED, THE LIQUID IN THE TUBE _____.

WHEN THE FLASK WAS COOLED, THE LIQUID IN THE TUBE _____.

WHEN THERE WAS LESS WATER IN THE FLASK, THE WATER IN THE TUBE _____.

Questions to Think About

1. What caused the liquid level in the tube to rise when the flask was heated?

2. What caused the liquid level in the tube to fall when the flask was cooled?

3. Why does changing the amount of liquid in the flask change how the liquid in the tube behaves?

4. What are some flaws with this type of thermometer? How can they be fixed?