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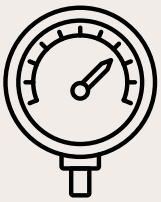


THERMODYNAMICS LAB REPORT

The Effect of Temperature on Evaporation

Introduction

The goal of this experiment is to investigate the relationship between temperature and the amount of water that evaporates at that temperature after a given amount of time. I accomplished this by heating up 20mL of water to four different initial temperatures at equal intervals. I then weighed the water, let it sit for 3 minutes, and determined the final mass after leaving it to evaporate. I then compared the differences in mass for each initial temperature and examined the relation between the two factors. I used a hotplate to achieve the water temperature and a thermometer to make sure that the water temperature was at the correct interval before leaving it to evaporate.

Question/Problem

Does the amount of water that evaporates within a set amount of time change depending on the initial temperature of the water?

Hypothesis

The amount of water that evaporates and the initial temperature of the water are unrelated.

Materials

- Hot Plate
- Water
- 4 50mL beakers
- Thermometer
- Mass scale
- Timer

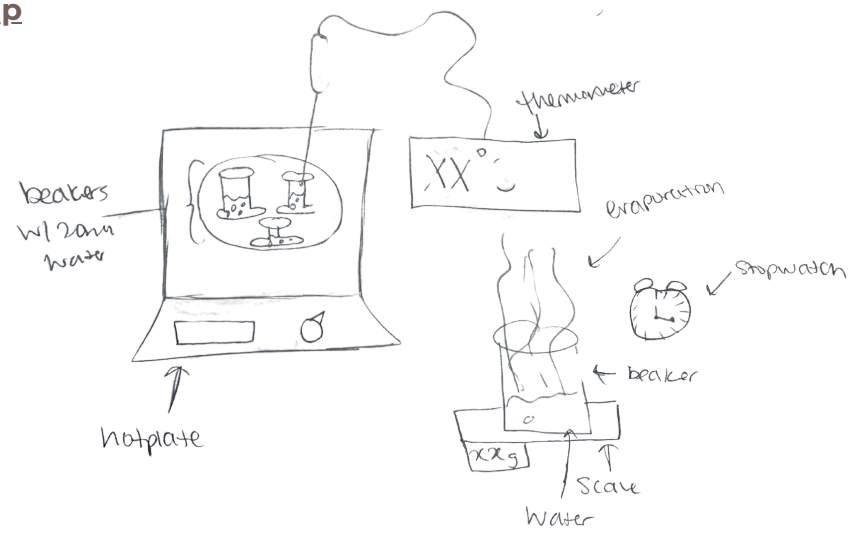
Scientific Concepts

Independent and dependent variables, pressure, temperature, incremental data collection, evaporation, mass

Procedure

1. Gather all materials
2. Ensure electronics work properly and glass materials have no cracks
3. Pour 20mL of water into each of the 4 flasks
4. Set flasks atop hotplate and turn knob to 5
5. Place thermometer into one of the flasks and heat until water reaches 68 degrees Celsius
6. Remove 1 flask and measure mass
7. Set a timer for 3 minutes
8. Weigh final mass
9. Repeat for other flasks, at 78, 88, and 98 degrees Celsius
10. Record initial and final masses of each flask

Diagram of Setup



Results Table

Temperature in Degrees Celsius	Difference in Mass in grams
68	0.16
78	0.44
88	0.63
98	0.79

- **Only 4 data points due to time constraint**

Results Analysis

The graph and the table suggest that there is a direct relationship between the two factors. In other words, when the initial temperature of the water increases, the amount of water that evaporates through steam over 3 minutes also increases. We see that the amount of water that evaporates increases at a decreasing rate, which suggests that the relationship is non-linear. The difference between evaporated mass between 68 to 78 was 0.28 grams; from 78 to 88 was 0.19 grams; from 88 to 98 was 0.14 grams. Even though the actual values of the amount evaporated increased, they increased at a decreasing rate, as opposed to linear relationship, which would increase at a constant rate.

Conclusion

The results from the graph and the table **do not** support our initial hypothesis that the temperature of the water and the amount of water that evaporates are not related. This indicates that the amount of water evaporated is linked to the initial temperature of the water. As we can see from the graph, the amount of water evaporated increases at an decreasing rate for every additional increment of 10 degrees celsius. This indicates a non-linear relationship and more of an logarithmic relationship.

Sources of Uncertainty

One source of uncertainty in my experiment was the hotplate. Since it does not show the current temperature or the rate of heating, I had to depend on the thermometer to determine the temperature of the water. However, since the hotplate heats continuously, it would still heat after the last measured temperature by the thermometer.
Another source of uncertainty is the mass scale. I do not know if the mass scale was calibrated and it only provided confidence to two decimal places. Another source of uncertainty is that the water began to evaporate before the mass could be weighed.

Possible Improvements

One possible improvement would be to use a hotplate that we could stop heating at a desired temperature quickly before moving on. This would allow us to wait for the pressure reading to stabilize for more accurate data measurements. We could also use a second thermometer so to confirm the accuracy of the temperature readings to increase our confidence that the mass recorded was for the correct interval of 10 degrees. Another improvement I could have made is to use two mass scales to confirm each other. That way, there would be decreased probability of both of them being inaccurate.

What did we Learn

One thing we learned was that there is a direct relationship between the initial temperature of water and the mass that is evaporated. The mass that was evaporated increased at a decreasing rate for every interval of 10 degrees celsius increase in initial temperature. We also learned that hotplates are not the best form of heat control as there isn't really a way to stop the heating at a desired temperature long enough to get a more accurate reading from the thermometer. We also learned that it is hard to accurately measure the mass of the water because it starts steaming before the mass is measured, resulting in the mass decreasing.