Viscosity Lab

Learning Target: To collect evidence how heat effects state of matter.

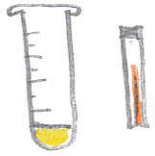
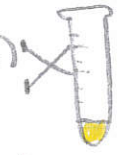
Hypothesis: If the temperature of honey is increased, then viscosity will decrease and if the temperature is decreased, viscosity will increase.

Materials:

1) Beaker
2) Honey
3) Thermometer
4) Test tube
5) Graber Nabers
6) Colors
7) Pencil
8) Notebook
9) Ice
10) Water
11) Hot plate
12) Protractor

Procedure:

1) Gather materials and put honey in test tube. Grab it with the graber nabers and tip the tube on its side and record the flow with the protractor for 10 seconds.
2) Record the temperature of the room. Repeat the "grab & tip" process two more times for cold and hot.
3) For the cold test, give the test tube an "ice bath" for about 4 minutes. Record temperature and flow.
4) For the hot, put the test tube in boiling water (hot plate) for about a minute and a half. Record the temperature and flow

Room { 1)  2)  3)  4) (Record)

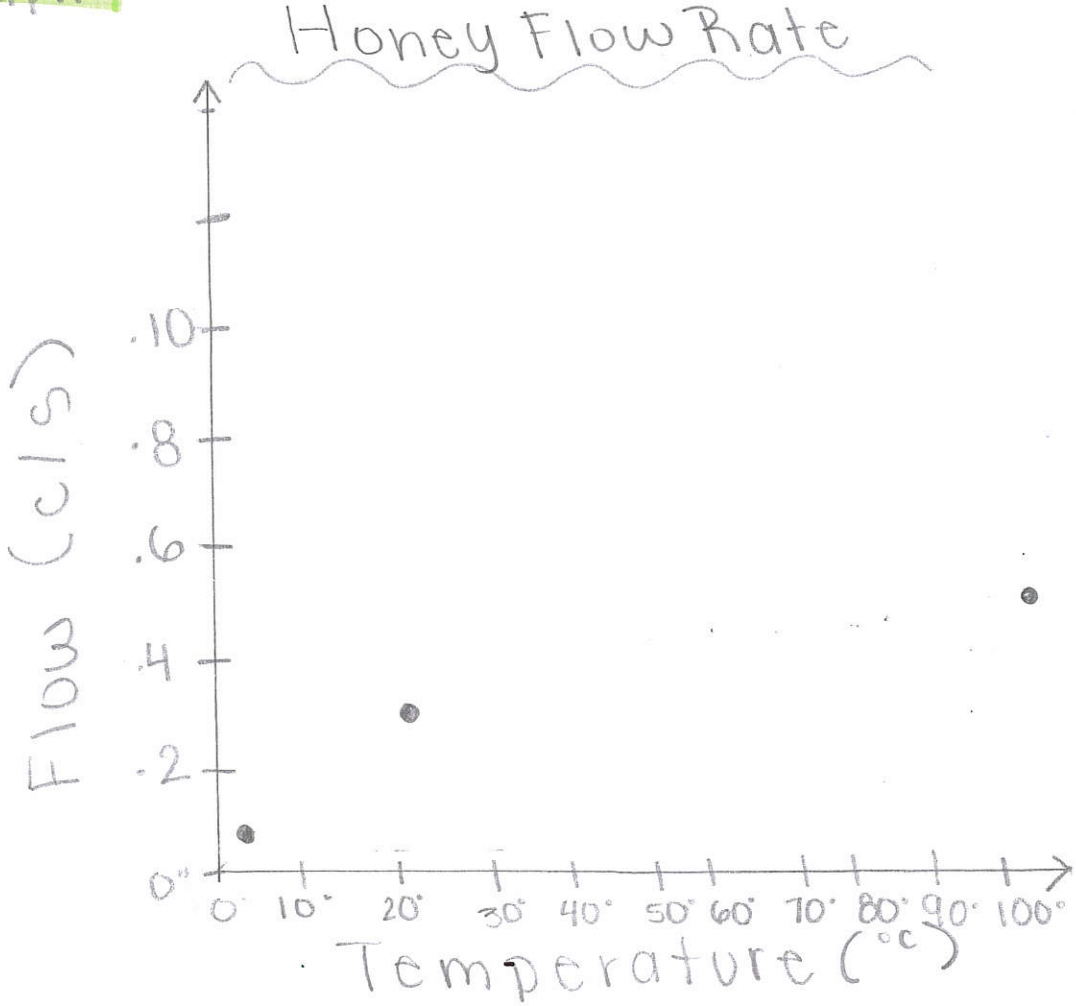
Data/Results/Observations:

Table:

Temp.	Room 22°C	cold 2°C	Hot 100°C
Flow Rate (m/s)	.3/s	.09/s	.5/s

3 cm in 10s .9 cm in 10s 5cm in 10s

Graph:



Additional Observations:

- The "ice bath" was effective immediatly
- When we put the test tube in the boiling water, condensation was building up on the sides
- Honey is very dence
- Senses could be observed (sight, sound, and touch)
- In the "hot test", the atoms were moving rapidly and vise versa for the "cold test"

Analysis:

Viscosity is the state of being thick, sticky, and semifluid in consistency due to internal friction. There is, as discovered in the lab, a connection between the flow rate and viscosity. The more viscosity something has (not moving, thick) had a lower flowrate and the less viscosity (movement, not thick) had a higher flow rate.

In this lab, we found a way to test the relationship between viscosity and temperature. We took a material (honey) and changed the temperature (demonstrated by thermometer). The honey approached

becoming a solid and it approached becoming a gas. By changing the temperature we did a "tip test" and measured the rate of flow. This proved / met the learning target (college level 3 analysis).

We, in this lab, found a connection between temperature and flow rate. Seen in the graph specifically, there is positive correlation between the temperature (x-axis) and the flow rate (y-axis). As the temperature increased (moving farther right) the flow rate (moving up) also increased. In the table, when we cooled the honey, it was 2° celcius and the flow rate was .3 cm a second. When we heated the honey, it was 100° celcius and the flow rate was .5 cm a second. This specific data shows that when we increase temperature, the flow rate will increase.

We also discovered a relationship between temperature and viscosity. First, the temperature data (2°, 22°, 100°) we know specifically that we changed the temperature of the honey. From level 1, we also know viscosity is the resistence to flow. When the honey approached

getting cooler ↑

becoming a solid (we know this because the atoms slowed down) the viscosity increased because it couldn't flow easily. The same thing when we had the honey approach a gas (we know this because the atoms sped up), the viscosity decreased because it could flow easily.

Advanced:

Sources of error include not accurate tipping, ice melting (changing temperature), and not leaving the honey in the boiling water / ice bath long enough.

Other applications have happened in the past for me. When we were going simply transporting chocolate in the car, the viscosity went from high to low. This is important information to know in life in order to avoid messes / accidents.

Extra Note: The Law of Conservation of Energy is involved. No energy was created in the honey, nor destroyed and the conservation of mass too.

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Conclusion: In this lab we collected evidence with honey to see a relationship between temperature and viscosity. We found, that if you increase the temperature of a material, the resistence to flow will go down and if we decrease the temperature, the resistence to flow will go up. I accept my hypothis because the data we collected showed that viscosity/flow rate change with temperature change. Overall I learned that viscosity is an important to know in real life. I also learned that not only does temperature effect states of matter. The last thing is that temperature effects resistence or flow. I wonder what would happen if we looked at crystilized honey and if it effects viscosity.