Lesson Plan
How Temperature Affects Viscosity

PURPOSE
The purpose of this lab activity is to determine whether or not and how temperature affects the viscosity of liquids.

OBJECTIVE(S): Students will be able to:
- Determine the effect of temperature on the viscosity of liquids.

STANDARD(S) & INDICATOR(S):
5-PS1-3. Make observations and measurements to identify materials based on their properties.

Background Information - *Define the following key term*
Viscosity:

Hypothesis
Write one sentence about how you think temperature affects the viscosity of liquids. What might be the relationship?

Materials
- Vegetable Oil/Water/Maple Syrup/Corn Syrup
- Cardboard Slope/Ramp
- Hot water bath/Cold water bath/Beakers at room temperature
- Thermometer
- Stop watch

Before you begin: Make sure your group has the following materials:
- 1 Cardboard Ramp
- 1 Spoon
- Stop watch (or other device for timing)
- Paper Towel (to place at the bottom of the ramp to catch the liquids)

Variable: ***Temperature***
- Hot (Liquid has been submerged in a hot water bath for at least 20 minutes)
- Room Temperature
- Cold (Liquid has been in fridge or freezer for at least 20 minutes), and may be surrounded by ice cubes

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Procedure
In groups of 3-4, you will time how long it takes for 2-3 different liquids at 2-3 different temperatures to flow from the start line to the finish line on the cardboard ramp. You will record your observations and results in the table below.

Step 1: Each group member should play one of the following roles during the activity. Assign these roles:
- Referee (in charge of acquiring the liquids and pouring them down the ramp)
- Timer (in charge of the stop watch and timing each liquid)
- Recorder (in charge of recording the temperatures and times)

Step 2: Make sure that your cardboard ramp is steady and ready to go. Choose one liquid to test, and bring it to your table. Fill the spoon with the liquid.

Step 3: Make sure that everyone is ready to start. On the count of "three", the referee will pour the spoon onto the top of the cardboard. The Timer will start the stop watch when the liquid crosses the start line. Then, stop the stop watch when the liquid crosses the finish line. Record your results (in minutes and seconds). Bring the liquid back to its original spot, and repeat these steps with another liquid.

***** Important***:** Make sure you put the liquid back into the right place (right temperature) when you are finished with it.

Observations & Results
Record your observations and results as you complete this lab activity.

Record your results in the table below. Your group must test **at least 2** liquids at all three temperatures, and if time permits, you may test more.

Liquid	**Temperature 1 _____°C**	**Temperature 2 _____°C**	**Temperature 3 _____°C**

Sources of Error
List at least two possible sources of error that you may have encountered during your lab activity, and explain how/why they could have affected your results.

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Discussion

1. a) According to your results, which liquid at which temperature has the highest viscosity (the most resistance to flow)? Why?

   b) According to your results, which liquid (and at which temperature) has the lowest viscosity (the least resistance to flow)? Why?

2. Why/how does temperature affect viscosity?

PARAMETERS TO EVALUATE STUDENT WORK PRODUCTS:
Students write a conclusion that describes how temperature affects the viscosity of liquids.

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