Milk Race: Investigating Viscosity

What kind of milk do you drink? Do you notice that certain types of milk have a thicker texture than others? If so, do you think that contributes to how fast it flows out of a container? In this lab, we're going to investigate how fast different types of milk flow and the reasons why.

Let's define viscosity:

Viscosity: _____
_____

Your group will need:
- column
- prepared samples of milk in test tubes
- funnel or pipette
- timer
- beaker/bowl

Procedure:
1. Break into groups (2-4 students) and collect test tubes of milk samples consisting of one known/control sample (whole milk) and four unknown samples (skim milk, 1% milk, 2% milk, and heavy cream).
2. Using a funnel or pipette, pour the first sample (whole milk) through the capped column.
3. When ready, un-cap the column, start the timer, and count the number of drops that drip out of the column over a one minute period. Record the number in the chart below.
4. Repeat step 3 three times to obtain an average # of drops/min (flowrate).
5. Repeat steps 2-4 for the unknown samples.
6. Graph the flowrate [drops/min] of each sample on the graph provided.
7. Using your graph, order the test tubes from highest flowrate to lowest flowrate.

Table 1: Record your number of drops here for each trial. Use this table to then calculate the average flowrate of all samples.

	Identification	Flowrate 1	Flowrate 2	Flowrate 3	Average Flowrate
Control	Whole Milk				
Unknown 1					
Unknown 2					
Unknown 3					
Unknown 4					
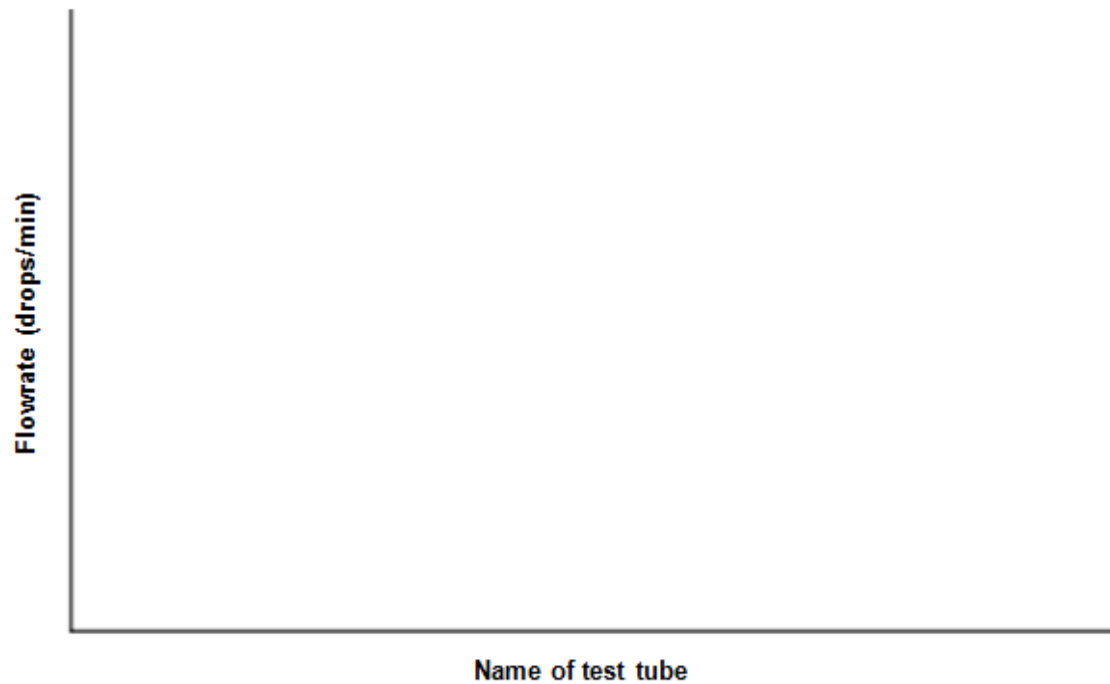
Graph 1: Using the average flowrate value, graph the data for all samples.

Answer the following questions in complete sentences:
1. What are the dependent and independent variables in this experiment?

2. How were you able to identify the unknown solutions?

3. Was your hypothesis correct?

4. What can you say about the relationship between viscosity and the flowrate of a liquid?

5. What do properties like viscosity and flowrate have to do with the chemistry of a particular fluid? How do different concentrations of fat in milk/cream affect their viscosity and flowrate through a column?

6. When would scientists or engineers want to use liquids of high viscosities? Low viscosities?