* Be able to list the 5 points of the **Particle Theory of Matter** (see ‘**Viscosity and Density Overview’**).
* Know the results and conclusion sections of three labs: ‘Sink or Float’, ‘Layered Liquids’ and ‘Flow Rate of a Liquid’.
* Be able to calculate Density, Mass or Volume given 2 out of 3 of the variables (refer to ‘**Density Review Sheet’**). **D=M/V**
* Be able to explain the effect that temperature has on density of a fluid.
* Know whether a substance will sink or float in fresh water based on its density.
* The density of fresh **water** at sea level is **1.0 g/mL.**
* Be able to rank a fluid’s viscosity level based on its flow rate.
* **Viscosity** is the resistance of a fluid to flow.

**Example Questions:**

**1**. Using the particle theory of matter, explain how temperature will affect a fluid’s density. Adding heat causes particles to gain energy, move faster, spread apart, creating a less dense fluid.

**2**. If fluid A has a faster flow rate than fluid B, then the fluid A is more or less viscous than fluid B? *Fluid A is less viscous as it flows more easily.*

**3**. An unknown object has a density of 3.5 g/cm3 and a mass of 175 g. What is its volume? *V=M/D , V = 175 / 3.5 = 50 cm3*

**4**. An unknown object has a mass of 250 g and a volume of 12.95 cm3. Which of the following materials is it? *D = M/V D = 250/12.95 = 19.3 g/cm3*

Granite (2.7 g/cm3), Cork (0.25 g/cm3), Wood (0.5 g/cm3), *Gold (19.3 g/cm3)*

Will this material float or sink in fresh water? *Gold will sink in water because it is more dense (water has a density of 1.0 g/mL)*

**5**. List three reasons why viscosity of a liquid is important (explain why).

*Use the list of 6 you made from page 120 in the text.*

**6**. Which of the following is a **testable scientific question**:

***a****. How does the temperature of a fluid affect its density?*

**b**. Why are some fluids denser than others? *(you can’t test this)*

**c**. Are particles constantly in motion? *(this is a yes/no question)*

Explain what is wrong with the other two choices.

**7**. Using the particle theory of matter, explain in detail what happens to the viscosity of maple syrup as it is heated. *Adding heat adds energy to the particles. particles with more energy move faster and spread apart. When particles are further from each other, the fluid is less dense and will flow easier meaning it is less viscous. So Viscosity decreases as density decreases.*

**8**. Anna wanted to know if the viscosity of molasses was affected by its temperature. She measured the time it took 15 mL of molasses to run down 10cm at three temperatures and obtained the following results:

|  |  |  |
| --- | --- | --- |
| Molasses temperature | Time(s) to run down 10cm | Flow Rate (cm/s) |
| 80c | 6.0 | *10/6 = 1.7 slowest* |
| 200c | 4.0 | *10/4 = 2.5* |
| 400c | 1.5 | *10/1.5 = 6.7 fastest* |

**a**. Determine the Flow Rate of molasses at each temperature above.

**b**. How does temperature affect viscosity? *As temperature increases, viscosity decreases (less viscous flows faster)*

**c**. List two variables Anna would have held constant for the experiment (controlled).

*1. amount of fluid run down the ramp*

*2. height of ramp*

**d**. What was Anna’s **independent variable**? *temperature*

**e**. Write a testable scientific question that Anna could investigate next based on this experiment. *(various answers – see question 6 for guidelines)*