



Grade 8 Science

Unit 3: Fluids



Viscosity

Over the last two periods we have looked at the fluid property viscosity. How did we describe viscosity?

The "thickness" of a fluid. Thick means high viscosity, thin means low.

Today we will spend some time looking at the science behind viscosity.

- *Why are fluids viscous?*
- *Can solids be viscous?*
- *Why do different fluids have different levels of viscosity?*
- *Why is viscosity important?*
- *What affect does temperature have on viscosity?*

All of these questions will be answers this period.

Why Are Fluids Viscous?

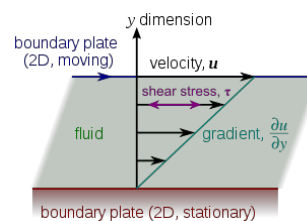
We know from our knowledge of the states of matter that both liquids and gases have particles that can move past one another. The ability to do this gives them the ability to flow (they are fluids).

Viscosity arises from the fact that as these particles move past one another, they rub against each other or bump into one another. The rubbing of the particles creates friction. The friction is what slows down the particles. We call this "internal friction."

The higher the internal friction, the higher the viscosity.

The particles of the fluid will also have friction against the material over which they are flowing. This, too, causes a change in flow rate.

Although this is university fluid dynamics, let's see if we can explain this diagram.



Can Solids Be Viscous?

Viscosity is a property of fluids, it is related to how well a fluid can flow.

Earlier in the unit we said that a fluid is a liquid or a gas, which would mean that a solid cannot be viscous, because it is not a fluid.

A fluid was any substance that can flow, or that can be poured.

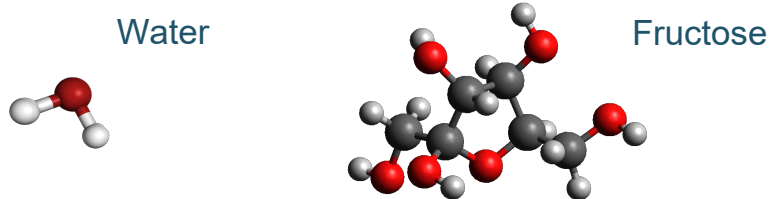
So, why is it that a solid is not a fluid? Can you not pour your cereal into a bowl?

We say we pour our milk in our cereal. We also say we pour our cereal in the bowl. So, what is the difference? Why is cereal not considered a fluid?



Why Does Viscosity Differ?

As discussed, viscosity is a result of particle flow and internal friction. As we know, not all particles are the same. Pictured below are a water molecule and a fructose molecule (corn syrup is a combination of fructose, glucose and water). Looking at these molecules, can you think of why the two substances would have different levels of viscosity?



The internal friction caused by the large bulky shape of fructose molecules is much higher than the internal friction caused by the small compact shape of the water molecules.

Gases have much larger spaces, so regardless of molecule shape, there is more room to allow particles to flow. This means less friction.

Why Is Viscosity Important?

The importance of viscosity may not, at first, seem apparent. However, it does play a very important role in many common applications.

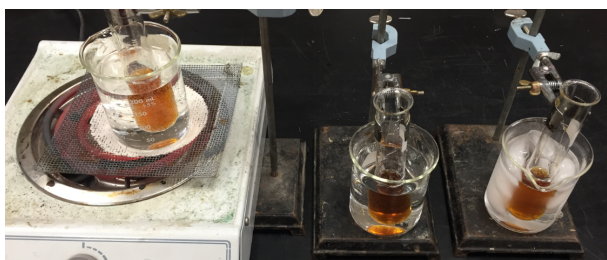
Look at the images below. In a small group, take a few minutes to discuss the importance of viscosity to the applications shown.



Viscosity vs Temperature

As has been suggested in an earlier lesson, temperature will change the viscosity of a fluid. To test that, let's do a demonstration.

I have three test tubes, each filled with corn syrup. One of these test tubes has been sitting in an ice bath, one at room temperature, and one in a hot water bath. What do you predict will happen when we attempt to empty the test tubes?



How does the particle theory support our results?

Viscosity

Homework:

Determine why someone working quality control at a Heinz ketchup factory would need to concern themselves with viscosity. Write a brief paragraph and keep it in your binder.

