



The Society of Rheology K12 Outreach Activities

Science
is
FUN!

The Great Viscosity Race

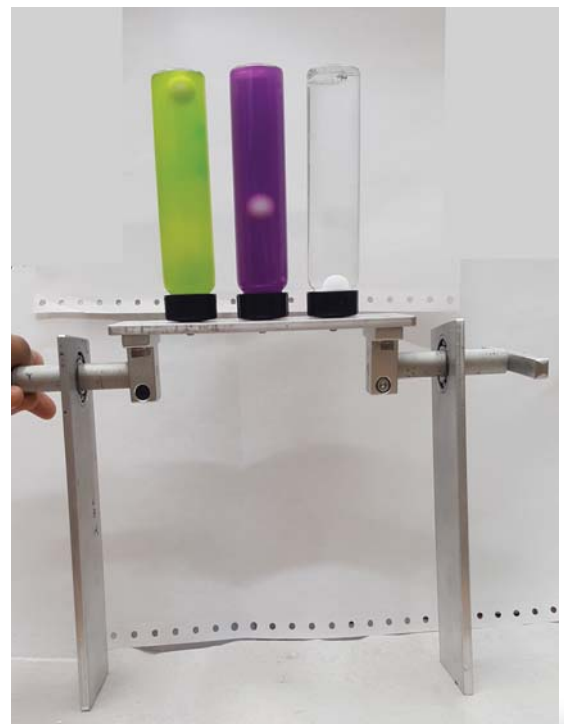
All fluids, like water and oil have property known as viscosity. Viscosity is what makes a fluid feel thick. If you think paddling a canoe in water is hard, you should try it in something more viscous like honey. In this experient, you will work with a number of fluids with different viscosities. You will probe them and play with them and see if you can tell the difference and then you will see how hard it is to move in a thick viscous fluid when we set up the great viscosity race.

What you will need to get started

- Water and corn syrup
- Probes – wooden sticks, plastic spoons, etc.
- Clear plastic cups
- Three tall glass jars with lids and three small spheres or marbles
- Paper towels and a small dust pin and broom

Prepare for the race

1. In the three cups, add a mixture of 80% corn syrup in water to one, 60% corn syrup in water to another and 40% corn syrup in water to the third.
2. Place a sphere/marble in the bottom of each bottle and add enough of each of the three liquids to fill the bottles to the top. Place the lid on the bottles and try to avoid trapping air bubbles.
3. You can add some food coloring for fun.
4. If you have one of the kits, a stand will be included so that you can flip all three bottles over simultaneously. If you don't have the stand you can flip the bottles over one at a time and use a stopwatch to determine the time for the sphere to settle to the bottom.
5. Other liquids like pure water, honey and molasses can be brought along for additional comparison





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Let's experiment!

1. Using a probe (stick, spoon, etc.) place it in each of the three different liquids and move it around. Poke it, prod it and mix it. What do you feel? Are they the same? Are they different? How are they different?
2. Using your spoon, try to scoop some fluid out of the cup? Now pour it back into the cup. What do you see? Are these fluids the same or different?
3. Make a prediction. What sphere will win the race? How long will each sphere take to settle?
4. Now let's flip over the bottles. If you can, flip them all over at the same time and watch the spheres fall. Which sphere won? Were you right?



How does it work?

All fluids have a property known as viscosity—the measurable thickness or resistance to flow in a fluid. Honey and ketchup are liquids that have a high resistance to flow, or a high viscosity. Water has a low viscosity. Sir Issac Newton showed that the stress (or force per unit area) that a fluid imparts on a moving object (car, plane, boat or sphere) is related to the shear rate in the fluid (or the velocity over a distance across which the fluid is deformed or sheared) by the fluid's viscosity. Increase the viscosity and the shear stress (or resistance to flow) increases. Decrease the viscosity and the shear stress (or resistance to flow) decreases. That's why it is harder to swim in honey than it is to swim in water.

