TRICKS WITH LIQUID DENSITY

STUDENT WORKSHEET

OBJECTIVES

1. Understand that liquids have different densities
2. Use this understanding to create a seven layer density column

BACKGROUND INFORMATION

Most of us have seen how oil floats on water. This is because of the different densities of oil and water. Different materials or liquids have different densities. So the exact same volume of two liquids may actually have different masses and therefore different densities. Density is defined as mass per unit volume. The table below has the density values for some common materials. The liquids with a higher density (weigh more) will sink below the liquid with a lower density (weighs less).

Material	Density
Honey	1.36
Dark maple syrup	1.37
Light maple syrup	1.33
Dish liquid	1.03
Water with food colouring	1.00
Vegetable oil	0.91
Rubbing alcohol	0.87
Baby oil	0.82
Lamp oil	0.80

WHAT YOU NEED

Part 1

- 200mL measuring cylinder
- Food colouring
- Rubbing alcohol
- Honey
- Water
- Maple syrup
- Blue Dawn Dish liquid
- Lamp oil or baby oil
- Vegetable oil

Part 2

- Food colouring
- Alcohol
- Water
- 2 x clear glasses
- Drink coaster/cardboard

WHAT TO DO

Part 1

1. Start the experiment by adding some food colouring to the water and the alcohol. Choose colours which are different from the other liquids being used to help differentiate between them. Eg. Red in the water and green in the rubbing alcohol, purple in the baby oil.
2. Work out which order you should pour the liquids in by checking the density table above.
3. Carefully pour 20mL of each of the liquids into the measuring cylinder. It is very important that you pour them in the order above.

4. Pour the liquids slowly and into the centre of the cylinder. If the liquids mix a little, the layers will even themselves out due to the different densities.
5. Observe what happens.

Part 2 Changing places trick

1. Pour the alcohol into one glass and the water into the other
2. Pour some food colouring into the alcohol to help differentiate between the two liquids
3. The glass with the alcohol will remain upright
4. Place a drink coaster on top of the glass containing the water, holding the coaster tightly invert the glass and place it directly on top of the other
5. Now very carefully pull the coaster slightly to one side so that there is a small gap about 2mm wide for the liquids to mix
6. Now observe what you see (should take about 10mins)

QUESTIONS

1. What order do you need to pour the liquids in, in order to keep the liquids separate? *Honey, light maple syrup, dish liquid, water, vegetable oil, rubbing alcohol, lamp oil/baby oil.*
2. How and why are the liquids kept separate? *The liquids are separated because they are of different densities.*
3. Are the liquids with the higher densities at the top or the bottom of the column? *At the bottom*.
4. In part 2 how does this illusion work? *Because of the different densities of water and alcohol. Water is "heavier" or has a greater density and therefore it is forced to the bottom glass.*

REAL WORLD APPLICATIONS OF LIQUID DENSITY

Cleaning up oil spills: In the event of an oil spill, the density of the oil makes cleaning up a little easier. Some ways that the oil is removed include lighting the surface of the water so that the oil burns off or using skimmers to skim the surface removing the majority of the spill.

CURRICULUM CONCEPTS ADDRESSED

Essential Learnings: Natural and processed materials

By the end of year 5

-Materials are used for a particular purpose because of their specific properties.

By the end of year 7

-Properties of a material will vary according to the type and quantity of components that make up its structure.

RESOURCES USED TO DEVELOP THIS ACTIVITY

1. Steve Spangler Science. (2008). *Seven Layer Density Column*. Retrieved October 30, 2008, from http://www.stevespanglerscience.com/experiment/seven-layer-density-column
2. *Neat Whiskey Trick* (2008).Retrieved October 30, 2008, from http://au.youtube.com/watch?v=8gH4q5Fmrpg

Image courtesy of: Steve Spangler Science. (2008). http://www.stevespanglerscience.com/experiment/seven-layer-density-column