**Lesson 6 – Activity Sheet Answers**

**Density of Liquids and Why they Float or Sink**

**Part 1 – Calculating the Density of Different Volumes of Water**

1. **In Lesson 3, Part 3, you measured the mass of 100 mL, 50 mL, and 25 mL of water. If you made those measurements, put your results for mass in the chart below and calculate the density for each sample.**

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| --- |
| **Finding the density of different volumes of water** |
| Volume of water (mL) | 100 milliliters | 50 milliliters | 25 milliliters |
| Mass of water (g) | 100 g | 50 g | 25 g |
| Density of Water (g/cm3) | 1 g/cm3 | 1 g/cm3 | 1 g/cm3 |

1. **What do you notice about the density of each sample of water?**

The density of each sample is 1 g/cm3. They are all the same.

1. **Now make a graph that compares the mass & volume (density) of the 3 samples of water. Use your “Graphing Checklist” to makes sure everything is included and in the right location! Draw the “best fit line” you can between the three points.**

**Put Volume on the x-axis, and Mass on the y-axis.**



1. **Based on your “best fit” line, what would the mass of 34 ml of water be? Explain how you know:** The mass of 34 mL of water would be 34 grams.

Since the density of water is 1 g/cm3, and a cm3 is the same as a mL, every mL has a mass of 1 gram. Therefore, 34 mL would have a mass of 34 grams.

You could also go to 34 mL on the x-axis and move straight up until you hit the line. This point would be at 34 grams on the y-axis.

**Part 2 – Comparing the Density of Water, Oil, and Alcohol**

The data below are based on using a plastic 50 mL graduated cylinder. The alcohol used was 91% isopropyl alcohol. The oil was vegetable (corn) oil.

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| --- | --- | --- | --- |
|  | **Oil (25 mL)** | **Water (25 mL)** | **Alcohol (25mL)** |
| Mass of empty graduated cylinder (g) | 6.8 g | 6.8g | 6.8 g |
| Mass of graduated cylinder + liquid (g) | 29.2 g | 31.8 g | 26.5 g |
| Mass of Liquid (g) | 22.6 g | 25 g | 19.7 g |
| Density of Liquid (g/cm3) | .9 g/cm3 | 1 g/cm3 | .78 g/cm3 |



1. **When your teacher poured the oil, water, and alcohol into a graduated cylinder, explain why the oil floated on the water and the alcohol floated on the oil.**

The alcohol floats on the oil because it is less dense than the oil. The water sinks in the oil because it is more dense than the oil.

***EXPLAIN IT WITH ATOMS & MOLECULES***

1. **Water molecules are smaller and have less mass than alcohol and oil molecules. Explain why water is more dense than alcohol and oil.**

Water is more dense than alcohol or oil because its molecules can pack closely together, in the same volume than either alcohol or oil. In addition, oil is made up of carbon and hydrogen atoms while water is made up of oxygen and hydrogen atoms. Because water contains a heavier atom, we might expect it to be more dense than oil. Although alcohol also contains oxygen atoms, its molecules are not able to pack together as tightly as water molecules, and so it is less dense than water.

***TAKE IT FURTHER***

**The fact that the material in the Lava Lamp sometimes floats and sometimes sinks probably has something to do with its density.**

**What can you say for sure about the density of the blob material compared to the surrounding liquid, at the bottom of the Lava Lamp and then at the top?**

At the bottom of the Lava Lamp, the blob material must become less dense than the surrounding liquid because the blobs rise and float up into the liquid. But when the blob is near the top of the Lava Lamp, the blob must become more dense than the surrounding liquid because the blob sinks.