Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Buoyancy and Density Activity**

**Directions:** Go to the following website to use an interactive simulation to work with buoyancy and density.

**http://phet.colorado.edu/sims/density-and-buoyancy/buoyancy\_en.html**

**Procedure:**

*Getting Familiar*

1. On the Intro screen, mess with the apparatus, changing the blocks, observing what happens when the mass, volume and densities are held constant.
2. Check and uncheck the boxes under “Show Forces” to see where they act.

**Intro:** Give a brief description of what the relationship is between mass, volume and density of each object and how it affects whether the object will sink or float.

*Lab Setup*

1. Click over to the Buoyancy Playground and begin the lab.
2. There are 5 different fluids to choose from in the lab and five different types of materials. (Styrofoam, wood, ice, brick and aluminum)
3. Use the table supplied to organize your work.

*Lab Procedure:* ***Part 1***

1. In each of the scenarios below, determine first, by predicting, whether the object will sink or float. **Use a mass of 4.5 kg.**
2. Test each object once you have predicted and record the results.

**Part 1:** Write an “S” for sink or an “F” for float. Predictions first!!

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Air** | | **Gasoline** | | **Olive Oil** | | **Water** | | **Honey** | |
|  | **Pred.** | **Act.** | **Pred.** | **Act.** | **Pred.** | **Act.** | **Pred.** | **Act.** | **Pred.** | **Act.** |
| **Styrofoam** |  |  |  |  |  |  |  |  |  |  |
| **Wood** |  |  |  |  |  |  |  |  |  |  |
| **Ice** |  |  |  |  |  |  |  |  |  |  |
| **Brick** |  |  |  |  |  |  |  |  |  |  |
| **Aluminum** |  |  |  |  |  |  |  |  |  |  |

*Lab Procedure:* ***Part 2***

1. For each of the objects, determine the density at which it sinks in kg/L.
2. **Use a mass of 4.5 kg.**
3. List this value in the table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Air** | **Gasoline** | **Olive Oil** | **Water** | **Honey** |
| **Styrofoam** |  |  |  |  |  |
| **Wood** |  |  |  |  |  |
| **Ice** |  |  |  |  |  |
| **Brick** |  |  |  |  |  |
| **Aluminum** |  |  |  |  |  |

*Lab Procedure:* ***Part 3***

1. In this part of the lab, determine the amount of buoyant force that is acting on each block of **mass 4.5 kg.**
2. Determine how you will find the amount of buoyant force or “buoyancy.” Perhaps try using the two scales given in the lab.
3. Record these values in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Air** | **Gasoline** | **Olive Oil** | **Water** | **Honey** |
| **Styrofoam** |  |  |  |  |  |
| **Wood** |  |  |  |  |  |
| **Ice** |  |  |  |  |  |
| **Brick** |  |  |  |  |  |
| **Aluminum** |  |  |  |  |  |

**Conclusions:**

1. In the part 1 of the lab, what happened when the ice was placed in olive oil?
2. In part 2 of the lab, which of the objects had the greatest density?
3. From part 3, what is the relationship between the buoyant force and the weight of an object when the object:
   1. Sinks
   2. Floats
4. How is it possible to have two objects of the same mass where one object sinks and the other object floats? Use your observations from the Intro part of the lab to answer this question.