

## 1.2, Density; Calculations, Concepts, and Comparisons

### Density:

#### Define density and units.

- Definition: Amount of matter in a given volume of substance; that is mass/volume ( /, per, to divide)
- Units and expression; g/ml at 20°C (normal temperature)
- Demonstrate with balance and small 1 cm<sup>3</sup> cube.
- Demonstrate with equal volumes of different substances; cubes.
- Demonstrate with ice (Bic pen barrel) in water and alcohol. If pen barrel is larger will it sink or float?
- CO<sub>2</sub> in fire extinguisher
- Demonstration: Have student volunteer determine the density of water at lab bench. (Intensive property)
- What volume of H<sub>2</sub>O is equal to 2 ml of Au?

#### Concepts and Comparisons:

- What is effect of T on volume and therefore density? If T increases, Volume increases, Density decreases.
- Give densities of Al (2.70 g/ml), Pb (11.34 g/ml), and Au (19.32 g/ml) Table on P. 47
  - If one g of each which has the greatest volume? Al
  - If one ml of each which has the greatest mass? Au
  - [Power Point questions](#) (on computer / TV)

#### Calculations:

- Identify units and sort data!
- Density is a converter from mass to volume and vice-versa.
- Algebraic manipulations, Calculate and find:
  - a.) density of a substance in which 36.0 cm<sup>3</sup> has a mass of 107.26 grams
  - b.) what volume of mercury is needed for a 500g mass sample?
  - c.) What mass of oxygen is contained in a 3.0 L flask? (standard pressure)

#### Homework Practice:

Worksheet: Density Calculations

#### Density Laboratory

**Laboratory Investigation: Determine the Density of several types of substances**

**Lab:** prelab responsibilities for completion of report.

1. Which has the greater? (Answer **same** if they are equal)

Mass:

- a.) \_\_\_\_\_ 5.0 grams of Pb or 5.0 grams of Al
- b.) \_\_\_\_\_ 1.0 L H<sub>2</sub>O or 10 ml H<sub>2</sub>O
- c.) \_\_\_\_\_ 50.0 ml of Pb or 50.0 ml of Al
- d.) \_\_\_\_\_ 30 grams Al or 30.0 grams Au

Volume:

- a.) \_\_\_\_\_ 1.0 gram Au or 1 g Al
- b.) \_\_\_\_\_ 270 g Al or 270 g H<sub>2</sub>O
- c.) \_\_\_\_\_ 270 ml of Al or 270 ml H<sub>2</sub>O
- d.) \_\_\_\_\_ 100g H<sub>2</sub>O or 100 ml H<sub>2</sub>O

Density:

- a.) \_\_\_\_\_ 2 grams Au or 2000 grams H<sub>2</sub>O
- b.) \_\_\_\_\_ 10 g Al or 100 g Al
- c.) \_\_\_\_\_ 50 grams/10 ml or 50 grams/ 5 ml
- d.) \_\_\_\_\_ 20 grams/20 ml or 5 grams/ 20ml