Density and Energy   **Name** _____

| **Density** is the amount of matter (g) per given volume (mL or cm³) | **Energy** is the capacity to do work or to supply heat |

1. A cork is placed into a container of water and floats on the water. Is the cork more or less dense than the water? __less___

2. What is the density of ethanol if 177.5 g of ethanol is in 225.0 mL of water?   _____

$$d = \frac{m}{V} = \frac{177.5\ g}{225.0\ mL} = 0.7889\ g/mL$$

3. Heptane, C_7H_{16}, has a density of 0.684 g/mL. What volume, in mL, is required to obtain 22.65 g of heptane?   _____

$$V = \frac{m}{d} = \frac{22.65\ g}{0.684\ g/mL} = 33.1\ mL$$

4. A solid metal sphere has a radius of 43.2 mm. If the sphere has a mass of 284.2 g, what is the density of the sphere? ($V_{sphere} = 4/3\pi r^3$)

$$V = \frac{4}{3}\pi \times \left(43.1\ mm \times \frac{1\ cm}{10\ mm}\right)^3 = 337.7\ cm^3$$

$$d = \frac{284.2\ g}{337.7 cm^3} = 0.842\ g/cm3$$

5. A 153 g baseball has a speed of 39.5 m/s. What is the kinetic energy, in J, of the baseball?

     m = 153 g = 0.153 kg
     E_k = ½ mv²

½ x 0.153 kg x (39.5 m/s)² = 119 $\frac{kg \cdot m^2}{s^2}$ = 119 J

6. An oxygen atom has a mass of 5.3×10^{-26} kg. If the atoms is moving at a speed of 425.5 m/s, what is the kinetic energy of the oxygen atom in J?

     E_k = ½ mv²

½ x (5.3×10^{-26} kg) x (425.5 m/s)² = 4.80×10^{-21} $\frac{kg \cdot m^2}{s^2}$ = 4.80×10^{-21} J