Mass, Weight & Density

Name: _____ Date: _____

Answer the following questions based on your reading and the notes you took from class.

$$\vec{W} = \vec{F_g} = m\vec{g}$$

where g= the acceleration due to gravity

$$1\ kg = 2.2\ lbs$$

$$D = \frac{m}{V}$$

Thinking, Inquiry and Problem Solving

1. a) Write your mass in pounds: _____ 180 lbs _____.

    b) Convert this weight into kg.

    180 ÷ 2·2   =   81,8 Kg

    c) Calculate your weight in Newton's on Earth?

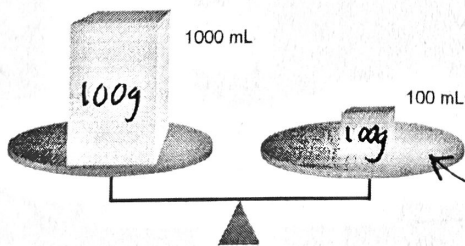 $F_g = mg = (81.8)(9.8) = \boxed{802\ N}$

    d) Calculate your weight in Newtons on the moon where the acceleration of gravity is 1.67 m/s/s.

    $F_g = mg = (81.8)(1.67) = \boxed{137\ N}$ less weight but same Mass

2. Which way would the balance tip? Explain. Use this example to explain the difference between mass and volume. Which object is denser? Explain how you know this.

    1000 mL   100g   100 mL   100g

    It will remain BALANCED

    Mass are the same!

    (second cube is More dense : $\dfrac{\text{same Mass}}{\text{More volume}}$

3. The density of a steel object on Earth was found to be 0.564 kg/cm³. If you had a block of this object with dimensions 23 cm x 8 cm x 3 cm.

a) Calculate the **volume** of the block ($l \times w \times h$) in cm³

$$V = (23)(8)(3) = \overline{552\,cm^3}$$

b) Using the volume **calculate the mass** since you know the density.

$$D = \frac{M}{V} \qquad M = DV$$
$$= (0.564)(552)$$
$$\boxed{M = 311\ kg}$$

c) Determine the **weight** (in Newtons and pounds) of this object if it were taken via a spaceship to a new planet where the acceleration of gravity is only 5.4 m/s/s.

$$F_g = Mg$$
$$= (311)(5.4)$$
$$\boxed{F_g = 1679\,N}$$

4. The weight of an object on the surface of Earth is 230 N. The density of the object is 2.34 kg/m³. **Calculate the volume** of the object in m³.

on Earth:

$$F_g = Mg$$
$$M = \frac{F_g}{g}$$
$$= \frac{230}{9.8}$$
$$M = 23.4\ kg$$

$$D = \frac{M}{V}$$
$$V = \frac{M}{D}$$
$$= \frac{23.4}{2.34}$$
$$\boxed{V = 10\ m^3}$$