**The National Orthodox School /Shmaisani**

**Subject: Science/ Physics Title: Density**

**Name: Grade-Section: ……CS**

**Objectives:**

1. **Define Density**
2. **Learn how to calculate density**
3. **Differentiate between the density of regular and irregular solids**
4. **Examine how to calculate the density of liquids**

What is Density?

**Density** is defined as the **mass** (amount of matter) of a substance that is found in a certain **volume.**

How do we calculate density?

$$DENSITY=\frac{MASS}{VOLUME}=kg/m^{3}$$

In our course we will use two units for density:

1. $kg/m^{3}$
2. $g/cm^{3}$

Exercise:

1. A metal cylinder has a mass of 6.20g and a volume of 124 cm**3**. What is the density of the cylinder?
2. What is the mass of an object that has a density of 8$\frac{g}{cm^{3}}$ and a volume of 64 cm3?
3. A piece of tin has a mass of 16.52 g and a volume of 2.26 $cm^{3}$. What is the density of tin?
4. A man has a 50.0 $cm^{3}$ bottle completely filled with 163 g of a slimy green liquid. What is the
density of the liquid?
5. What is the volume of 325 g of metal with a density of 9.0 g/$ cm^{3}$?
6. You have a box that has a volume of 412 $cm^{3}$ and weighs 42g. What is its density?

**Volume of a rectangular shaped object/cube**

To find the volume we use the following rule: Length x Width x Height (L x W x H).

Example:

Find the **volume** in each of the following:

1. A cube has a length of 3 cm. (Note – a cube has six equal sides).

Solution: V = 3 x 3 x 3 = 27 $cm^{3}$.

1. A piece of wood has a length of 10 cm, width of 18 cm, and height of 3 cm.
Solution: V = 10 x 18 x 3 = 540 $cm^{3}$

Check you understanding:

1. A rectangular fish tank is 60.00 cm long, 200.00 mm wide, and 200.00 m deep.
(a) What volume of water can it hold?

(b) What is the mass of the water?

1. Calculate the density of a 500 g rectangular block with the following dimensions:
length=8 cm, width=6 cm, height=5 cm.
2. A gold cube is 150.00 mm long, 10.00 cm wide, and 0.95 m thick. If gold has a density of 19.3 g/$ cm^{3}$, calculate the mass of the gold cube.

**Volume of an irregularly shaped object**

Use a graduated cylinder filled with a fluid.
a) Record the beginning amount of fluid.

b) Drop the object into the graduated cylinder.

c)Record the level of the fluid with the object.

To determine the volume:

**Level of fluid with object – beginning amount of fluid**

Example:

A graduated cylinder is filled to the 30mL mark with water. You drop in a rock. The water level rises to 48mL.

Solution: V = 48mL – 30mL = 18mL= 18 cm**3**

**Check your understanding:**

1. A bead weighs 15 g. You place it in a graduated cylinder that has 20mL of water in it.
After placing the bead in the cylinder, the water level is now at 30mL. What is its
density?
2. An irregular object with a mass of 118 g **displaces** 25mL of water when placed in a graduated cylinder. Calculate the density of the object.
3. A graduated cylinder is filled with water to a level of 40.0 mL. When a piece of copper is lowered into the cylinder, the water level rises to 63.4 mL. Find the volume of the copper sample. If the density of the copper is 8.9 g/cm3, what is its mass?

**Density of Liquids:**

* Just like solids, liquids also have their own characteristic density.
* The volume of a liquid can be measured directly with a graduated cylinder.
* To measure the mass of the liquid we do the following:
	+ An empty measuring cylinder is put on a balance and its mass is found (M1)
	+ The liquid is poured into the measuring cylinder and the mass is found on the balance as (M2)
	+ Thus Mass= M2-M1