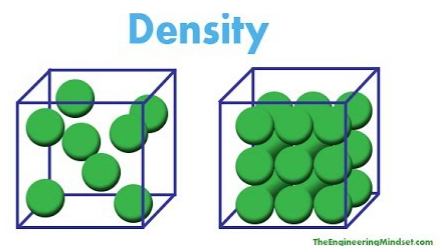


Warm-Up

What is the difference between a physical and chemical change?

Density

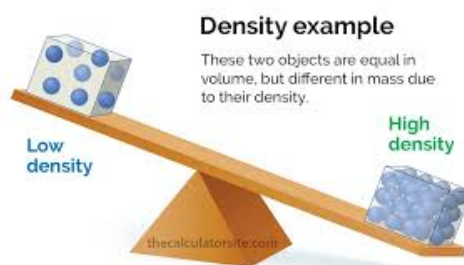


All matter has **mass** and **volume**.

Mass is a measure of the amount of matter an object has. Its measure is usually given in **grams** (g) or **kilograms** (kg).

Volume is the amount of space an object occupies. There are numerous units for volume including **liters** (l), **meters cubed** (m³), and **gallons** (gal).

Mass and **volume** are physical properties of matter and may vary with different objects.



If both pieces of metal are made of the same material the ratio of the **mass** and **volume** will be the same.

We define **density** (ρ) as the ratio of the **mass** of an object to the **volume** it occupies. The equation is given by:

$$\rho = \frac{M}{V}$$

here the symbol M stands for the **mass** of the object, and V the **volume**. **Density** has the units of **mass** divided by **volume** such as **grams** per **centimeters cube** (g/cm^3) or **kilograms** per **liter** (kg/l).

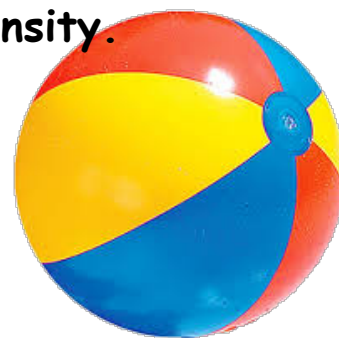
Question # 1 -

A block of wood has a mass of 8 g and occupies a volume of 10 cm³. What is its density?



Question #2

A beach ball has a mass of 10 grams (g) and a volume of 400 centimeters cubed (cm^3). Find the density.



Solve for the unknown in each case.

a) $p = ?$ $M = 6 \text{ kg}$ $V = 3 \text{ m}^3$

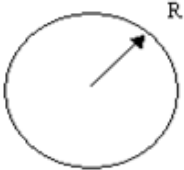
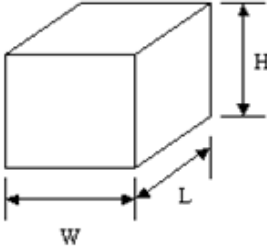
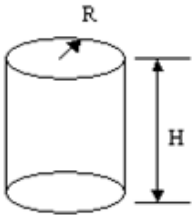
b) $p = 3.5 \text{ g/ml}$ $M = ?$ $V = 20 \text{ mL}$

c) $p = 2 \text{ g/cm}^3$ $M = 20 \text{ g}$ $V = ?$

We can calculate our own **density** if we have the proper means to do so.

We can use scales to give us the **mass** of an object.

To find the **volume** of an object, we can use some known equations to measure the **volume** of various shapes.

		
Sphere	Cube	Cylinder
$V = \frac{4}{3} \cdot \pi \cdot R^3$	$V = L \cdot W \cdot H$	$V = \frac{\pi}{4} \cdot R^2 \cdot H$

When finding the density of water, keep in mind that $1 \text{ g} = 1 \text{ mL} = 1 \text{ cm}^3$

Question #3

The mass is put on a scale and found to be 20kg. If the block has lengths of 5 Centimeters, 10 Centimeters, and 15 Centimeters, what would be the density?

What if our shape has an irregular **volume**? (ie. rock)

If the shape of our object is an irregular shape, we can use an idea called water displacement!!!

If we measure a body of water that we know, then we can measure the change in the water after an object is dropped into it.



So, if we know the **mass** of an object, and we can find the **volume**, then we can calculate the **density**!

Question #4

A cylinder has 10mL of water in it but when a rock is put into it the new reading is 15 mL. If the rock had a mass of 12 grams, what is the density?

Density Worksheet

