

# Properties of Matter

## Matter

- "the stuff everything is made of" OR anything that has mass and takes up space

The "building blocks" of matter

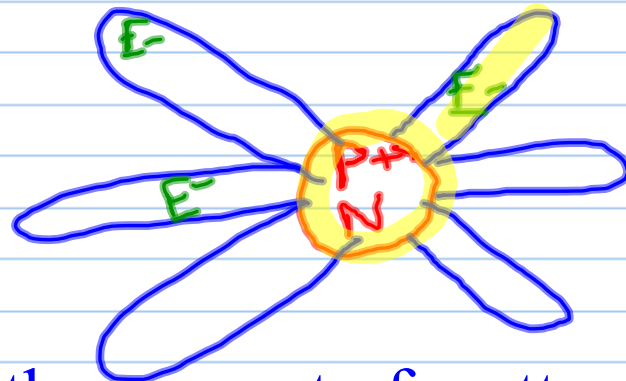
Atoms - the smallest pieces of matter

Protons  
(+)

Neutrons  
(No charge)

Electrons  
(-)

made of



Nucleus: the center of an atom  
- Neutrons and protons are in the nucleus of an atom  
- Electrons orbit the nucleus (electron cloud)

Mass - the amount of matter something is made of

- usually measured in grams (g) [1 kg = ~ 2.2 lbs]

- unlike weight which depends on gravity, the mass of an object doesn't change with differences in gravity

- we find mass using a balance

$$1000g = 1kg$$

Gravity - a measure of the amount of attraction between objects

-the more mass something has, the greater the attraction (and stronger gravitational force)

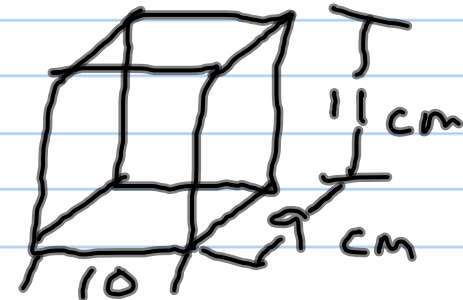
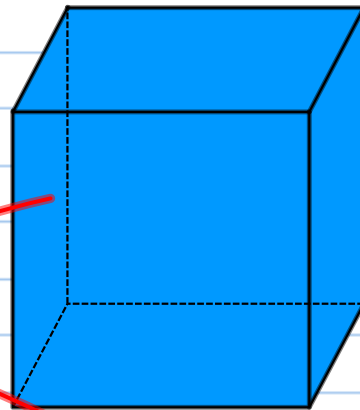
Volume - how much space matter takes up

-the simple math formula for regular geometric shapes is

LENGTH x WIDTH x HEIGHT

length x width x depth

mL is the scientific unit for measuring Volume



$$9 \text{ cm} \times 10 \text{ cm} \times 11 \text{ cm}$$

$$90 \text{ cm}^2$$

$$990 \text{ cm}^3$$

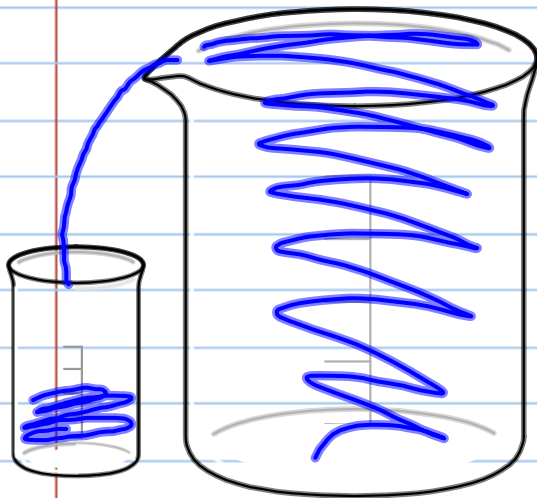
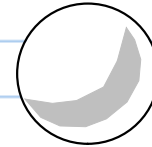
We can measure volume in cm<sup>3</sup> or L (liters)  
cubic centimeters

$$1 \text{ cm}^3 = 1 \text{ mL}$$

## Using **Water Displacement** to Find the Volume of an Object

No two objects can occupy the same space at the same time.

You can use overflow to find out the volume of an object because of water displacement; putting an object in water will push some of the water out of the way... The volume (measure of the amount) of water that was pushed out of the way equals the volume of the object:



1. Fill a container to capacity (all the way to the top)

2. Insert the object you wish to measure and catch the overflow (water that spills out)

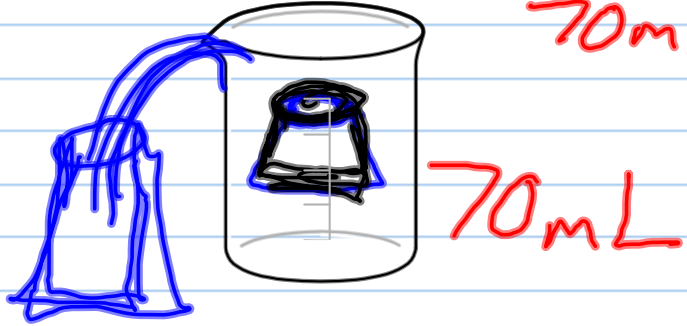
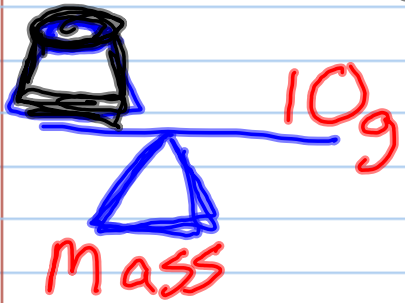
3. Measure the amount of the overflow (this equals the object's volume)

Density - the amount of mass of an object compared to its volume  
(a measure of how closely packed the atoms/molecules are)

hat  
'd I  
Sa  
y

-density is usually measured in g/mL (grams per milliliter)

$\text{Mass} \div \text{Volume}$



$$\frac{10g}{70mL} = .143 \text{ g/mL}$$

-matter that has a higher density than the surrounding matter will...

$\star$  Triple beam balance <sup>sink</sup> measure mass

pure water has a density of 1g/mL

Pure, (distilled) water has a density of 1g/mL