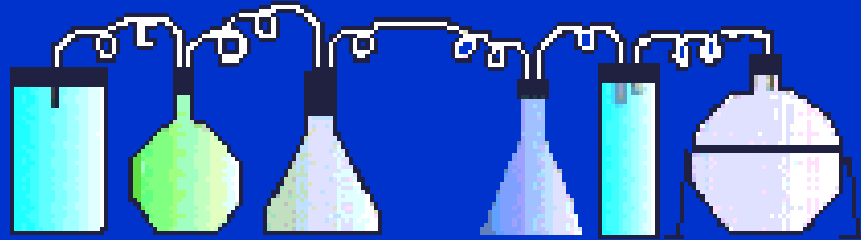


# Ch 1

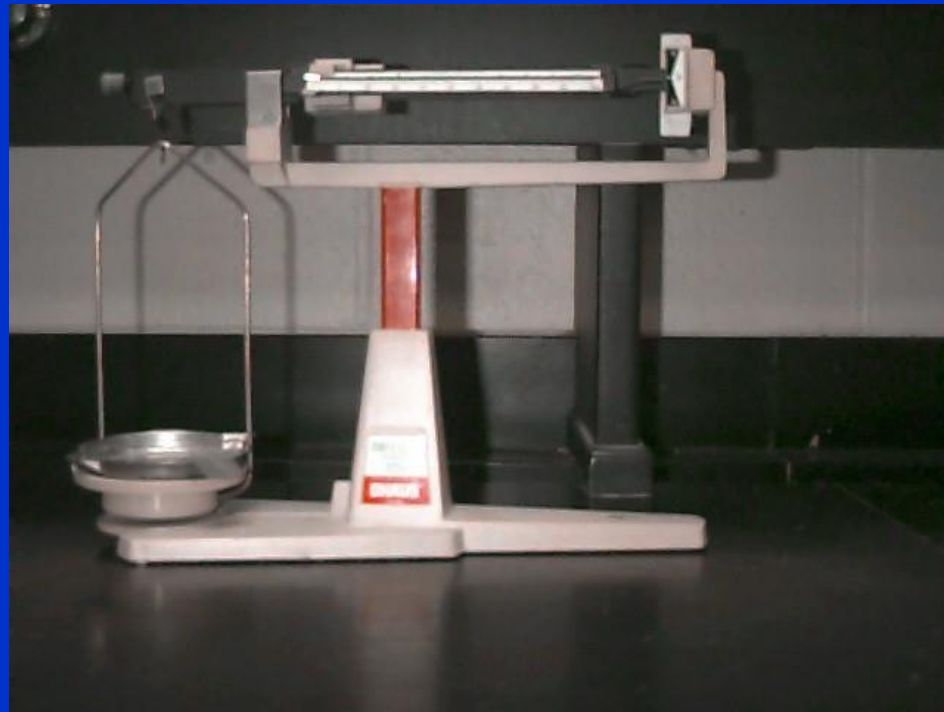
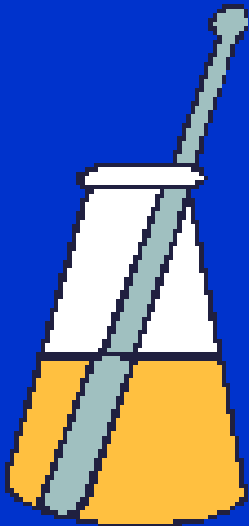
## Introduction to Matter

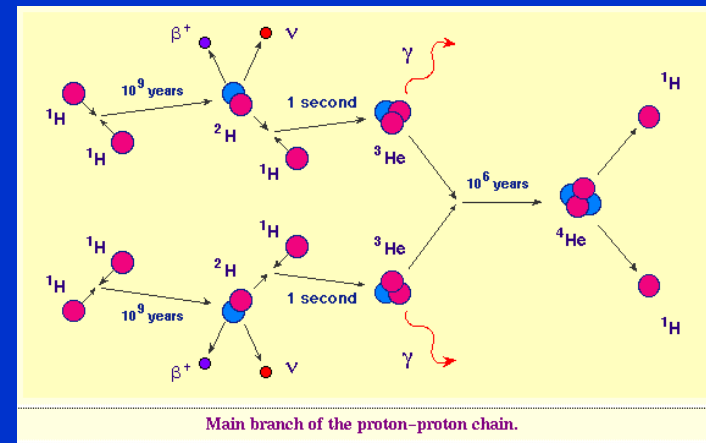
### 1.1 Matter Has Mass & Volume



# All objects are made of matter

Matter—anything that has mass & takes up space

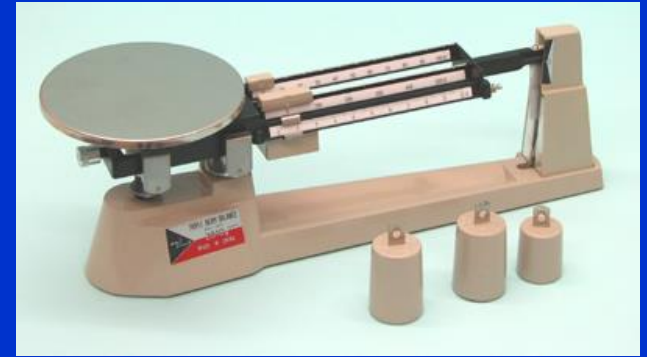




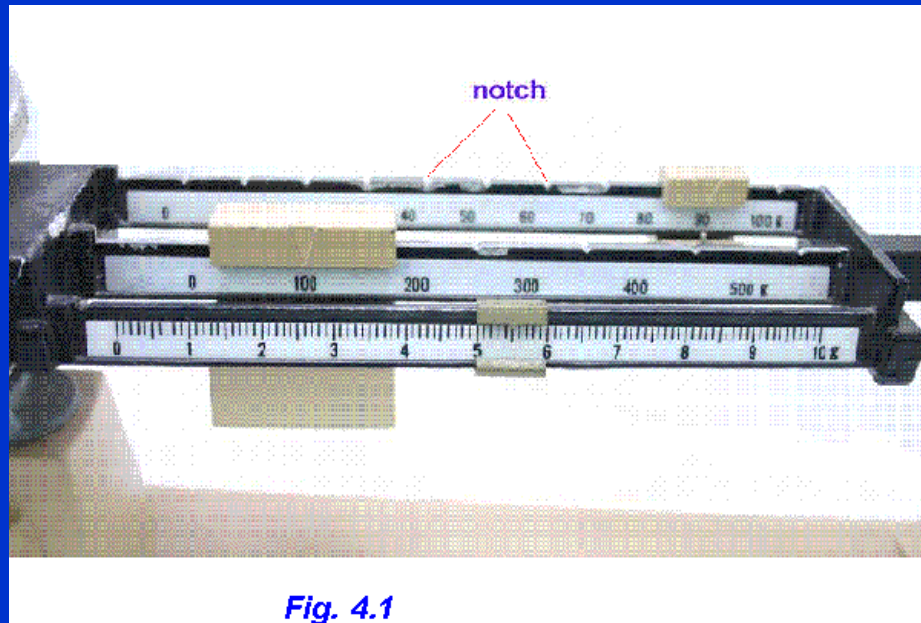
- All solids, liquids, & gases, are made of matter
- Energy is NOT matter (light, heat, sound)



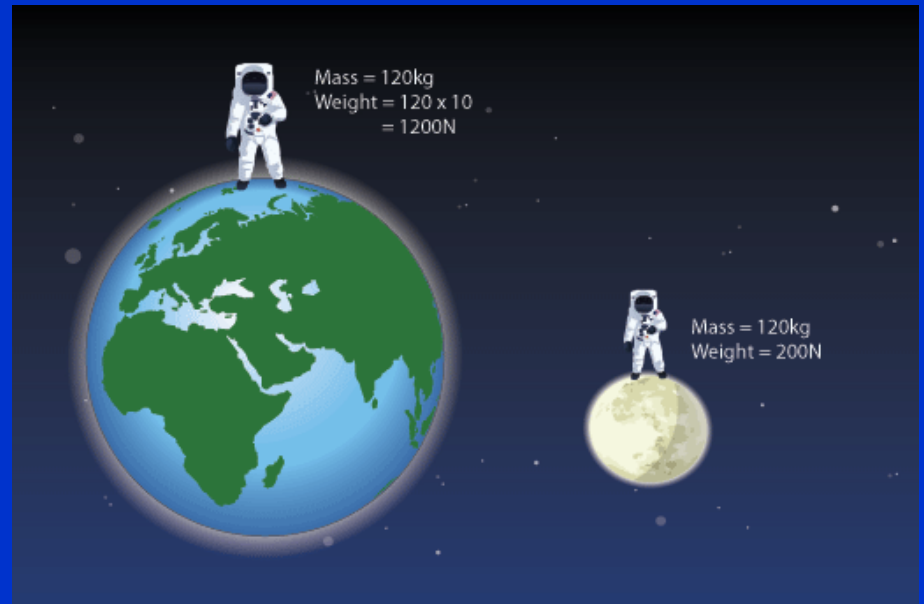
Mass is a measure of the amount of matter



- Metric units of mass are gram, kilogram, etc.



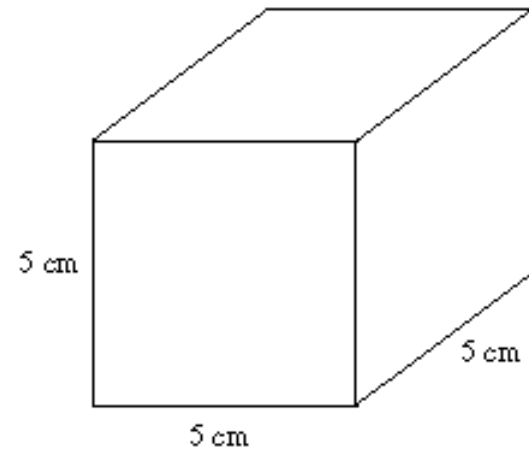
*Fig. 4.1*



- Weight does NOT equal mass! It is the downward pull of gravity on an object
  - An object's weight is proportional to gravity
  - Weight is measured in Newtons (in the metric system)  
 $1 \text{ pound} = 4.4482216 \text{ N}$

# Volume is a measure of the space matter occupies

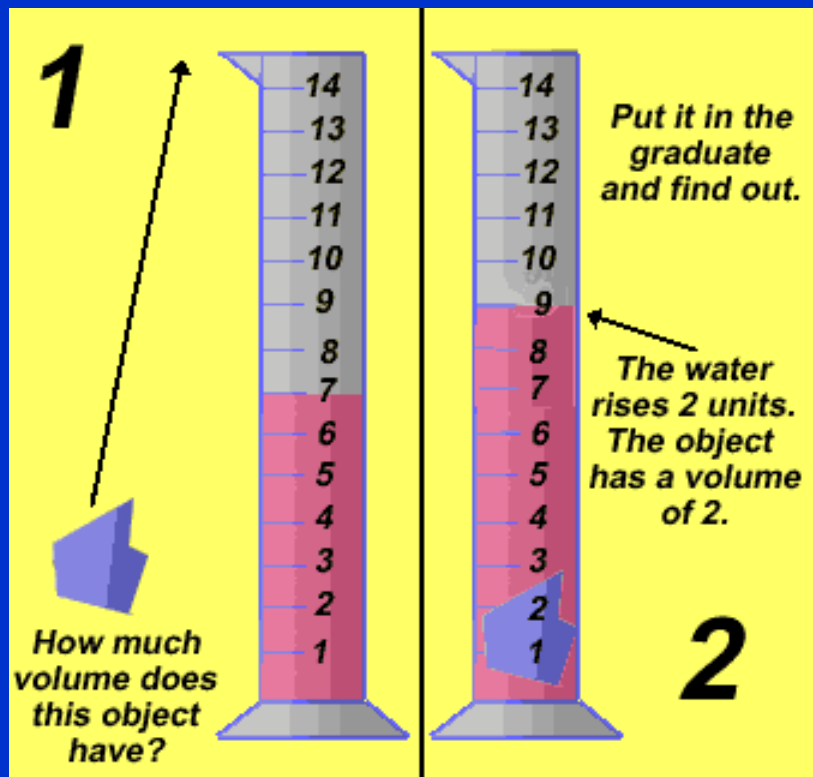
- Units = cubic cm, liter, mL, etc.
- May be measured 2 ways
  - Formula, for particular shapes
    - Volume of a cube =  $L \times W \times H$



- Displacement, for objects with irregular shapes

# Volume by Displacement

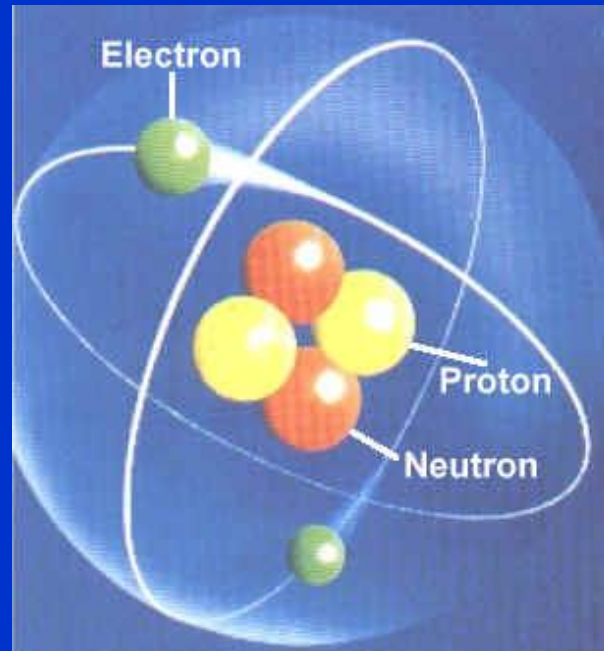
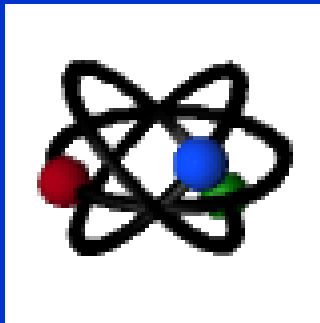
*formula* →



← *displacement*

# 1.2 Matter is made of atoms

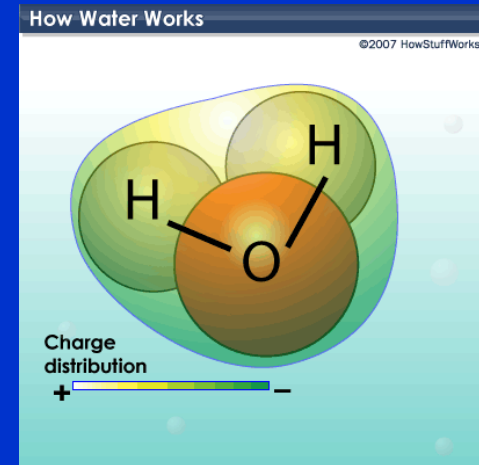
- Atoms are extremely small
  - Scientists have identified more than 100 kinds





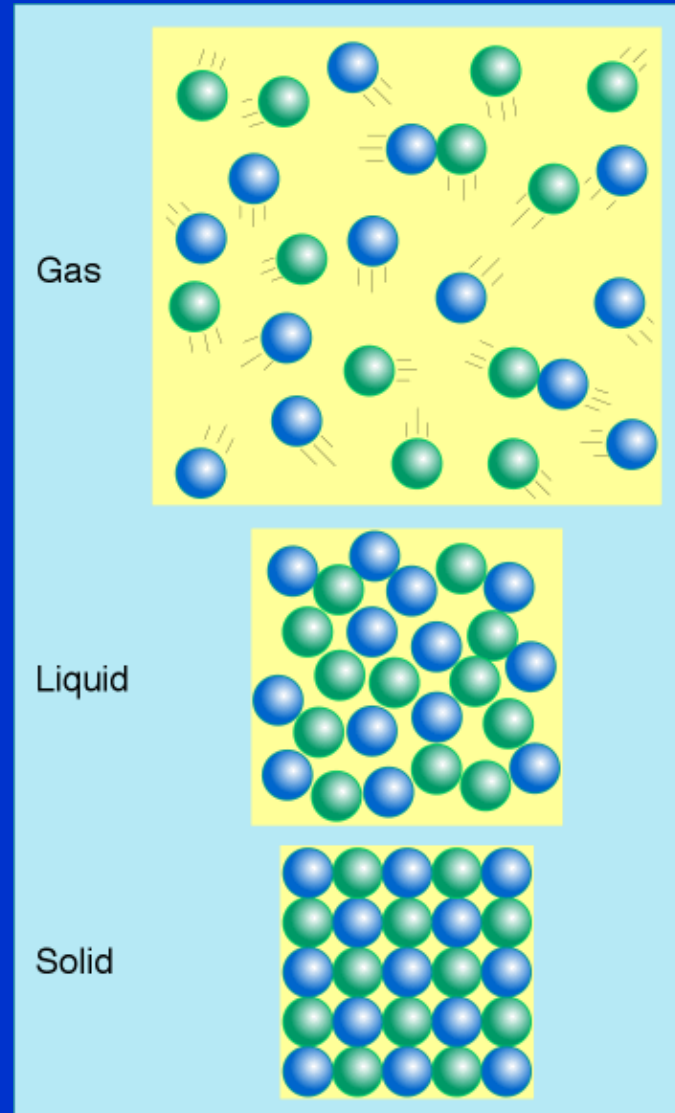
# Atoms combine to form molecules

- A molecule is made from 2 or more atoms (bonded together)
  - Water = 2 hydrogens for every 1 oxygen bonded together
  - Ozone = 3 oxygens bonded together



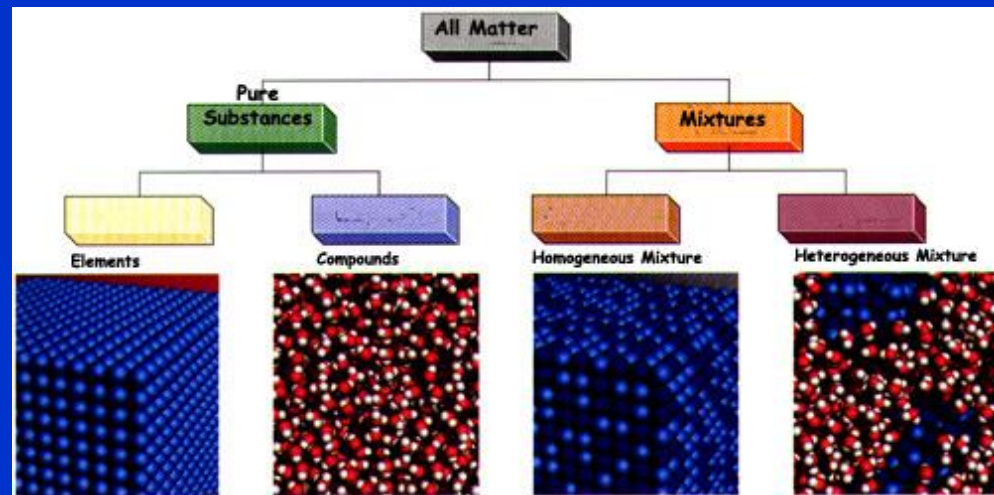
# Atoms & molecules are always in motion

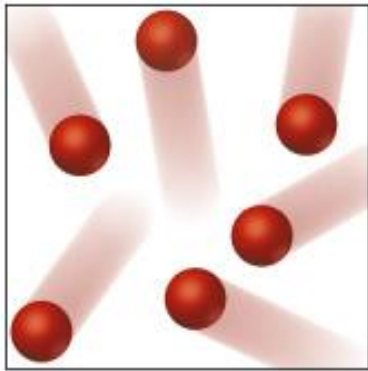
- Gases—molecules move fastest (bounce off each other)
- Liquids (slide past each other)
- Solids—molecules move slowest (twist or vibrate)



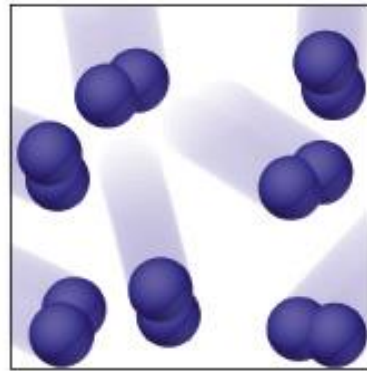
# 1.3 Matter combines to form different substances

- Matter can be pure or mixed
  - Pure = contains only 1 type of substance
  - Mixed = contains 2 or more substances mixed together

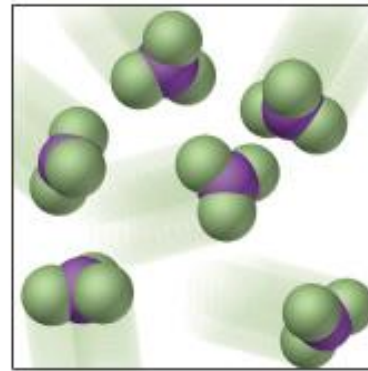




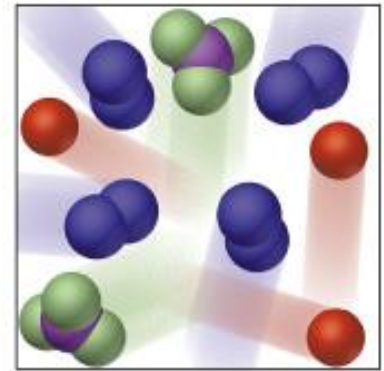
(a) Atoms of an element



(b) Molecules of an element

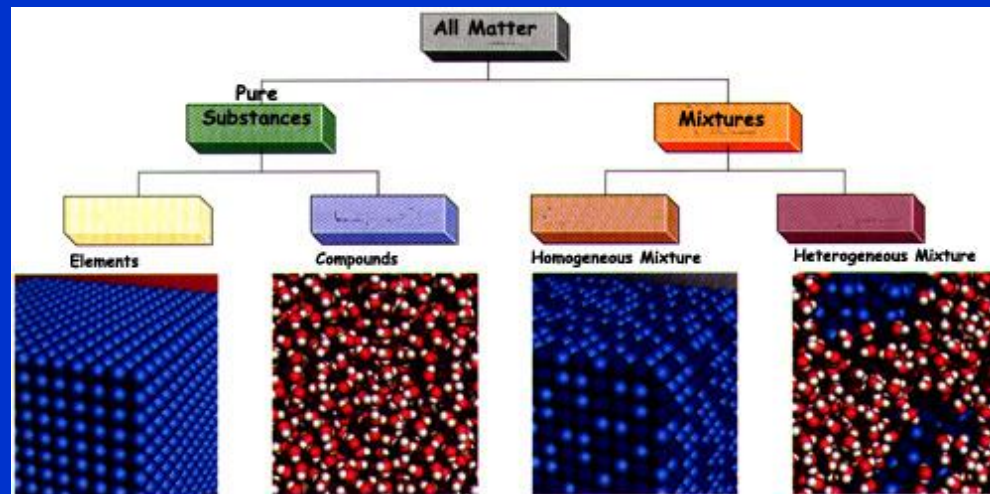


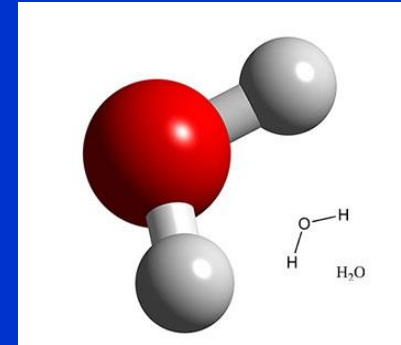
(c) Molecules of a compound



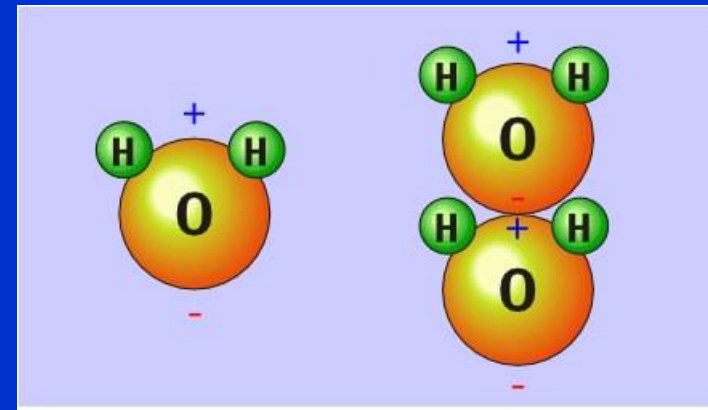
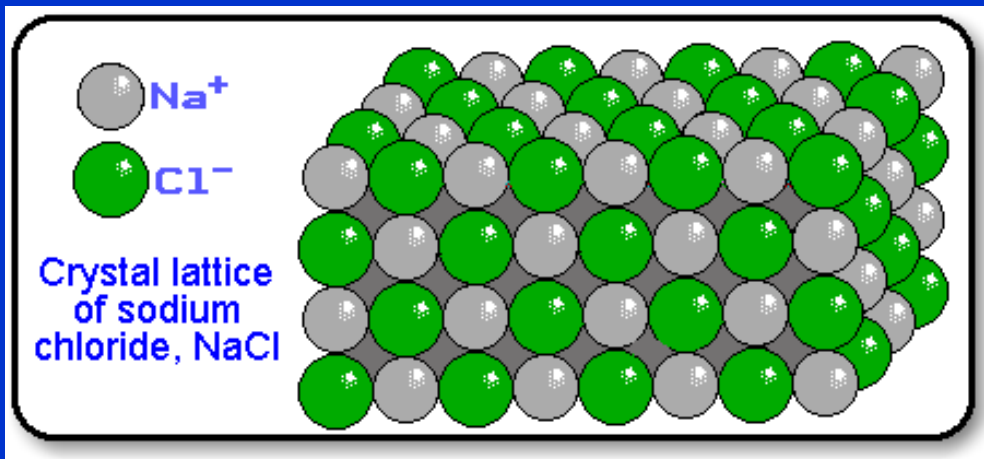
(d) Mixture of elements and a compound

- Element—contains only 1 kind of atom (ex=gold)





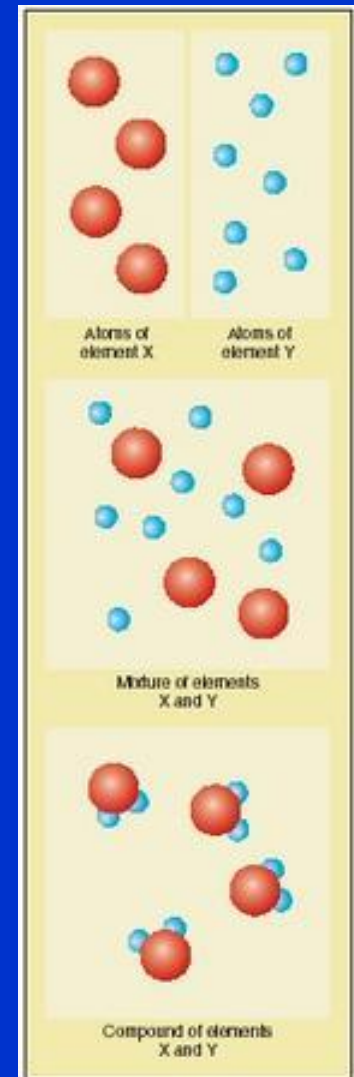
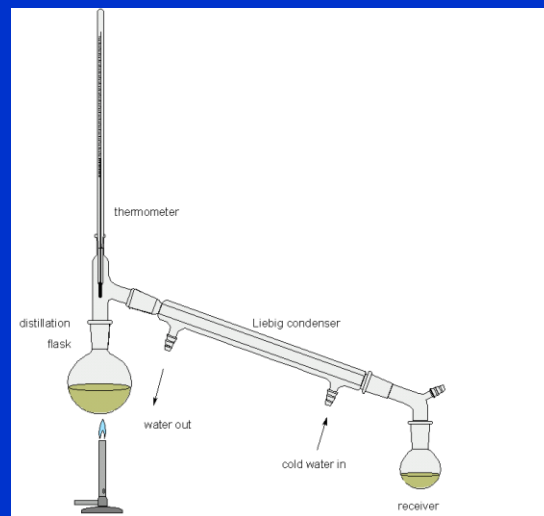
- Compound—consists of 2 or more different types of atoms bonded together → ex= H<sub>2</sub>O & NaCl





- Mixture—combination of different substances that retain their individual properties & can be separated by physical means (filters, distillation, etc.)

*Simple Distillation* →

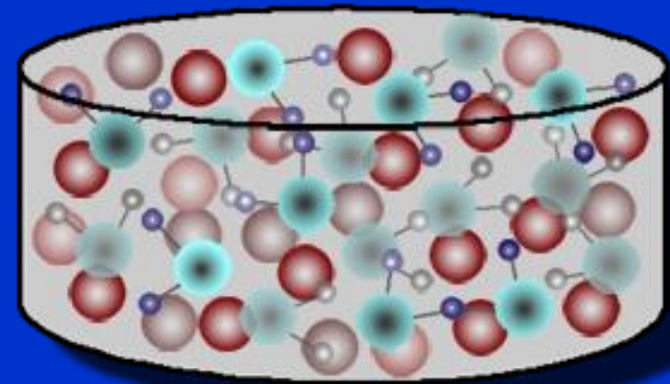
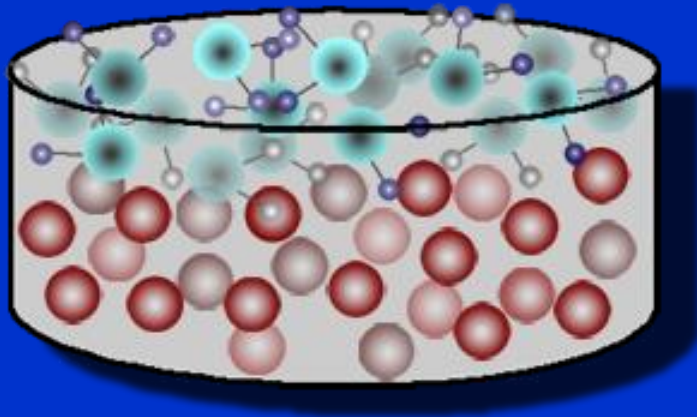




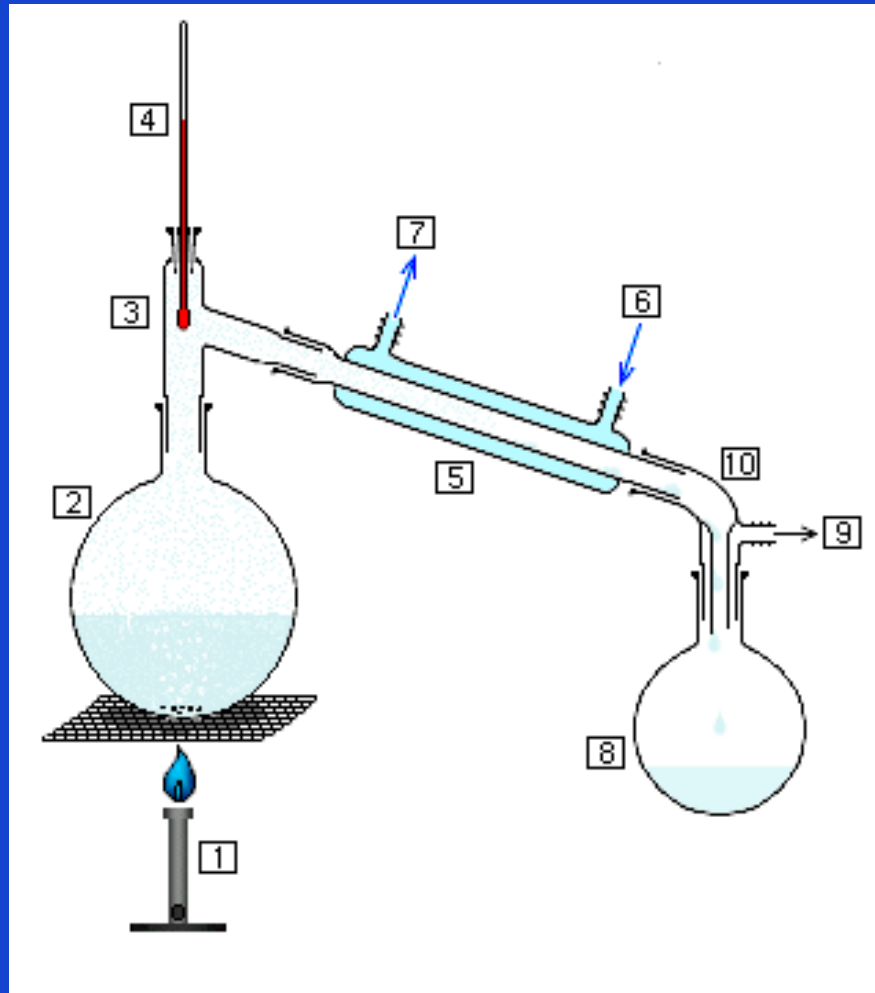
## 2 types of mixtures



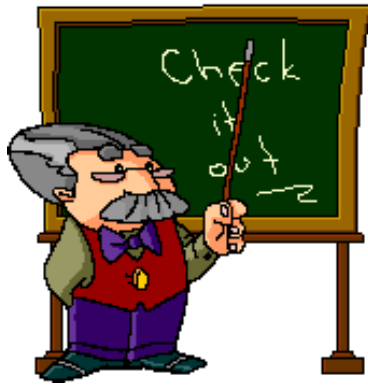
1. Heterogeneous—particles are not evenly dispersed
2. Homogeneous—mixed evenly throughout



# Simple Distillation







## 1.4 Matter exists in 4 different states

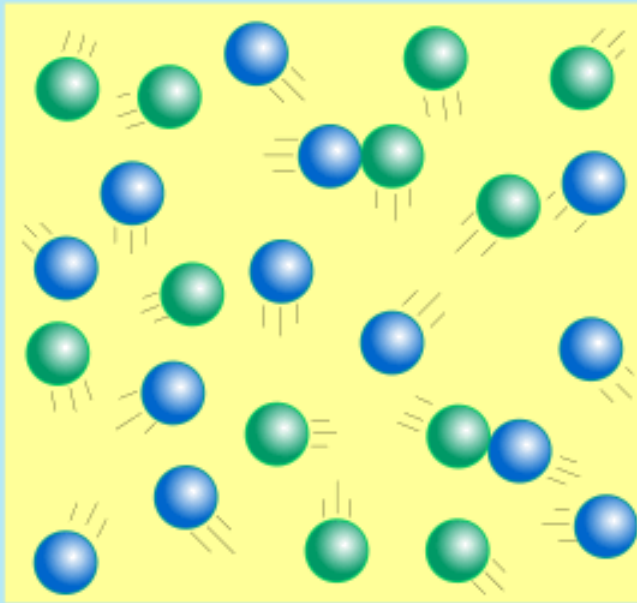
1. Solid—particles are close together; they vibrate  
--has a fixed volume & shape  
--solids are considered to be frozen
2. Liquid—particles are further apart; they can slide past each other  
--has a fixed volume but no fixed shape



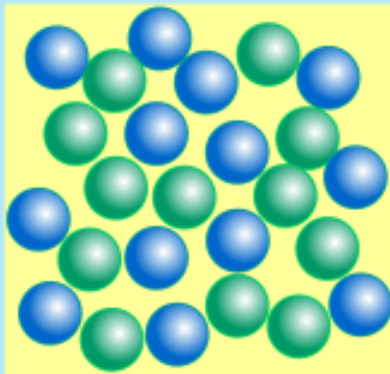


3. Gas—particles are not close together; they move about freely
  - have no fixed volume or shape
  - \*\*Increasing temp, increases air pressure
4. Plasma—electrons jump energy levels & emit light or energy

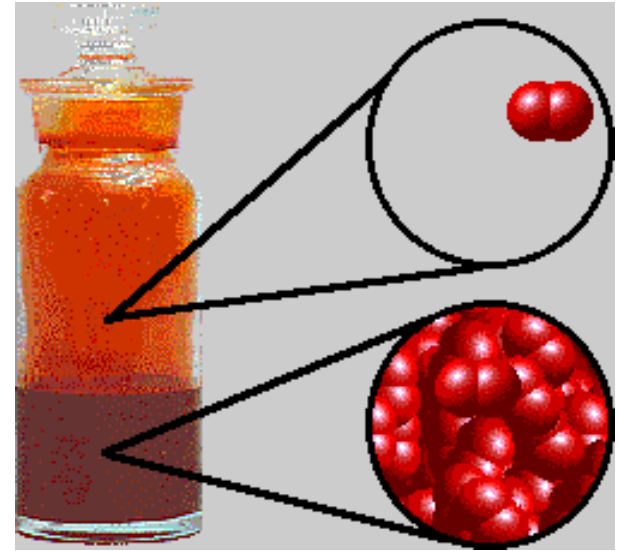
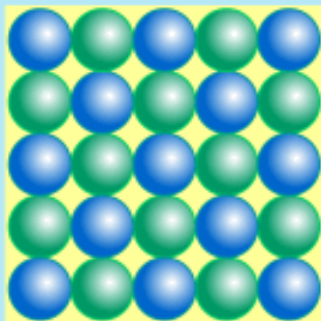
Gas



Liquid



Solid



Nitrogen's Electron Configuration Table  
 $1s^2$   
 $2s^2 2p^3$

