Matter & Energy

Chemistry studies matter and its interactions

Matter = has mass & occupies space
Space = measurable volume
Mass = "intrinsic (just is) property" called inertia
Mass = measure of quantity
Inertia =resistance to change in motion

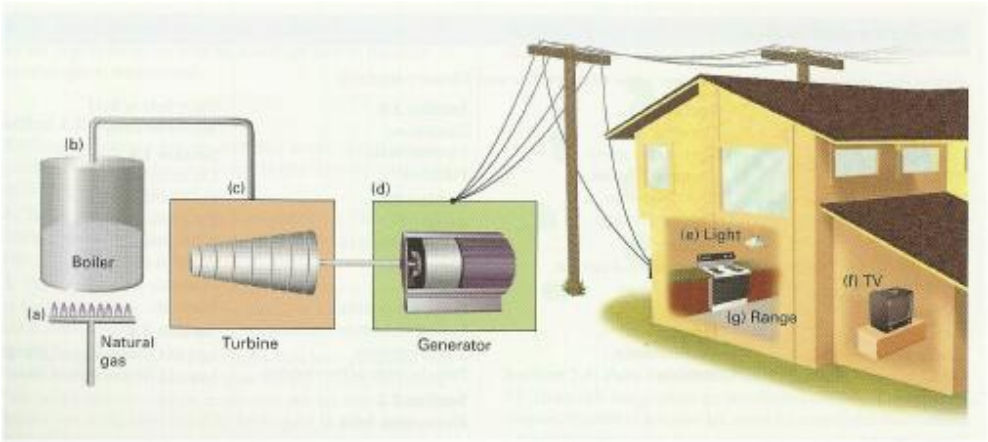
Interactions with other substances requires Energy

Energy = ability to do work
Energy = ability to move matter
Energy = "change agent'
So, chemistry explores just about everything!

Kinetic Energy
Depends On Motion-Moving water thru electrical generator of a dam
Potential Energy
Depends On Position -Still water at top of dam

Conservation of Energy

Energy is neither created or destroyed, but only transformed



Mass vs. Weight

Mass	Weight
Depends on the quantity	Depends on force (gravity)
Does not change with location	Changes with location
Can never be zero	Can be zero
Measured in grams	Measured in Pounds

Mass vs. Weight

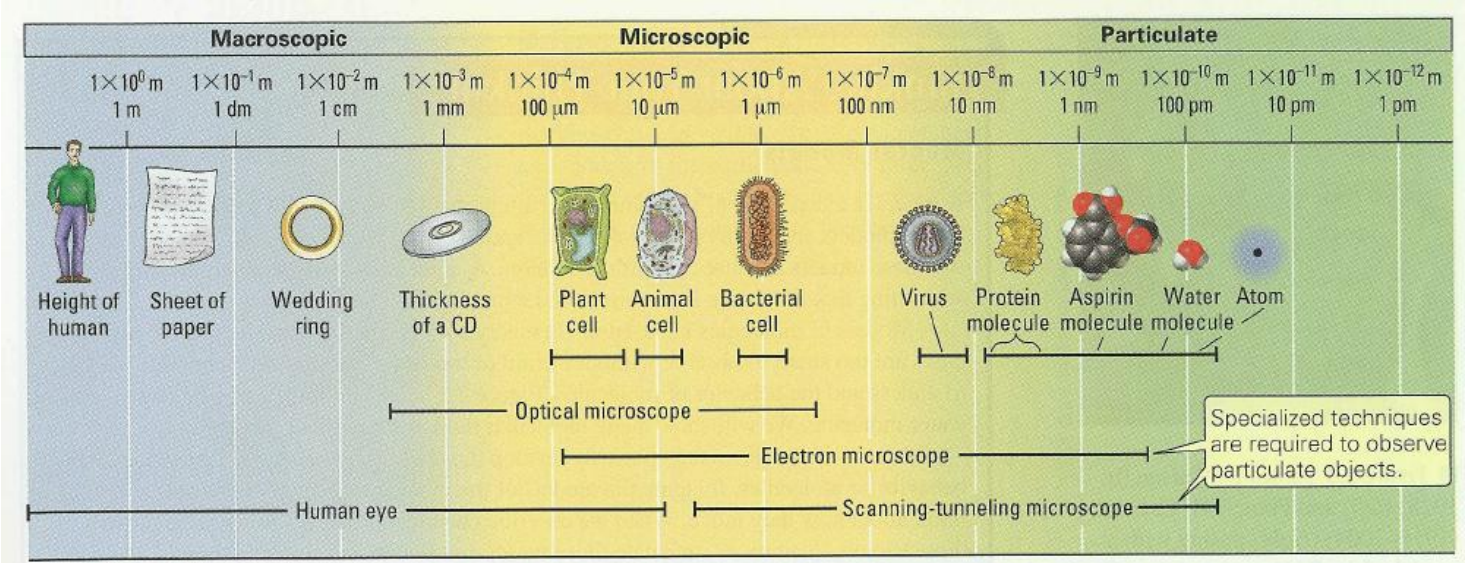
Earth Mass = 70 Kg

Object	Weight (lbs)
Mercury	57
Venus	140
Earth	154
Moon	26
Mars	57
Jupiter	446
Saturn	161
Uranus	132
Neptune	175
Pluto	3

Mass (kg) is constant

Weight (lbs) changes with location

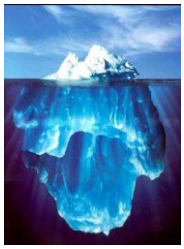
Descriptions of Matter



Macroscopic = Visible to eye
Microscopic = visible with microscope
Particulate = atoms & molecules … must be modeled

States of Matter-Solid

Form	Rigid
Compressibility	Very Low (on exam: not compressible)
Shape	Constant (definite)
Volume	Constant (definite)
Particle Movement	Vibration in fixed position



States of Matter-Liquid

Form	Fluid (Flows)
Compressibility	Extremely Low (on exam: not compressible)
Shape	Variable (Fills Container)
Volume	Constant (Definite)
Particle Movement	Some attraction, particles move freely beneath surface

States of Matter- Gas

Form	Fluid (Flows)
Compressibility	Very High
Shape	Variable (Fills Closed Container)
Volume	Variable (Fills Closed Container)
Particle Movement	Random, Independent

Changing States of Matter

Requires change in energy

Solid ➔ Liquid ➔ Gas

heat must be added

Gas ➔ Liquid ➔ Solid

heat must be removed

Properties of Matter

Physical	Chemical
Observed without forming new substance	New substance(s) formed when observed
Described by sense	List of chemical changes
Color, shape, odor, taste	"may react to form…"
Measurable	
mp, bp, density	

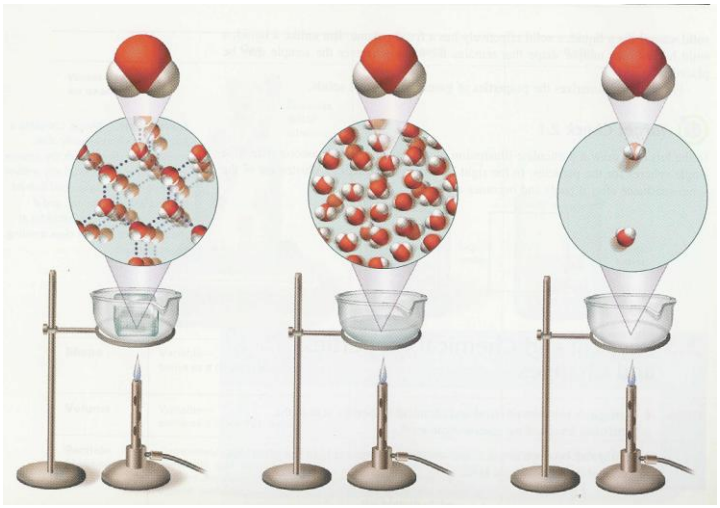
Changes

Physical	Chemical
New form	Old substance(s) destroyed
No new substance formed	New substance(s) formed
Examples:	Examples:
Wax melting	Wax burning
Sugar dissolving	Apple juice fermenting

Chemical

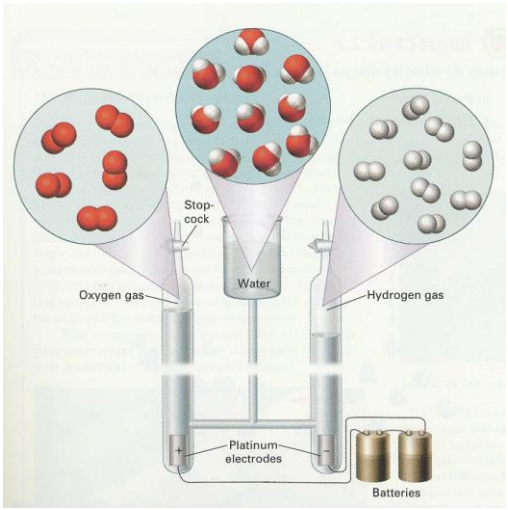
Physical

Physical Change



Ice Water Steam

Chemical Change



Electrical Current changes water to H_2 and O_2

Classifying Matter-Macroscopic

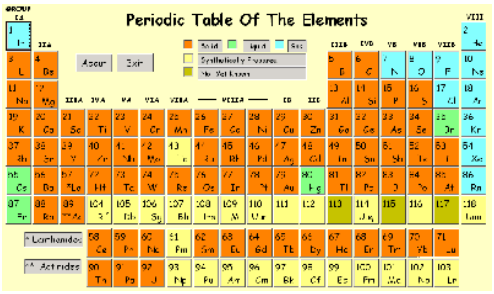
Homogeneous	Heterogeneous
Uniform composition	Non-uniform composition
Uniform appearance	Non-uniform appearance
	Distinct parts, "phases"
homo = "same"	*hetero* = "different"

Classifying Matter

Single (Pure) Substance	Mixture
Single chemical	Two or more chemicals
Only one kind of matter	Variable compositions
Has one definite composition	Properties depend on composition
Has definite properties	Can be physically separated or decomposed into components
Homogeneous	Homogeneous or Heterogeneous
Chemically Pure Reagents	inks, beverages polluted water

Pure Substances

Elements	Compounds
Can't be sub-divided	Can be chemically sub-divided Contain 2 or more kinds of atoms (molecule)
Contains only 1 kind of atom	water, rust, salt, baking soda



Atom

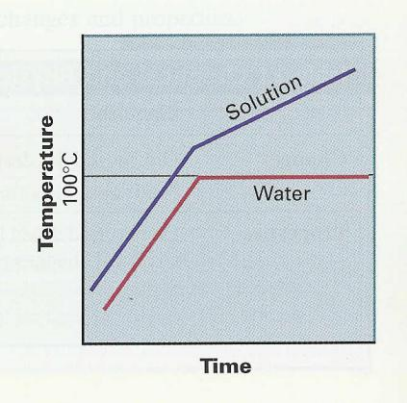
Smallest particle of an element
Combines with other atoms to form molecules

Cut an element into smaller & smaller pieces
Smallest remaining object of an element is atom

Example: Silver –an element, metal exists as an ordered array (crystal)
Sterling Silver- an alloy or mixture of elements (silver and copper)

Boiling Point Plot

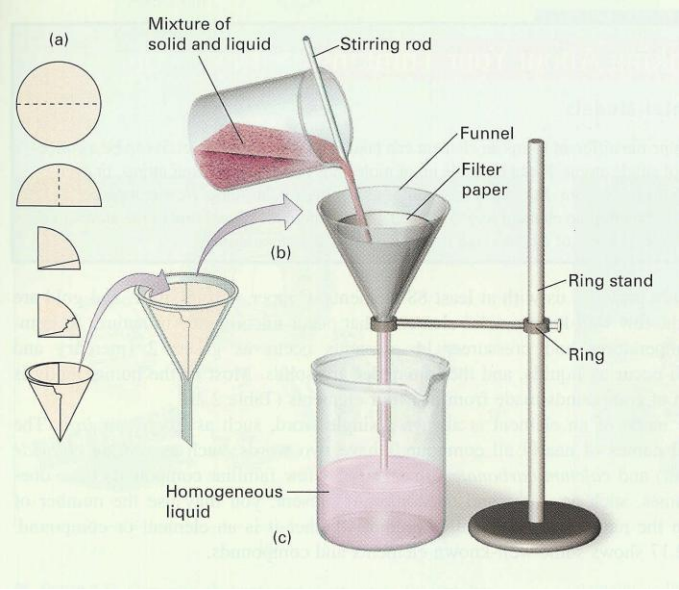
Means of determining mixture or single element



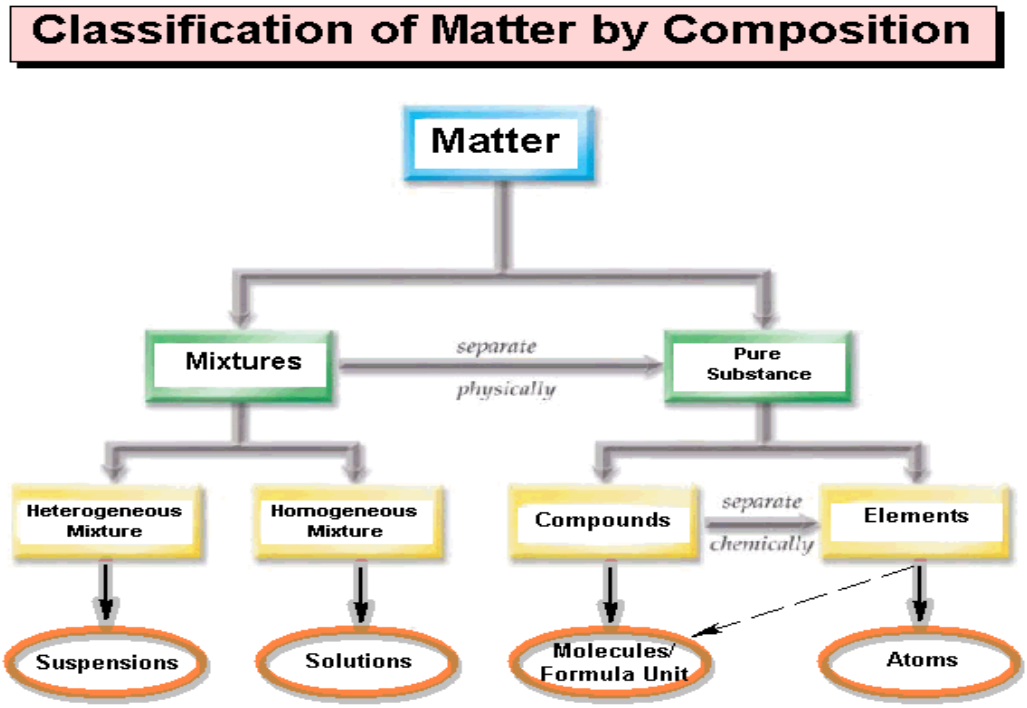
Pure = Constant
Mixture = Variable

With mixture,
Composition changes as water boils away

Separation – Filtering



Method of separating solids from liquids



General Classification Scheme

Assignment:

Take Blackboard Practice Quiz on Properties & Changes

Take Unit 1 Practice Test
Blackboard only records highest score
Take until multiple 100's have been scored (questions are variable)
(Gives sense of test exam format and content)

The Practice Quiz is very similar to the Unit Exam
Success on Unit exam is directly related to practice exam experiences

Continue memorizing:
Conversion factors
Polyatomic Ions
Elemental Symbols