
Matter
Topic#3
AMSAT
Chem 1H

Matter
Topic#3

Properties of Matter

- Mass and volume; $d = m/V$
- Element - simplest part is called an atom
 - symbol comprised of one or two letters from name, first capitalized second NOT
 - zinc (Zn), iron (Fe), potassium (K)

Au

Hg

Sn

Zn not Z_N

Pb

W

Sb

Fe not F_E

Ag

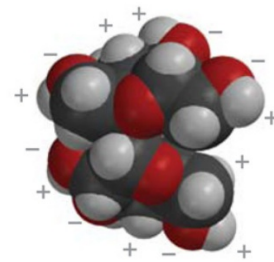
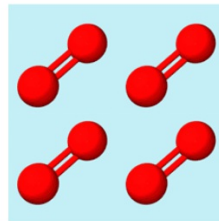
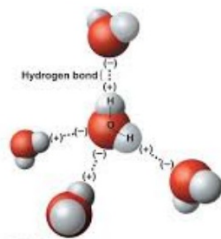
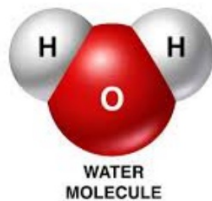
K

Cu

Fe

Na

- Compound - made of two or more different atoms chemically combined (ionic, covalent, metallic)
 - water (H₂O), ammonia (NH₃), sodium chloride (NaCl)



Properties of Matter**Matter
Topic#3**

Intensive property - does not depend on the amount of a substance

- density, boiling point (bp), freezing point (fp)

Extensive property - does depend on the amount of a substance

- volume, energy content, etc

Topic#3 Sample WS#1 - Matter Extensive/Intensive Properties

Identify each as intensive (I) or extensive (E).

1. A piece of wood has a mass of 1000 grams. _____
2. Water has a heat capacity of $4.184\text{J/g}^\circ\text{C}$ _____
3. Ice has a density of 0.91g/cm^3 . _____
4. I traveled 300 miles on a tank of gas. _____

Matter
Topic#3

Properties of Matter

Physical Properties - properties observed without changing the substance

- mp, bp, density, solubility, etc

Chemical Property - properties of the substance as it transforms into different substances

- flammability, reactivity with another substance, etc.

Physical vs. Chemical Property

Identify each as a physical (P) or chemical (C) property.

5. Paper ignites at 451°F. _____
6. Salt dissolves in water. _____
7. Iron rusts when in contact with water. _____
8. Silver is a good conductor of electricity. _____
9. Sodium reacts violently with water. _____
10. Healthy leaves reflect green light. _____

Matter
Topic#3

Changes in Matter

Physical Changes - involves changing one phase into another phase

- phases are solid (*s*), liquid (*l*), and gas (*g*) (and plasma but not
delt with in chemistry)

Chemical Changes - involve the changing of a substance into a
different substance

- key words - react with, produces, makes, etc.

Can I change it back through simple physical means?

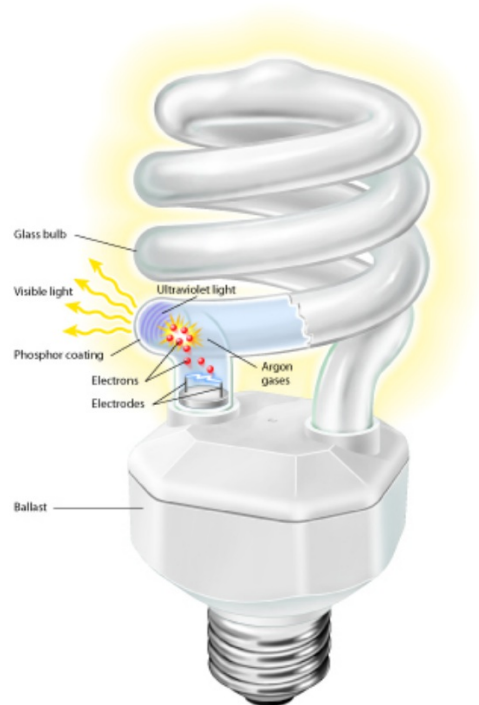
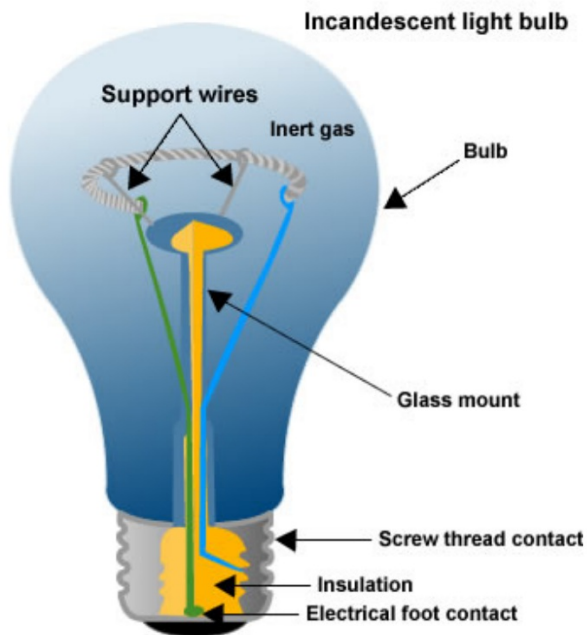
All changes require energy

- exothermic - energy released
- endothermic - energy absorbed

Energy Change with Physical Change

Indicate as exothermic (exo) or endothermic (endo).

- | | | | | | |
|------------------|-------|-----------------|-------|----------------|-------|
| 11. vaporization | _____ | 14. melting | _____ | 17. deposition | _____ |
| 12. evaporation | _____ | 15. freezing | _____ | | |
| 13. condensation | _____ | 16. sublimation | _____ | | |



Changes in Matter

**Matter
Topic#3**

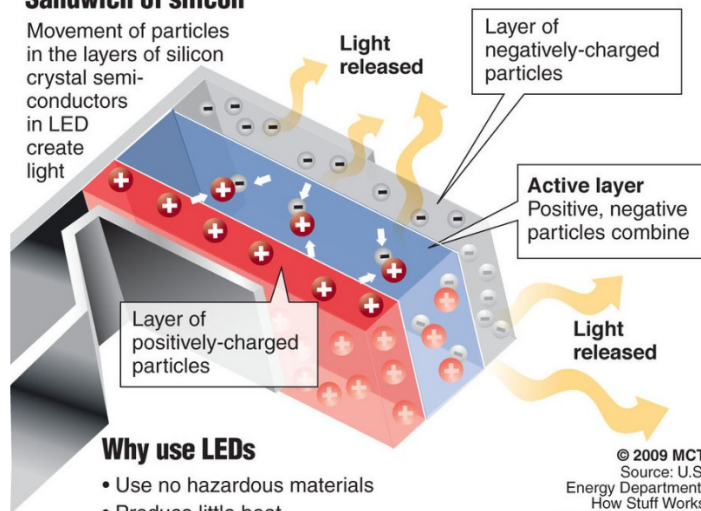


How an LED works

Scientists are making a replacement for the energy-wasting light bulb; "solid-state light" devices made of light emitting diodes (LEDs).

Sandwich of silicon

Movement of particles in the layers of silicon crystal semi-conductors in LED create light









Why use LEDs

- Use no hazardous materials
- Produce little heat
- Last for thousands of hours
- Ten times more efficient than incandescent light bulbs

© 2009 MCT
Source: U.S.
Energy Department,
How Stuff Works
Graphic: Lee Hulteng,
Judy Treible

THE CHEMISTRY OF LED LIGHTS

LED lights come in a full range of colours – this graphic takes a closer look at the chemistry behind how their light and varied hues are achieved.

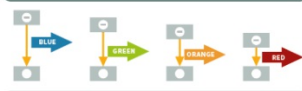
					
RED	ORANGE	YELLOW	GREEN	BLUE	VIOLET
GaAsP	GaAsP	GaAsP	GaP	InGaN	InGaN
AlGaInP	AlGaInP	AlGaInP	GaN	AlGaIn	AlGaIn
GaP	GaP	GaP	InGaN	ZnSe	GaN

HOW DO LEDS WORK?

Light emitting diodes (LEDs) use semiconducting materials to produce light and colour. Many of the materials used are based on gallium, such as gallium phosphide (GaP) and gallium nitride (GaN).

Layers of the semiconductor are "doped" with impurities. This creates an n-type layer, which has electrons spare, and a p-type layer, which has electron "holes". When a current is applied, electrons from the n-type layer combine with the "holes" in the p-type layer. When the electrons fall into these holes, they release energy in the form of visible light.

HOW ARE DIFFERENT COLOURS MADE?



A variety of colours are made possible by the use of different semiconducting materials, and "doping" them with different types and amounts of impurities. This affects the energy gap between the n-type and p-type layers, affecting the wavelength of light produced when a current passes through the LED.

© COMPOUND INTEREST 2016 - WWW.COMPOUNDCHEM.COM | Twitter: @compoundchem | Facebook: www.facebook.com/compoundchem
 This graphic is shared under a Creative Commons Attribution-NonCommercial-NoDerivatives International 4.0 licence.

Matter
Topic#3

Changes in Matter

Physical/Chemical Change

Identify each as a physical (P) or chemical (C) change.

18. Paper burning. _____
19. Kool-Aid dissolving in water. _____
20. Milk souring. _____
21. Wood rotting. _____
22. A glass of water evaporating. _____

Phase Diagram Activity - (Do as a Starter) Drawing a Phase Diagram

Fill in the phase diagram with the three phases, and the phase changes.

Word bank:

condensation	deposition
sublimation	gas
vaporization	solid
freezing	liquid
melting	

Matter Topic#3

Types of Matter

4 Types of Matter

1. Elements
2. Compounds
3. Homogeneous Mixtures (solutions)
4. Heterogeneous Mixtures

Pure Substances

- elements: atoms
- compounds: molecules

Mixtures

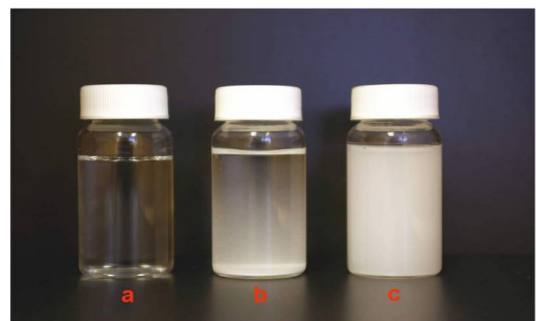
- homogeneous mixture (solution)
 - solute/solvent
 - alloy - metal solution
- heterogeneous mixture
 - suspension/colloid (Tyndall effect)

Uniform Composition

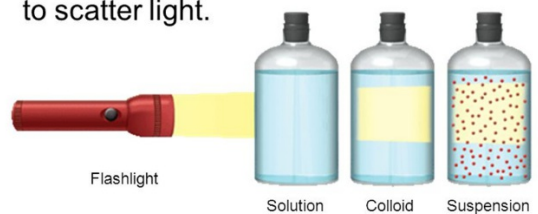
- element, compound, and homogeneous mixtures (solutions)

Not Uniform in Composition

- heterogeneous mixtures
 - separate into two phases after agitation has stopped



- Suspensions also exhibit the Tyndall effect.
- The particles in solutions are too small to scatter light.



Types of Matter**Matter
Topic#3**

Identifying Types of Matter

Identify the type of matter for each of the following.

(HM) homogeneous mixture, (HT) heterogeneous mixture,
or (P) pure.

23. supreme pizza _____

24. milk chocolate bar _____

25. open can of Coke (recently/over night) _____

26. vinegar _____

27. bleach _____

28. Windex window cleaner (in the friggen' bottle) _____

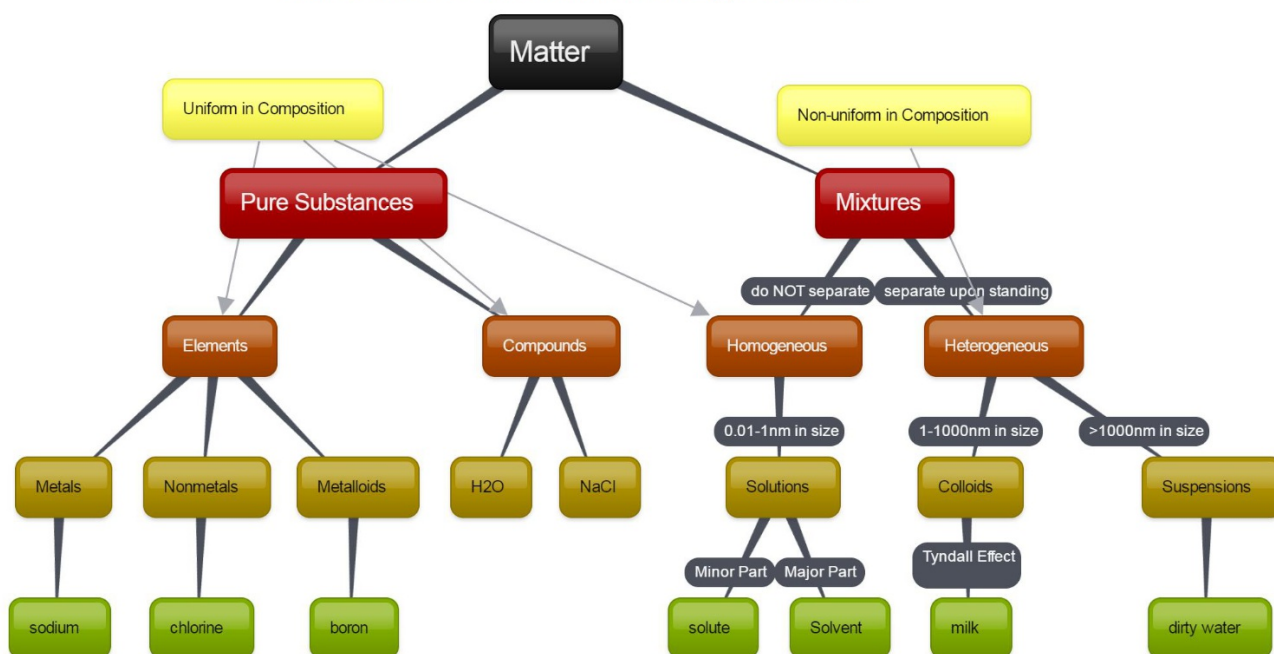
29. water _____

30. sugar _____

Types of Matter

Matter Topic#3

Flow chart for the determination of the type of matter.



created with www.bubbl.us

Types of Elements

3 Types of Elements

1) Metals

- malleable: can be pounded (formed) into sheets
- ductile: can be drawn into wires
- conduct: transfers heat and electricity
- luster: shiny
- lose electrons to become positive ions (cations)

2) Nonmetals

- brittle, some are gases, do not conduct electricity/heat (insulators), dull
- gain electrons to become ions (anions)

3) Metalloids

- properties in between metals and nonmetals

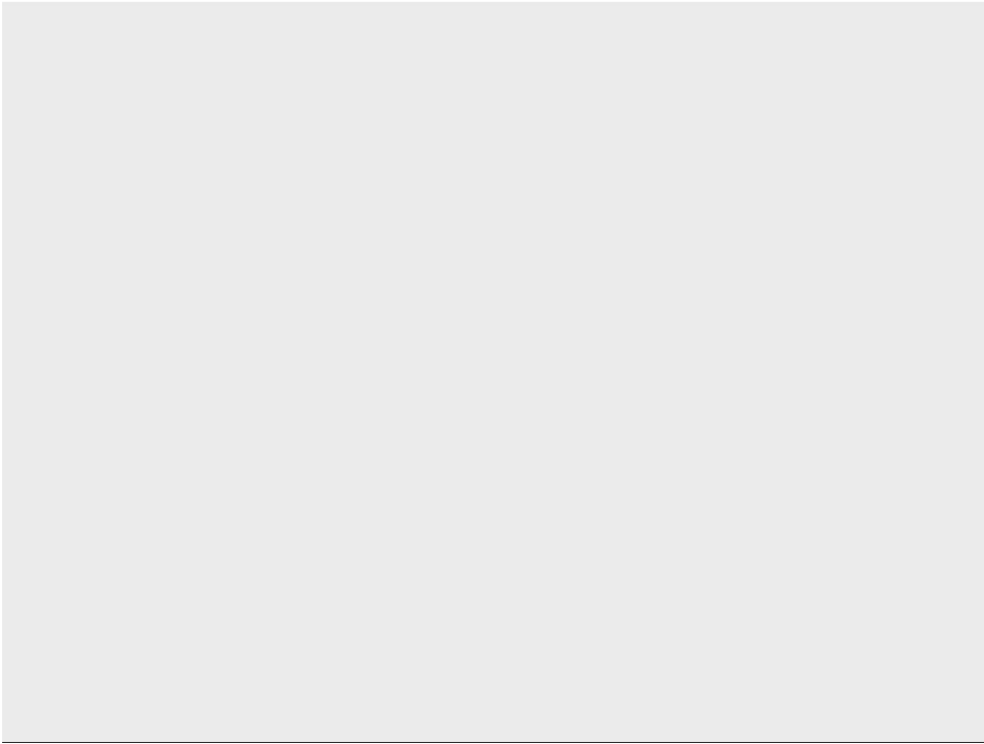
Types of Elements

Matter
Topic#3



Types of Elements

**Matter
Topic#3**



Types of Elements

3 Types of Elements

1. Metals

- malleable: can be pounded (formed) into sheets
- ductile: can be drawn into wires
- conduct: transfers heat and electricity
- luster: shiny
- lose electrons to become positive ions (cations)

2. Nonmetals

- brittle, some are gases, do not conduct electricity/heat (insulators), dull
- gain electrons to become ions (anions)

3. Metalloids

- properties in between metals and nonmetals

Types of Elements

Identify the following elements as either a metal (m), nonmetal (nm), or metalloid (ml).

- | | | | |
|-------------------|---------------------|-------------------|-------------------|
| 31. sodium ____ | 34. silicon ____ | 37. selenium ____ | 40. tungsten ____ |
| 32. fluorine ____ | 35. arsenic ____ | 38. antimony ____ | |
| 33. neon ____ | 36. molybdenum ____ | 39. bismuth ____ | |

Types of Elements Activity

- Periodic table

- 3 colored pencils

Matter
Topic#3

Types of Elements

46 Common Elements to Memorize (Color each box on the handed out periodic table)

aluminum	Al	gold	Au (aurum)	potassium	K (kalium)
argon	Ar	helium	He	radium	Ra
arsenic	As	hydrogen	H	rubidium	Rb
barium	Ba	iodine	I	selenium	Se
beryllium	Be	iron	Fe (ferrum)	silicon	Si
boron	B	krypton	Kr	silver	Ag (argentum)
bromine	Br	lead	Pb (plumbum)	sodium	Na (natrium)
calcium	Ca	lithium	Li	strontium	Sr
cadmium	Cd	magnesium	Mg	sulfur	S
carbon	C	manganese	Mn	tin	Sn (stannum)
chlorine*	Cl	mercury	Hg (hydrargyrum)	titanium	Ti
cesium	Cs	neon	Ne	uranium	U
chromium	Cr	nickel	Ni	xenon	Xe
cobalt	Co	nitrogen	N	zinc	Zn
copper	Cu (cuprum)	oxygen	O		
fluorine*	F	phosphorus*	P		

* most misspelled elements

Matter
Topic#3

Periodic Table

Periods

- across from left to right
- also called rows or energy levels
- elements close together are more similar than elements far apart in same period (left side metals to right side nonmetals)

Groups

- up and down
- also called, families or columns
- elements with similar physical and chemical properties

Period and Row of Elements

Identify the element based on the period and group.

41. period 3, group 17
42. period 5, group 12
43. period 2, group 14
44. period 6, group 11
45. period 4, group 15

1	2																	18		
1	H																	2		
2	Li	Be													B	C	N	O	F	Ne
3	Na	Mg	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr		
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe		
6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn		
7	Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og		
119	Uue																			
	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu						
	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr						

Oxygen
Most of me is you.
I strive for independence,
fail with every breath.