

Unit One: Matter & Change

Describing Matter:

Matter is anything that has mass and takes up space. The _____ of an object is a measure of the amount of matter the object contains. The _____ of an object is a measure of the space occupied by the object. Are mass and weight the same thing?

There are two different types of properties that we use to describe matter are:

Extensive Property:

Intensive Property:

Matter that has a uniform and definite composition is called a _____. Aluminum (Al) and Copper (Cu) are examples of substances, which are also referred to as _____.

- ▶ Every sample of a given *substance* has *identical intensive properties* because every sample has the same composition!

Aluminum and Copper have some properties in common, but there are differences besides their distinctive colors:

Aluminum	Copper
Highly reflective	Harder than Aluminum
Used in Paints	Better conductor of heat/electrical current
Malleable	Malleable

Hardness, color, conductivity, and malleability are all examples of physical properties!

Physical property =

Physical Changes:

States of Matter:

What are the three states of matter?

1)

2)

3)

There are several characteristics that distinguish each state of matter from the other two:

Solid:

Liquid:

Gas:

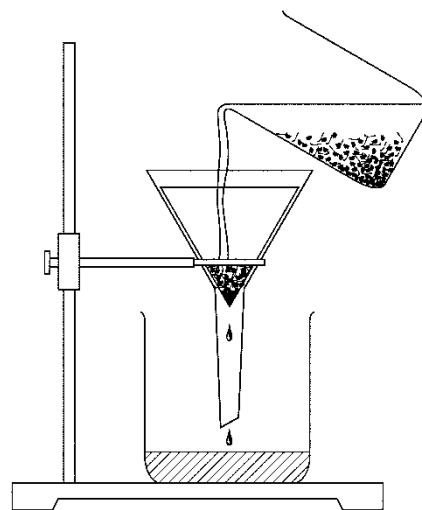
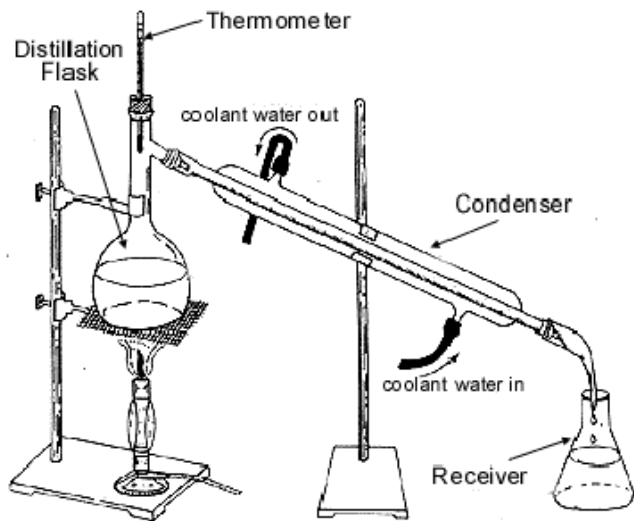
Classifying Mixtures:

A _____ is a physical blend of two or more components. Most samples of matter are mixtures, some mixtures are easier to recognize than others.

Heterogeneous Mixtures:

Homogeneous Mixtures:

In the lab we can use two different techniques to separate mixtures; **filtration** and **distillation**. We will use filtration several times this semester to separate mixtures!



Elements and Compounds:

We will classify substances as either elements or compounds.

Element:

Compound:

In general, the properties of chemicals are different than those of the elements that make up the compound!

Compounds cannot be broken down into simpler substances by the same physical methods that we use to separate mixtures. For example, water (H_2O) is a compound if you boil liquid water you wind up with water vapor, not the individual elements of oxygen and hydrogen that water contains.

A _____ is a change that produces matter with a different composition than the original matter.

- ▶ Heating is one of the processes used to break down compounds into simpler substances (if you heat sugar it goes through a series of chemical changes, the final products of these changes are solid carbon and water vapor).
- ▶ There is no chemical process that will break down an element into any simpler substance.

Symbols and Formulas:

As chemists, we use symbols to represent elements, and chemical formulas to represent compounds. You will be responsible for memorizing the chemical symbols for 36 common elements that we will use throughout the year.

The Periodic Table- A Preview: (We will spend an entire unit talking about the periodic table!)

The periodic table allows you to easily compare the properties of one element (or group of elements) to another element (or group of elements).

hydrogen 1 H 1.0079																	helium 2 He 4.0026	
lithium 3 Li 6.941	beryllium 4 Be 9.0122											boron 5 B 10.811	carbon 6 C 12.011	nitrogen 7 N 14.007	oxygen 8 O 15.999	fluorine 9 F 18.998	neon 10 Ne 20.180	
sodium 11 Na 22.990	magnesium 12 Mg 24.305											aluminum 13 Al 26.982	silicon 14 Si 28.086	phosphorus 15 P 30.974	sulfur 16 S 32.065	chlorine 17 Cl 35.453	argon 18 Ar 39.948	
potassium 19 K 39.098	calcium 20 Ca 40.078	scandium 21 Sc 44.956	titanium 22 Ti 47.867	vanadium 23 V 50.942	chromium 24 Cr 51.996	manganese 25 Mn 54.938	iron 26 Fe 55.845	cobalt 27 Co 58.933	nickel 28 Ni 58.693	copper 29 Cu 63.546	zinc 30 Zn 65.39	gallium 31 Ga 69.723	germanium 32 Ge 72.61	arsenic 33 As 74.922	selenium 34 Se 78.96	bromine 35 Br 79.904	krypton 36 Kr 83.80	
rubidium 37 Rb 85.468	strontium 38 Sr 87.62	yttrium 39 Y 88.906	zirconium 40 Zr 91.224	niobium 41 Nb 92.906	molybdenum 42 Mo 95.94	technetium 43 Tc [98]	ruthenium 44 Ru 101.07	rhodium 45 Rh 102.91	palladium 46 Pd 106.42	silver 47 Ag 107.87	cadmium 48 Cd 112.41	indium 49 In 114.82	tin 50 Sn 118.71	antimony 51 Sb 121.76	tellurium 52 Te 127.60	iodine 53 I 126.90	xenon 54 Xe 131.29	
caesium 55 Cs 132.91	barium 56 Ba 137.33	57-70 * *	lutetium 71 Lu 174.97	hafnium 72 Hf 178.49	tantalum 73 Ta 180.95	tungsten 74 W 183.84	rhenium 75 Re 186.21	osmium 76 Os 190.23	iridium 77 Ir 192.22	platinum 78 Pt 195.08	gold 79 Au 196.97	mercury 80 Hg 200.59	thallium 81 Tl 204.38	lead 82 Pb 207.2	bismuth 83 Bi 208.98	polonium 84 Po [209]	astatine 85 At [210]	radon 86 Rn [222]
francium 87 Fr [223]	radium 88 Ra [226]	89-102 * *	lawrencium 103 Lr [262]	rutherfordium 104 Rf [261]	dubnium 105 Db [262]	seaborgium 106 Sg [266]	bohrium 107 Bh [264]	hassium 108 Hs [269]	meitnerium 109 Mt [268]	ununnium 110 Uun [271]	ununium 111 Uuu [272]	unubium 112 Uub [277]	ununquadium 114 Uuq [289]					

* Lanthanide series

lanthanum 57 La 138.91	cerium 58 Ce 140.12	praseodymium 59 Pr 140.91	neodymium 60 Nd 144.24	promethium 61 Pm [145]	samarium 62 Sm 150.36	europium 63 Eu 151.96	gadolinium 64 Gd 157.25	terbium 65 Tb 158.93	dysprosium 66 Dy 162.50	holmium 67 Ho 164.93	erbium 68 Er 167.26	thulium 69 Tm 168.93	ytterbium 70 Yb 173.04
actinium 89 Ac [227]	thorium 90 Th 232.04	protactinium 91 Pa 231.04	uranium 92 U 238.03	neptunium 93 Np [237]	plutonium 94 Pu [244]	americium 95 Am [243]	curium 96 Cm [247]	berkelium 97 Bk [247]	californium 98 Cf [251]	einsteinium 99 Es [252]	fermium 100 Fm [257]	mendelevium 101 Md [258]	nobelium 102 No [259]

Chemical Reactions:

Iron rusting is an example of a chemical reaction occurring between iron (Fe) and oxygen (O), which results in iron oxide (Fe₂O₃). Words such as burn, rot, rust, decompose, ferment, explode, and corrode usually signify that a chemical change has occurred.

The ability of a substance to undergo a specific chemical change is called a _____.

How do we recognize that a chemical change has taken place?

The Law of Conservation of Mass:

Percent Composition:

One way to describe a mixture quantitatively is to report the percentage by mass of components.

Practice:

When 25.0g of a particular salt solution is evaporated to dryness, the residual salt is found to have a mass of 1.32g. What is the percent composition of the salt in the solution?

A chocolate chip cookie consists of 17.33g of cookie and 11.49g of chocolate chips. What are the percentages of cookie and chocolate?