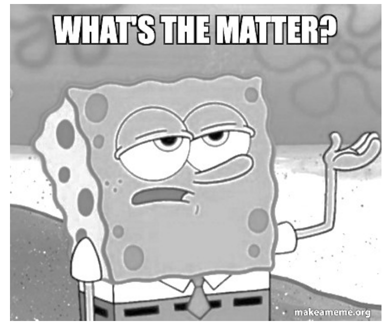
Matter Chemistry

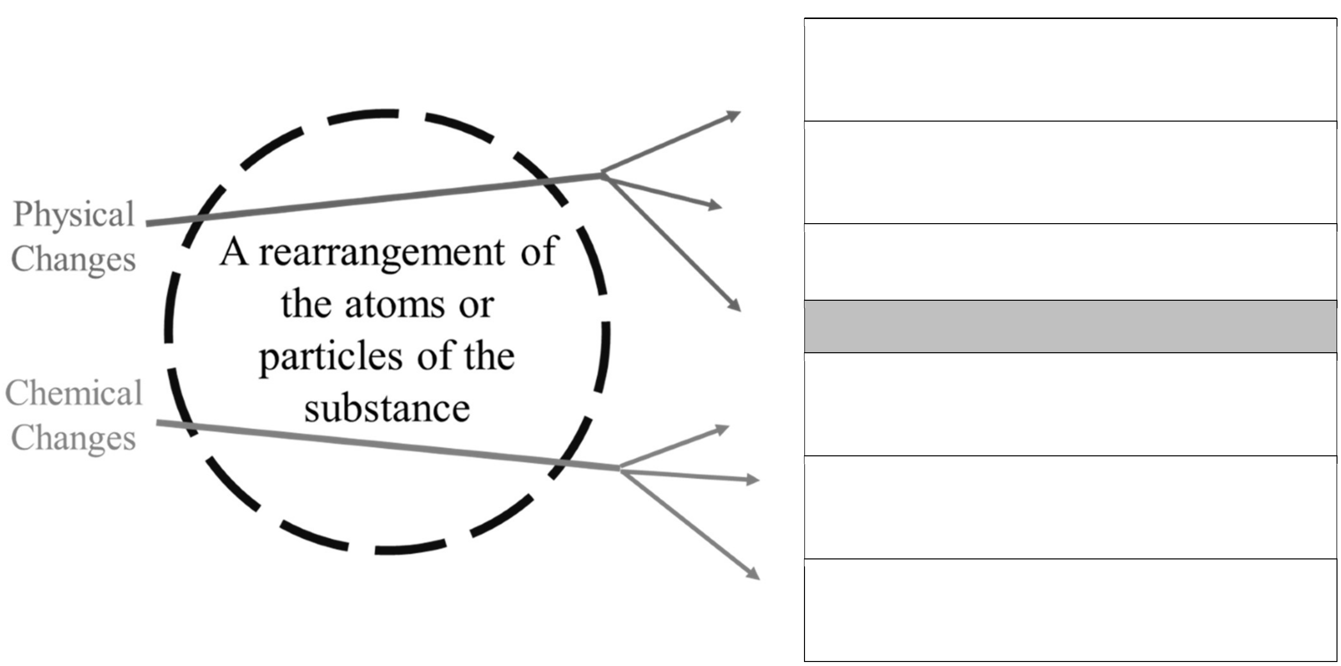
What's the matter with you? ☺



Fill in the cover of this handout, front, back and inside.			
Formula	Name	This is a…	with ? atoms
CO_2	Carbon dioxide	compound	3
H_2O	Dihydrogen monoxide	compound	
O_2	Oxygen	diatomic element, not a compound	
$C_6H_{12}O_6$	Glucose	compound	
Fe	Iron	an element	
HCl	Hydrogen monochloride	compound	
Hg	Mercury	an element	1
NaCl	Sodium chloride	compound	
$CaCl_2$	Calcium chloride	compound	
AlF_3	Aluminum fluoride	compound	
H_2	Hydrogen	diatomic element, not a compound	
NH_3	Ammonia	compound	
$Sc(OH)_3$	Scandium hydroxide	compound	
$(NH_4)_2S$	Ammonium sulfide	compound	

☺

Matter Notes					
1	Matter is				
2	All matter exists in these 4 states or phases				
3	Aqueous means…				
4	Matter can be Pure includes				
5	Mixed matter is just a				
6	Physical properties of matter…				
7	Some examples of physical properties are…				

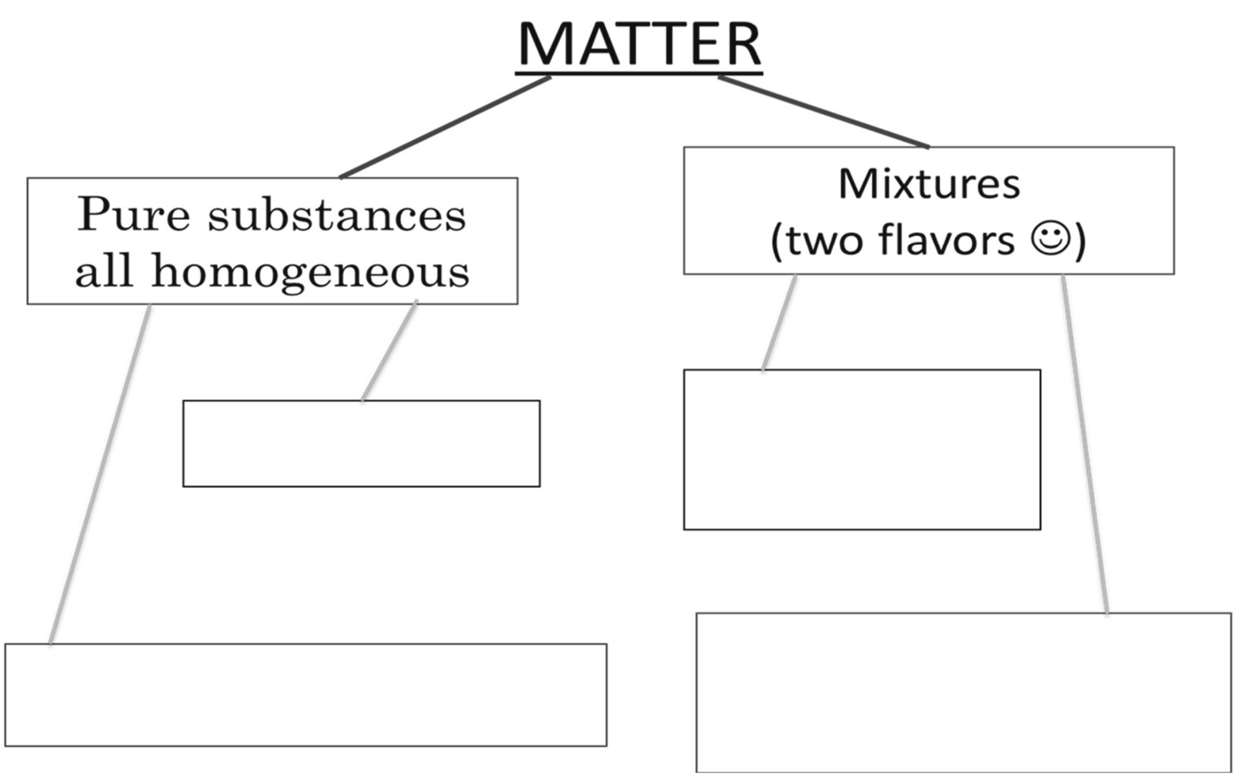
8	Physical changes are also called…
9	The six phase changes are… Solid → Liquid is called
	Liquid → Solid is called
	Gas → Liquid is called
	Liquid → Gas is called
	Solid → Gas is called
	Gas → Solid is called
10	

11	Physical changes are…
12	Mixtures are… The properties of matter in a mixture are When making a mixture….
14	Mixtures can be
15	Mixtures that are mixed the SAME THROUGHOUT are called →
16	Mixtures that are mixed DIFFERENTLY THROUGHOUT are called →
17	SAND + WATER make a
18	SUGAR + WATER make a
19	Salt water is homogeneous –
20	Chocolate milk is heterogeneous, because
21	Oil and vinegar are heterogeneous

22. Mixtures come in ALL PHASES. Examples of mixtures

Phase	examples	Contains this	Mixed with this
Solids	Cast Iron	Carbon	
	Brass	Zinc	
Liquids	Wine	Ethanol	
	Vinegar	Acetic acid	
Gas	Air	Oxygen	
Aqueous	Ocean water	Salt	
	Gatorade	Sugar + Food color	

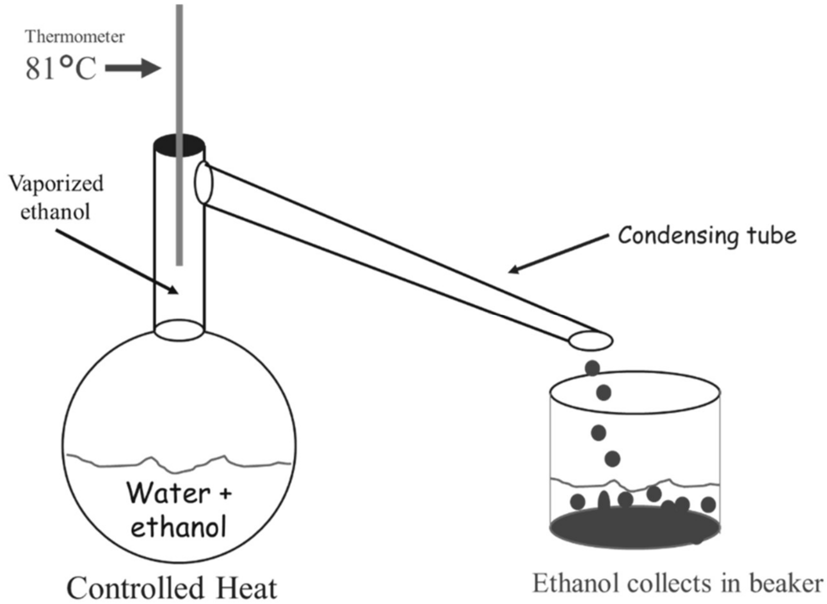
Matter Class #2 the Law of Conservation of Matter



24	The Law of Conservation of Matter (memorize this)
	Sodium and Chlorine yields Sodium Chloride
25	Sodium and Chlorine are the
26	Sodium chloride is the
27	
28	If you completely react 46 g Na and 70 g Cl, how many grams of sodium chloride form?
29	When 8 grams of hydrogen reacts with 64 grams of oxygen, how many grams of water form?
30	When 4 g hydrogen reacts with sufficient oxygen and forms 36 grams water, how many grams of oxygen was used in this reaction?
31	How many grams of hydrogen reacts here to form ammonia? ___ g H_2 + 28 g N_2 $\rightarrow$ 34 g NH_3

32	How much Iron (III) oxide forms here? *(that's rust)* 223 g Fe + 96 grams O_2 → ____ g Fe_2O_3		
For these compounds, copy the formulas, then COUNT the total atoms inside each one. 33 is an example			
33	carbon dioxide	CO_2	3
34	lithium carbonate		
35	aluminum phosphate		
36	water		
37	glucose		
38	hydrogen sulfate		
39	hydrogen phosphate		
40	silicon dioxide		
41	magnesium hydroxide		
42	ammonium sulfite		
43	cobalt (II) dichromate		
44	manganese (VII) carbonate		
45	aluminum hydroxide		

Matter Class #3 Mixtures, separating mixtures, chemical reactions, etc.	
46	A mixture is
47	When 2 or more pure substances are mixed together
48	Each part of a mixture…
49	When you put some table salt into water, you get salty water.
50	The mixture…
51	You can separate a mixture apart physically...
52	Separating mixtures…
53	You can separate mixtures by…
54	The “process” that allows us to separate a mixture is to (write this one BIG!)
55	To separate ethanol from water (both liquids) you can’t filter them apart. You can take advantage of...

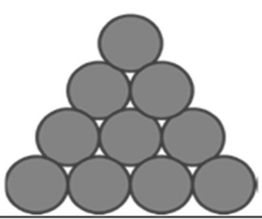
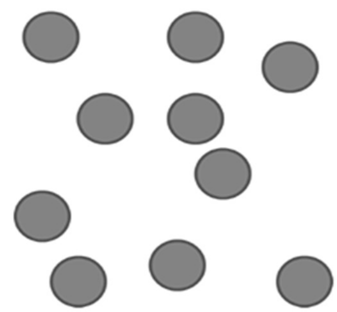
56		The system at left is called a…
57	iron can be separated from sulfur, by <u>taking advantage</u> of	
58	allows you to separate the colors of markers by taking advantage of the ink solubility in water, as well as the density of color particles.	
59	You could also separate mixtures by taking advantage of…	
60	A chemical reaction is when 2 or more substances are bonded together in a chemical reaction...	
61	We'll use the acronym:	

62.	Indicators that a chemical reaction probably occurred
T	
O	
P	
I	
C	
B	

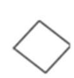
Matter Class #4 Particle diagrams (cartoons)	
63	A particle diagram shows…
SOLID	
LIQUID	
GAS	

atom	
diatomic elements	
compound	
mixture	

64 Particle diagrams

Solid	Liquid	Gas
		

Write the molecular "ratios" these particle diagrams represent, and an example or two that each could be.

65	How will you remember the 7 elements that are diatomic? They are called the
66	Enjoy the cartoons here, make sure you really see what is what, or you ASK a question right now!

Review for Matter Celebration

67	A physical change is a.. A. chemical change B. phase change C. chemical reaction D. change in density

68	Write a phase symbol (S, L, or G) for each definition		Indefinite shape, indefinite volume
			Definite shape, definite volume
			Indefinite shape, definite volume

69	Define Homogeneous
70	Define Heterogeneous
71	Which CAN be decomposed by a chemical change? A. Co B. CO C. Hg D. Fe
72	How can we separate a mixture of table salt and water? A. a chemical reaction B. with filter paper C. with a strong magnet D. with a distillation apparatus
73	Convert the melting point of copper into centigrade degrees. *Use a formula.*
74	If 502 grams of iron completely combines with 216 grams of oxygen, how many grams of rust form?

75	When 2 elements chemically combine into a product, the product… A. has the same properties as the reactants B. has a blend of properties of the reactants C. has new, unique properties, unlike the reactants D. may or may not be similar, it depends on which elements combine

76. Count the number of atoms in these formulas

	Compound name	Formula	Number of atoms
A	aluminum permanganate	$Al(MnO_4)_3$	
B	ammonium carbonate	$(NH_4)_2CO_3$	
C	nickel (III) acetate	$Ni(C_2H_3O_2)_3$	
D	ammonium phosphate	$(NH_4)_3PO_4$	
E	yttrium oxalate	$Y(C_2O_4)_3$	

77. Name these phase changes

Solid → Gas	
Liquid → Gas	
Solid → Liquid	
Gas → Solid	
Liquid → Solid	
Gas → Liquid	

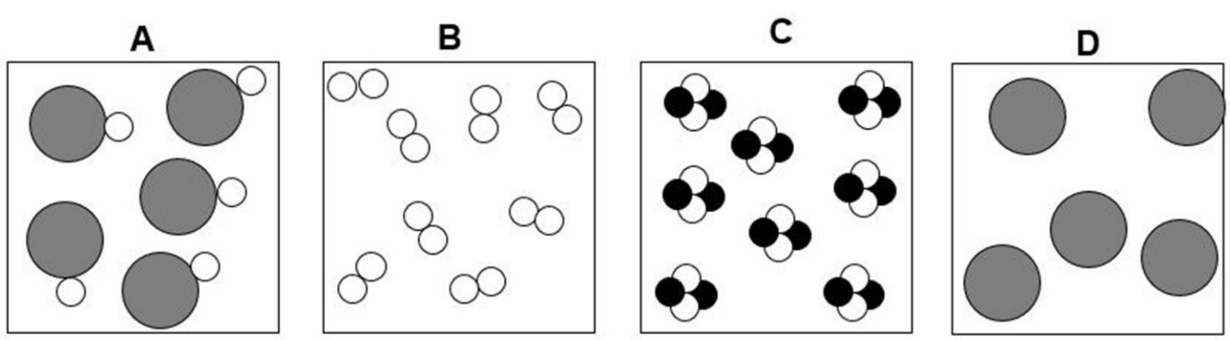
78. State standard temperature in Kelvin and Centigrade: ___________ Kelvin ___________°C

79	Calculate (with a formula) the volume of 375 grams of sodium metal.

This is a balanced equation for the combustion of heptane.

$$C_7H_{16(L)} + 11O_{2(G)} \rightarrow 7CO_{2(G)} + 8H_2O_{(G)}$$

80	Which of the 4 substances are reactants?	
81	Which are the products?	
82	How many atoms in one heptane?	
83	How many molecules of water formed?	
84	What is the underlying principle of separating mixtures? (what do we "have to do"?)	
85	Which box or boxes contain a diatomic element, a mixture, a monoatomic element, a compound?	



Matter Basics

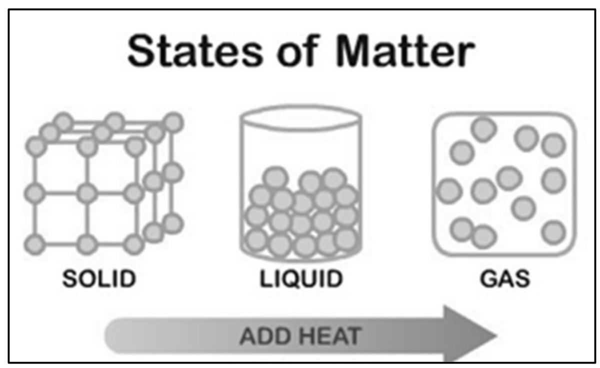
Chemistry is the study of matter. What it is, what is it made up of and how does matter react with other matter. Matter is the "stuff" that makes up the whole universe. It's the stuff that takes up space and has mass. Matter is measurable, and matter reacts in predictable ways that we will be learning about all year.

The simplest forms of matter are the elements, listed in the Periodic Table. Elements are the unique forms of matter that cannot be broken down into simpler substances by any chemical or physical process. Examples include mercury, iron, carbon, and uranium. The smallest bit of an element is an atom.

We'll learn more about atoms and atomic structure in the next portion of our class, but you may already know that atoms are made up of neutrons, protons, and electrons. If you "split" an atom into those smaller parts you still have matter, but you no longer have an element, just these sub-atomic particles.

Each element on the periodic table has unique properties that can be measured by us in class, or by scientists. Each element reacts in ways that are known, and which can be relied upon. We will learn later in the year how the atoms of certain elements can chemically combine, or bond, with other atoms to form new substances called compounds. The smallest part of every compound is called a molecule (or formula unit in some cases). These new substances have their own measurable properties which are different from the properties of the atoms that bonded into the compound. Compounds can be broken down into elements by a chemical reaction.

Pure substances are types of matter made up of only one kind of matter. Examples include elements which are each made up of only one kind of atom. Another example are compounds. Compounds are made up of a specific ratio of at least 2 different kinds of atoms. Examples are water (H_2O), or table sugar ($C_{12}H_{22}O_{11}$).



Pure substances are always the same throughout, which is called homogeneous. The properties of the elements are always the same in every sample, and within any sample. The properties of compounds are also constant. All samples of pure water have the same density (for example), all of the properties water has are the same for all samples of pure water.

Some of the properties of matter that we'll be measuring, and that you will need to be familiar with are density, boiling point, melting point, solubility, and particle size. A physical property of matter is a quality that can be changed, or measured, without changing the chemical properties of the matter itself. PURE Matter comes in 3 states, or phases: Solids, liquids and gases

Solid matter has its atoms (or molecules) packed in very close together. These particles are stick in a rigid arrangement that does not change. Because of this the solids are hard, and hold their shape and volume. Solids cannot be compressed practically at all because of the closeness of the particles.

Liquids also have their atoms (or molecules) packed close together, but they are not locked in place, they move, or flow over each other. The closeness of the particles means that liquids have a definite volume. Liquids do not hold their own shape, they will take the shape of any container they are put into. Liquids cannot be compressed because of how close the particles are to each other.

Gases are very different than solids or liquids. Most different is the proximity of their particles. Gas atoms or molecules are very far apart from each other compared to their size. They move very rapidly in straight lines, bounce around off of each other and the walls of any container that holds them. Gases have no definite shape and will expand to fill any size container they're put into. Gases have no definite volume either, they can be greatly compressed into small containers.

Here is a diagram of a solid, liquid, and a gas.
Each little ball represents a particle.
The atoms of a solid are very close together, and have a definite shape and volume.

The liquid has close packed particles - moving around, but take the shape of the container.

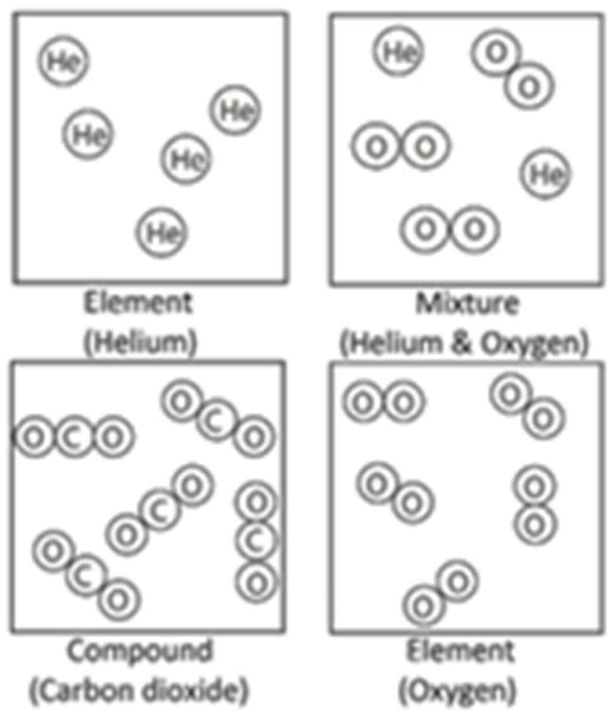
The gas has a lot of space between the particles, and fills any shape or sized container it's put into.

Matter that is dissolved into water has a 4th phase, which is called AQUEOUS. Solids, like salt, that dissolve into water are in the aqueous phase, written as $NaCl_{(AQ)}$ which is salt dissolved into water.

Aqueous solutions are homogenous mixtures of a substance in water (which is another substance). This is not a "pure" substance, it is a mixture. Homogeneous mixtures are mixed the same throughout.

Matter can be chemically combined into compounds, or just mixed together, into mixtures. A mixture is a physical blend of pure substances. Two or more elements can be mixed, two or more compounds can be mixed, or elements and compounds together can be mixed.

Mixtures have no definite ratio (no formulas) of the component parts like compounds have. Because of this, mixtures are not always homogeneous. They can also be heterogeneous, or different throughout. Mixtures are just stirred up, and the pure substances that make them keep their properties.



No new substances are formed, rather there is just a rearrangement of the atoms or particles. Compounds *are* new pure substances, with new properties.

Since these mixtures are just physical blends, they can be separated easily, by physical means (no chemical reactions required).

Our examples include
the element helium, made up of single atoms.

Oxygen (bottom right) is also an element, but does not exist in the pure form as single atoms, it is always O_2 molecules. They are diatomic.

A compound (CO_2) is when 2 or more different atoms bond together to form a new pure substance. That new substance has unique properties, which is not the mixing of the carbon and oxygen properties.

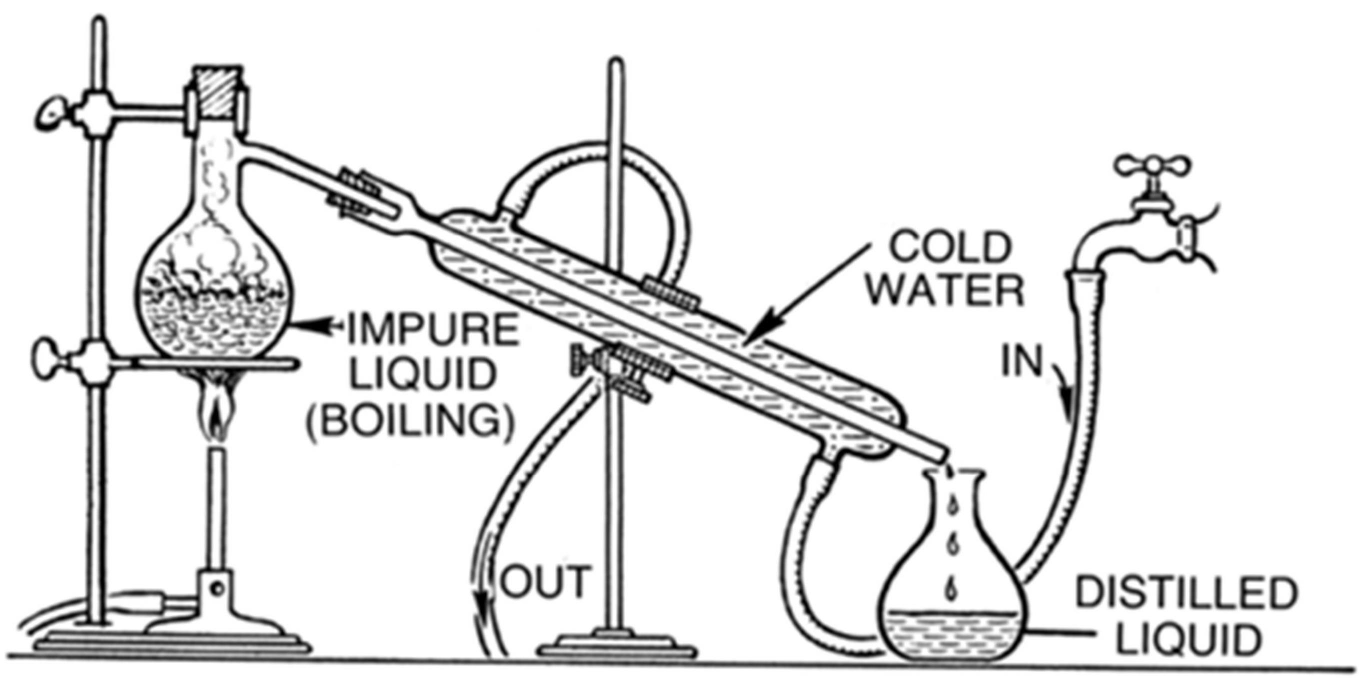
The mixture is just that, when elements are put together but do not chemically combine. There are NO NEW PROPERTIES. This mixture of oxygen gas & helium gas has the properties of oxygen & of helium.

The processes used to separate these mixtures work “because they take advantage of differences in certain physical properties of the parts of the mixture.   Here are several examples…

Distillation

Distillation is used to separate a mixture called a solution (when a solute is dissolved into a solvent). If salt water is our solution, salt is the solute, water is the solvent. Since sodium chloride and water have a different boiling points (1465°C for NaCl, just 100°C for H_2O).

Boiling salt water (impure liquid) causes the water to change phase into steam (gas), which travels out the top into the tube towards the right. That tube is cooled with water, which causes the H_2O Gas to condense back into pure H_2O Liquid, which is captured in the round bottomed flask at right. The salt never reaches its own boiling point, it just gets warm, and it gets stuck in the distilling flask (at left).



The mixture here (impure liquid of salt and water) is separated by taking advantage of the difference in the boiling points of the parts of the mixture (water boils at 100 °C and salt boils at 1465°C).

Pure water ends up on the right (distilled liquid). Salt gets left behind in the flask above the Bunsen burner. The salt never gets even close to its boiling point, it gets hot but is stuck on the left side of this setup.

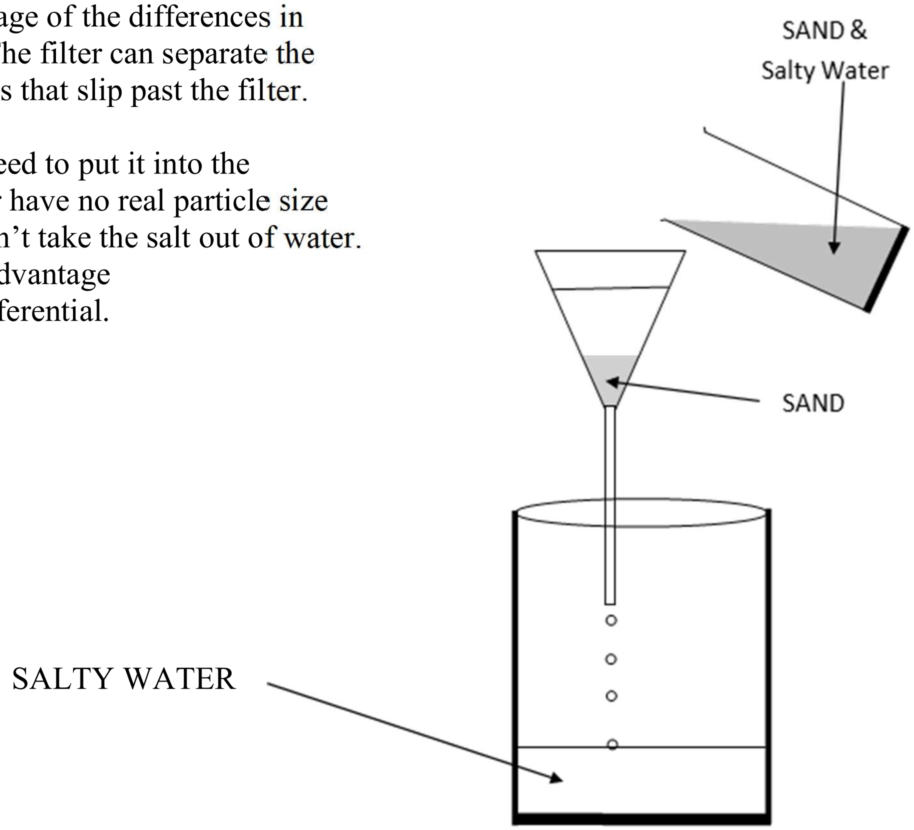
All mixtures are separated by taking advantage of differences in their physical properties. Distillation is our first example.

Filtration of Mixtures

If you pour beach water, containing salt and sand, through a filter as shown here, the sand will be caught in the filter, but the salty water will go right through.

To separate a mixture, you must take advantage of the differences in physical properties, here it is particle size. The filter can separate the larger particles from the molecular sized ones that slip past the filter.

To get the salt apart from the water, you'd need to put it into the distillation apparatus. The salt and the water have no real particle size difference to take advantage of. Filtering can't take the salt out of water. Separating mixtures can be done by taking advantage of particle sizes only when there is a size differential.



Magnetism

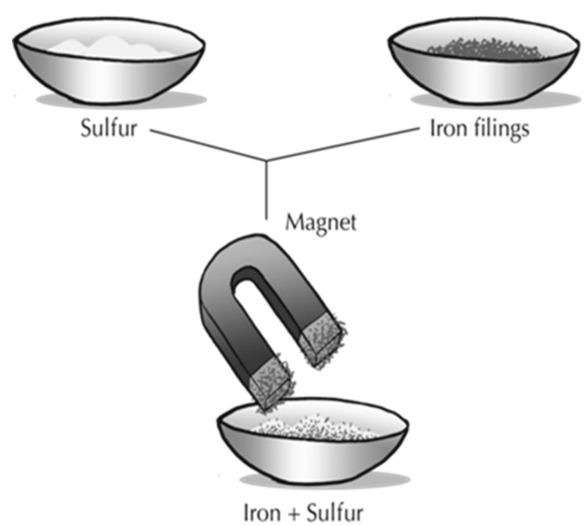
Magnetism separates some mixtures.

If the mixture you have is ground up iron filings and sulfur powder, you can't run it through a filter, both iron and sulfur would be caught in the filter.

You couldn't separate them by distillation either, they'd chemically react before either boiled away.

You could use a magnet to separate out the iron. Iron is attracted to the magnet, but the sulfur is not.

Separating a mixture requires you to take advantage of a difference in physical properties, in this case, if one is attracted to a magnet and the other part of the mixture is not.



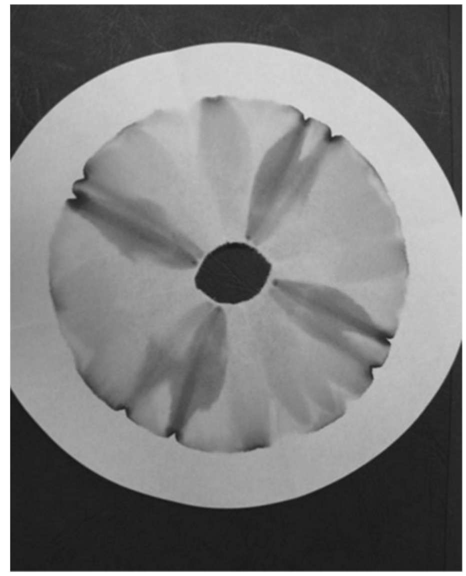
Separating mixtures by Paper Chromatography

We did this in class, taking advantage of the differences in both solubility and the density of the particles of color from our magic markers. We "think" our magic markers are one color, but they're made up of several different colors of particles, so close together, that they blur into one color to our eyes.

The water flowing through the filter paper can dissolve some inks and can transport the color particles and take them on a ride. The densest, or heaviest, drop out quickly, the lighter less dense ink particles travel further along on the paper.

Although this is "just color", this is how paper chromatography works chemically as well. Our marker colors are mixtures of colors, which we proved by our lab work.

Taking advantage of the different densities of the color particles allow us to separate this kind of mixture.



An important thing to remember about separating mixtures is that since they are not chemically combined, you don't need to do "chemistry" to get them apart. They're physically blended, so you use physical means to take them apart.

You need to find a difference in the physical properties of mixed substances and take advantage of them to get them apart.

Mixtures do not have formulas; they do not have exact ratios of substances.

H_2O has 2 hydrogen atoms bonded to one oxygen atom. It has an exact 2:1 ratio of atoms.

Some chocolate milk is very chocolatey; some chocolate milk is less so.
The mixture of chocolate and milk is not in any sort of exact ratio.
There is no formula for chocolate milk.

(Stronger chocolate milk tastes better, but that's a qualitative measurement!)

More about mixtures

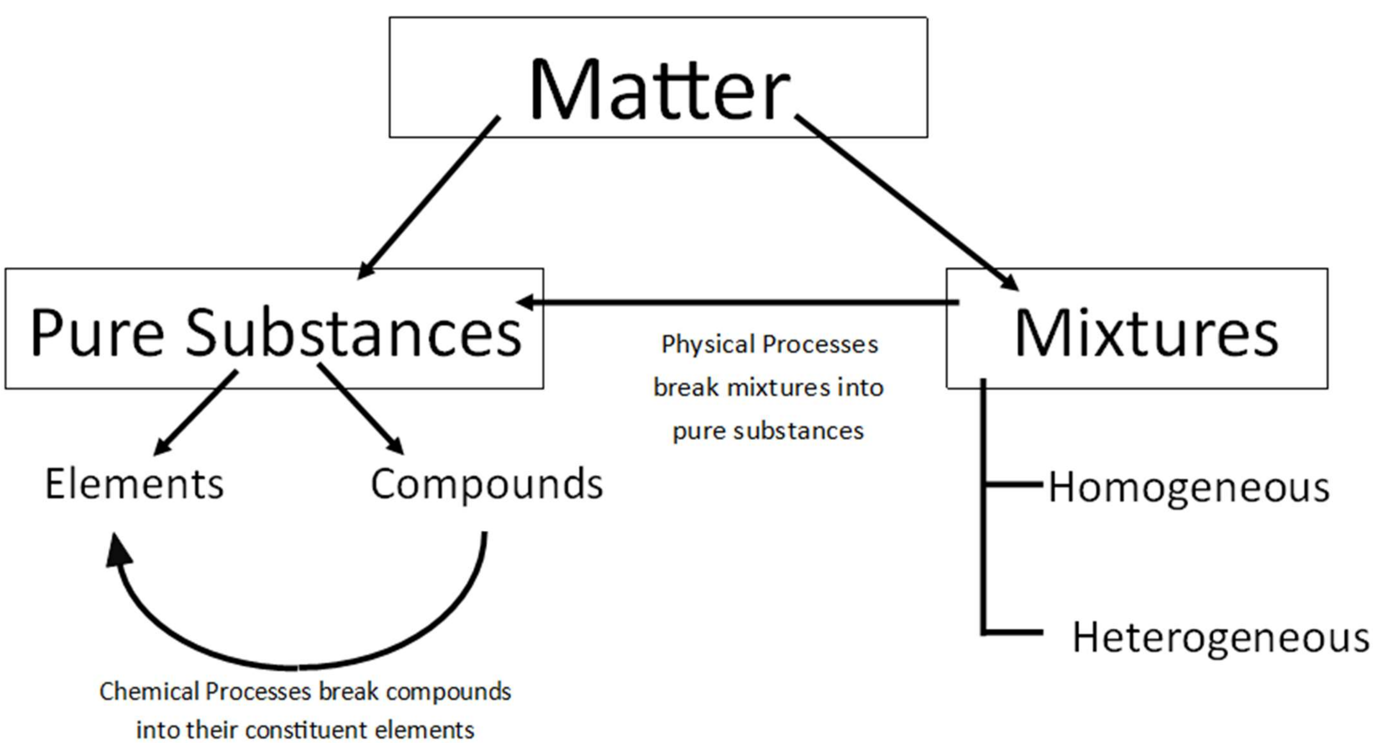
Solutions are mixtures where one part is dissolved into a liquid. The liquid part of this kind of mixture is called the solvent. The dissolved part is the solute. Water is a common solvent, although any liquid could be a solvent. With salty water, salt is the solute, dissolved into the solvent which is water.
Solutions are homogeneous, which means they are the same throughout.

Not all solutes dissolve into all solvents. Solvents all have limits to how much solute they can hold as well. You can only put a certain amount of sugar in a cup of coffee before solid sugar falls out to the bottom of the cup. Solvents can become "maxed out", or saturated. Adding more solute after the solvent is saturated just causes the excess solute to the bottom of the container.

Gases can mix as well. They create gaseous mixtures. Air is a mix of nitrogen, oxygen and many other gases. You could mix helium and carbon dioxide gases—if you had them in one container.

Solids can also be mixed together, but this usually requires you melt them so they can meld. Alloys of metals melted together include sterling silver, which is made from copper and silver melted (mixed). The proportions can change, and different qualities of sterling silver can be made.

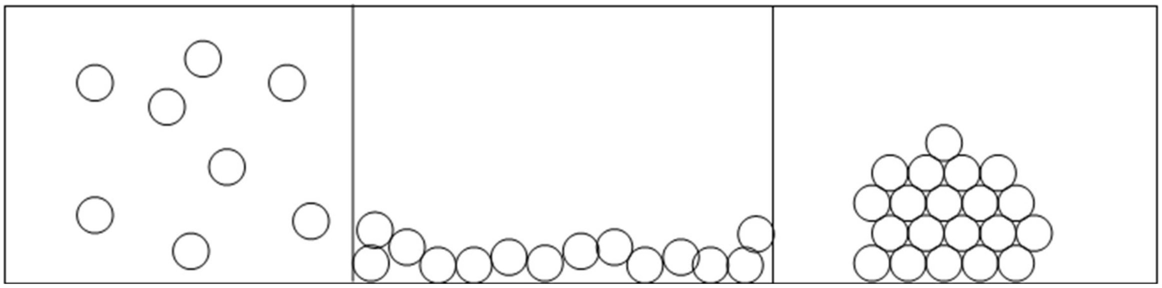
Copper and tin melted together make bronze, while copper and zinc melted together make brass. Carbon with melted iron creates steel. All of these are homogeneous mixtures.



The study of matter will be our work all year. This chart, like the one we drew in our notes, shows the relationship between all the different kinds of matter. Make sure you understand these boxes and arrows, and that you can draw it from memory, with examples for each box.

Particle diagrams

Because our particles, our atoms and molecules, are much too small to see, there is a technique called particle diagramming that allows us to "cartoon" to create diagrams showing elements, compounds, and mixtures. Using different shapes, or colors, we'll use pictures to express the relationships between atoms and molecules. These diagrams will also show solid, liquid, and gas phases.



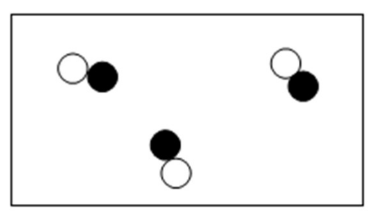
Above are little circles which represent one kind of particle. At left the particles are not touching, and are all "up" in the box, which represents gas particles, which have NO definite volume and NO definite shape.

At center, the particles are all touching and conform to the bottom of a container. This represents a liquid made up of the same kind of particles as the gas is. The particles are "sticky but not stuck". Liquids have a definite volume but indefinite shape.

At right, the exact kind of particles but they stack tightly, they have a definite shape. This represents a solid of the same kind of particles. Particles are stuck, in a uniform, lattice structure. Definite shape and definite volume.

If the particles (little circles) were water molecules, steam is left, water is in the middle, ice at right.
If the particles are iron atoms, at left is very hot iron gas, center is molten iron, and at right is solid iron.

In this particle diagram we have a lot more going on. Each particle is made up of two kinds of atoms, black & white circles, which are touching.



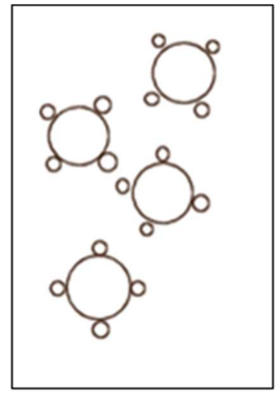
This means that the white circle is chemically bonded to a black circle.

This represents 3 particles called molecules. If the white circles are oxygen, and the black are carbon, this shows a 1:1 ratio of carbon bonded to oxygen, which is called carbon monoxide (CO gas). There are 3 molecules of $CO_{(G)}$. This is a pure substance, not a mixture.

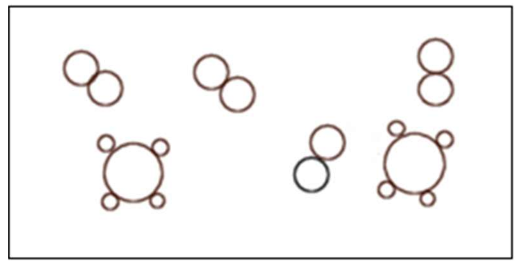
If you imagined the white circle to be sodium, and the black as chlorine, this could also represent 3 particles of sodium chloride which has a formula of NaCl and a 1:1 ratio as well. It would be unlikely that the NaCl would be a gas though, it has a very high boiling point.

If this diagram had a key to show you which atoms are represented by the shapes and colors, you could KNOW what it showed. Otherwise, it could represent a variety of compounds.

In this particle diagram we have a different situation. Here we have a big circle with four little circles attached to it. This could represent four molecules in a 1:4 ratio, for example, methane gas with a CH_4 chemical formula. I could be CBr_4 as well. This particle diagram can't represent atoms, because different shapes are touching, therefore it must be a compound. All the molecules are the same, so it is a pure substance, not a mixture. The particles are not in any definite shape, rather they're floating around, so it's a gas as well. It is methane in the gas phase.
Solid or liquid methane would not be "floating" in the box.



Here we have two methane molecules mixed with 4 diatomic molecules.

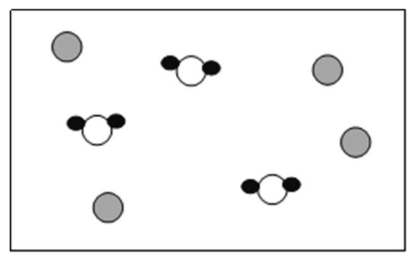


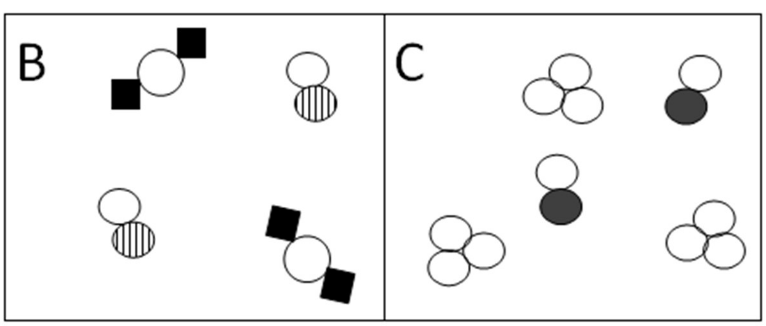
Diatomic means two of the same atoms bonded together.

There are 7 diatomic elements on the Periodic Table that are always paired normal temperatures. These might be oxygen as O_2, or nitrogen as N_2, or even the beautiful purple $I_{2(G)}$ we saw in lab.

Use your imagination. The 2 little touching circles could NOT be carbon monoxide, C + O are different atoms, they would have to be different colors or shapes.

This particle diagram shows one kind of an atom (grey dots) mixed with one kind of compound (the triple circles).
This could represent any one kind of atom, with CO_2 or maybe NO_2 (nitrogen dioxide). Without a key it could be any atom and many different molecules. The diagram "represents" one kind of atom, and one kind of molecule in a 1:2 ratio.





What's in the "B" & "C" boxes? Don't peek below until you try to figure this out!

B is two kinds of molecules (CO_2 and HCl maybe); this is a mixture.

C is triatomic element (like O_3 ozone), molecule (carbon monoxide CO maybe) this is a mixture too.

Chemical Symbols

The symbols of the atoms of the periodic table of elements come from a variety of languages and therefore do not always seem to match the common names of the elements. Hydrogen is H, helium is He, simple enough, but then sodium is Na, tin is Sn, and the famous mercury is Hg. Don't try to memorize these, use table S whenever you need to.

The rules are easy. All element symbols are capitalized. If the symbol has more than one letter (many do) the second letter is never capitalized.

When compounds form, only certain ratios of atoms to atoms are possible. We'll learn later in the year how to figure that out, but for now we can still learn to count how many atoms are present in a molecule.

H_2O is water. The two means that there are 2 hydrogen atoms. The lack of a number next to the oxygen (O) means that only one atom of oxygen is present. So, H_2O has a total of three atoms.

NH_3 is ammonia. Here we have 1 nitrogen atom chemically bonded with 3 hydrogen atoms. 4 total atoms.

Methane gas is CH_4, which is 1 carbon atom bonded to 4 hydrogen atoms, a total of five atoms.

$C_{12}H_{22}O_{11}$ is a much bigger molecule of sucrose (table sugar). A dozen carbons, twenty-two hydrogen atoms and eleven oxygen atoms, a total of 45 atoms!

$NH_4S_2O_3$ is ammonium thiosulfate. It has got one N, four H, two S, and three O atoms, for a total of 10.

$Ca(OH)_2$ is calcium hydroxide. Here the OH is in parenthesis, so we double that part.
It has one Ca, and two OH's, for five total atoms.

Later in the year we'll learn all the naming rules, the ratio making rules, and the proper ways to deal with this. For now, we want just to understand the subscript numbers and the elemental symbols.

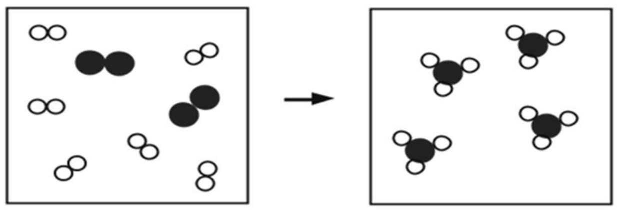
The Law of Conservation of Matter (or Mass)

Matter cannot be created or destroyed in a chemical reaction or physical change. Matter is conserved.
A physical change is a phase change, like solids melting into liquid, or a gas condensing into a liquid.

If you start with 100 grams of reactants, you will end up with 100 grams of products. This is the law.

6 grams hydrogen react completely with 28 grams of nitrogen and form exactly 34 grams of ammonia.
There can never be a loss of mass, or a gain of mass in a chemical reaction (or any physical change).

The cartoon shows 6 molecules of H_2 and 2 molecules of N_2. They react and form 4 molecules of NH_3.
Count the little pairs and the big pairs. They get reorganized, but they are all there!



Chemical vs. Physical Changes

Physical changes are the result of a rearrangement of the atoms or molecules present, but not in the formation of new substances with new properties. They include changing the phase in any direction from S, L, G or AQ.

Chemical changes are the result of a rearrangement of atoms or molecules whereby new substances form, new properties form, and the original substances and their properties disappear. These are chemical reactions. When methane gas reacts with oxygen, it releases a lot of heat, carbon dioxide and water gas. The methane and oxygen are recombined into new molecules, they oxygen + methane "disappear" as pure substances, forming into the water & carbon dioxide. No loss of mass, but big changes have happened.

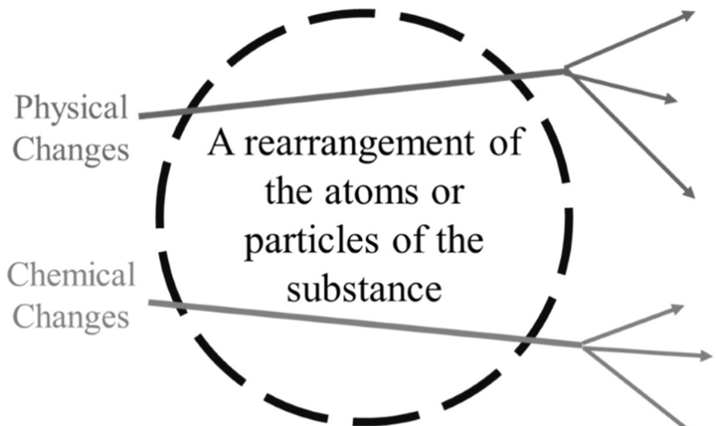
Some likely indicators that a chemical reaction has taken place (these are not always definite) are easily remembered with the acronym TOPIC-B.

T	Temperature changes. Often a chemical reaction will release energy or heat, or the opposite will absorb energy, making the immediate environment cold. Heat release is an exothermic reaction, heat absorption is an endothermic reaction.
O	Odor release. New smells usually indicate something new has formed from the reactants at hand. Many kinds of matter have an odor, a different odor makes you think something different is present.
P	Precipitates in solutions. Sometimes we mix solutions and form new compounds that cannot dissolve in the solvent. These insoluble compounds "fall out" of solutions as solids. Two solutions can mix together, but if a solid falls out, that is an indicator that a chemical change happened, a new insoluble substance formed that was not present before.
I	I means irreversible, which needs an explanation. All chemical reactions can be reversed, but they are not spontaneously reversible. They don't go backwards by themselves. Once a chemical reaction occurs it will not spontaneously reform the original reactants. Chemical reactions tend to go one way. To reverse a chemical reaction takes another chemical reaction.
C	For is for color changes. Matter is fairly stable; color is directly connected to the atoms or molecules present. A change in color usually indicates a change in the particles, new particles formed.
B	Bubbles that were not there before also indicate that something has chemically changed. Opening a warm can of soda means someone gets sprayed, which is funny, but these are not new bubbles, so it is not a chemical reaction. When new bubbles form (like new odors), something new forms.

Physical vs. Chemical Changes

In a chemical change, there is a rearrangement of atoms or particles in a substance. This rearrangement includes the formation of new substances with their own new properties. Examples include all chemical reactions, with the TOPIC B indicators.

Physical changes also have a rearrangement of atoms or particles, but no new substances form, so all the original properties remain. Examples include all phase changes, bending of metals, shattering of crystals, ripping of paper, or stirring paint colors together.

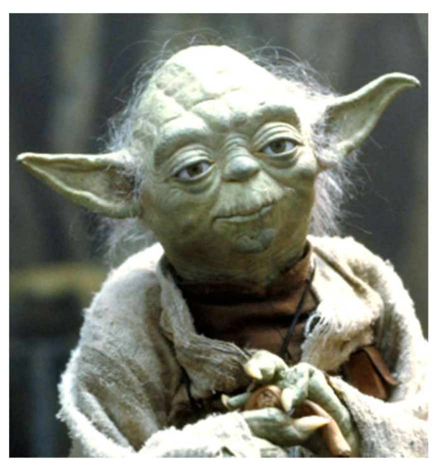


No new substances form
No new properties
No new formulas
New substances form, with…
New properties that have…
New formulas

This diagram above is one of many that will "show" the meaning of concepts of chemistry. Think hard when you look at it, make sure you understand what it shows. If you don't understand it, that is normal, but you must come to your teacher and ask for clarification.

If you think that overlooking this diagram will work out for you, that is a big mistake. It's okay to need some more explanation, but it's never okay to make believe everything is cool when it's not.

Do you get this diagram, or do you need to ask for some help? Choose wisely.



Fill in the phase change names *(them memorize them)*	
Solid → liquid	
Liquid → gas	
Solid → gas	
Liquid → solid	
Gas → liquid	
Gas → solid	

Vocabulary words (or else)	
Substance	A pure substance (element or compound) has a constant composition and constant properties throughout a given sample, and from sample to sample.
Element	Elements are substances that are composed of atoms that have the same atomic number. Elements cannot be broken down by chemical change.
Compound	A compound is a substance composed of two or more different elements that are chemically combined in a fixed proportion. A chemical compound can be broken down by chemical means. A chemical compound can be represented by a specific chemical formula and assigned a name based on the IUPAC system
IUPAC	International Union of Physical and Applied Chemists, the rule making body for naming compounds and new elements on the periodic table, and to make any (small) changes to the Periodic Table numbers
Mixture	Mixtures are composed of two or more different substances that can be separated by physical means. When different substances are mixed together, a homogeneous or heterogeneous mixture is formed.
Phase	The three phases of matter (solids, liquids, and gases) have different properties. Which phase a substance is in depends upon temperature and pressure that they exist at. Phase changes occur at the melting/freezing point and boiling/condensing points. Some substances can “jump” from solid to gas or reverse.
Homogeneous	When a substance, or a mixture is the same throughout.
Heterogeneous	When a mixture is not the same throughout.

<table>
<tr><td colspan="2">Draw particle diagrams
for the three phases
(once you know how)</td><td>In last column, write one of these lines…

Definite Volume & Indefinite Shape,
Definite Volume & Definite Shape, or
Indefinite Volume & Indefinite Shape</td></tr>
<tr><td>S</td><td></td><td></td></tr>
<tr><td>L</td><td></td><td></td></tr>
<tr><td>G</td><td></td><td></td></tr>
<tr><td colspan="3">Define Aqueous</td></tr>
</table>