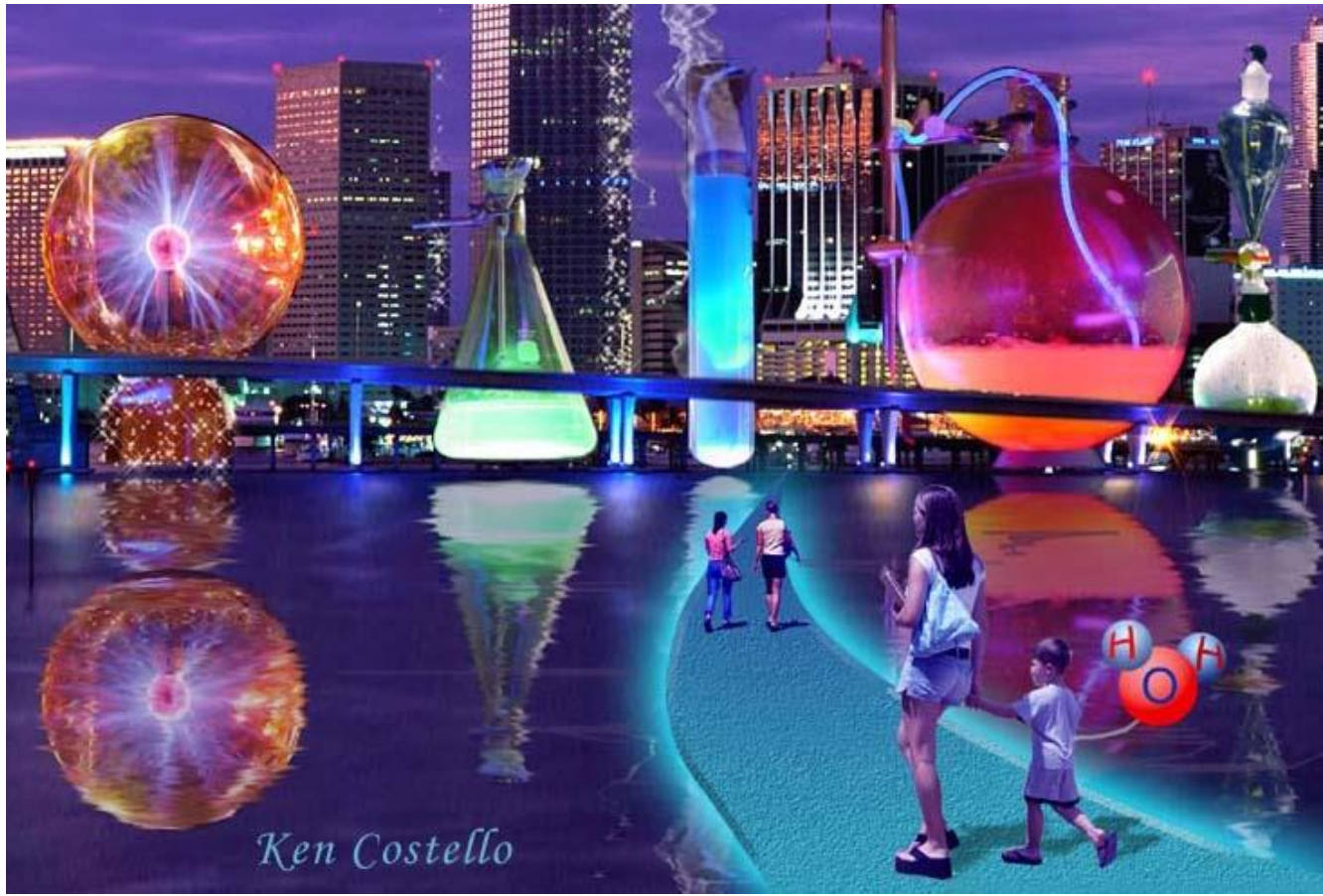


The Classification of Matter

CHAPTER 5 - SECTION 1

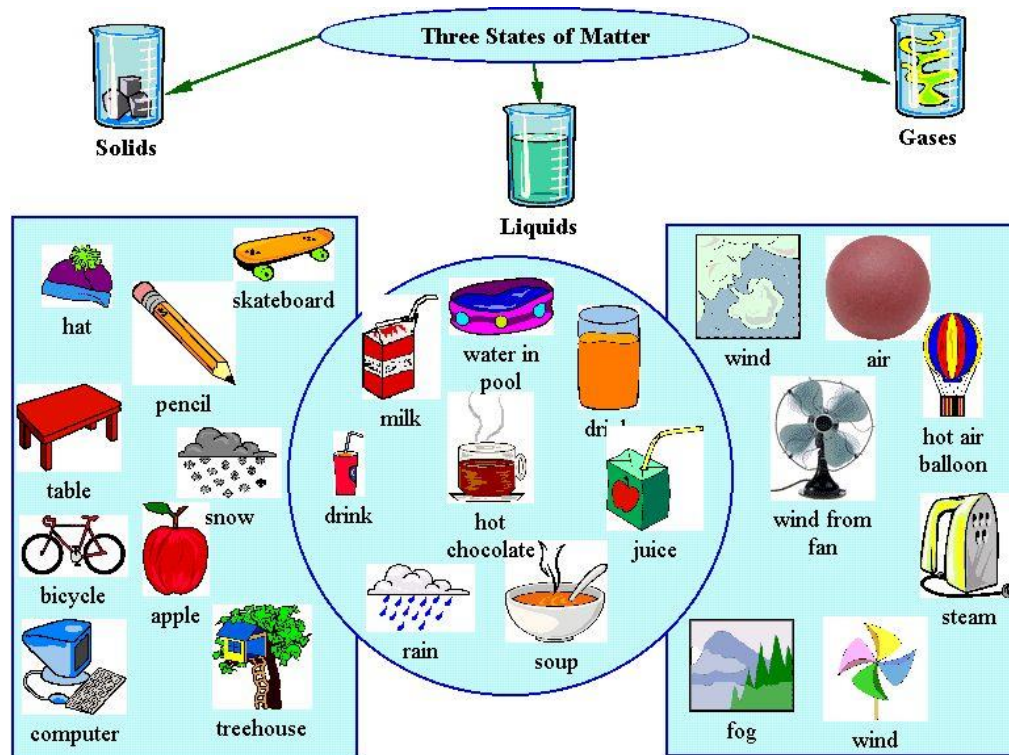
What is Chemistry

Chemistry is the study of matter..



What is Matter?

Matter is anything that has **mass** and **volume**.



What is Matter?

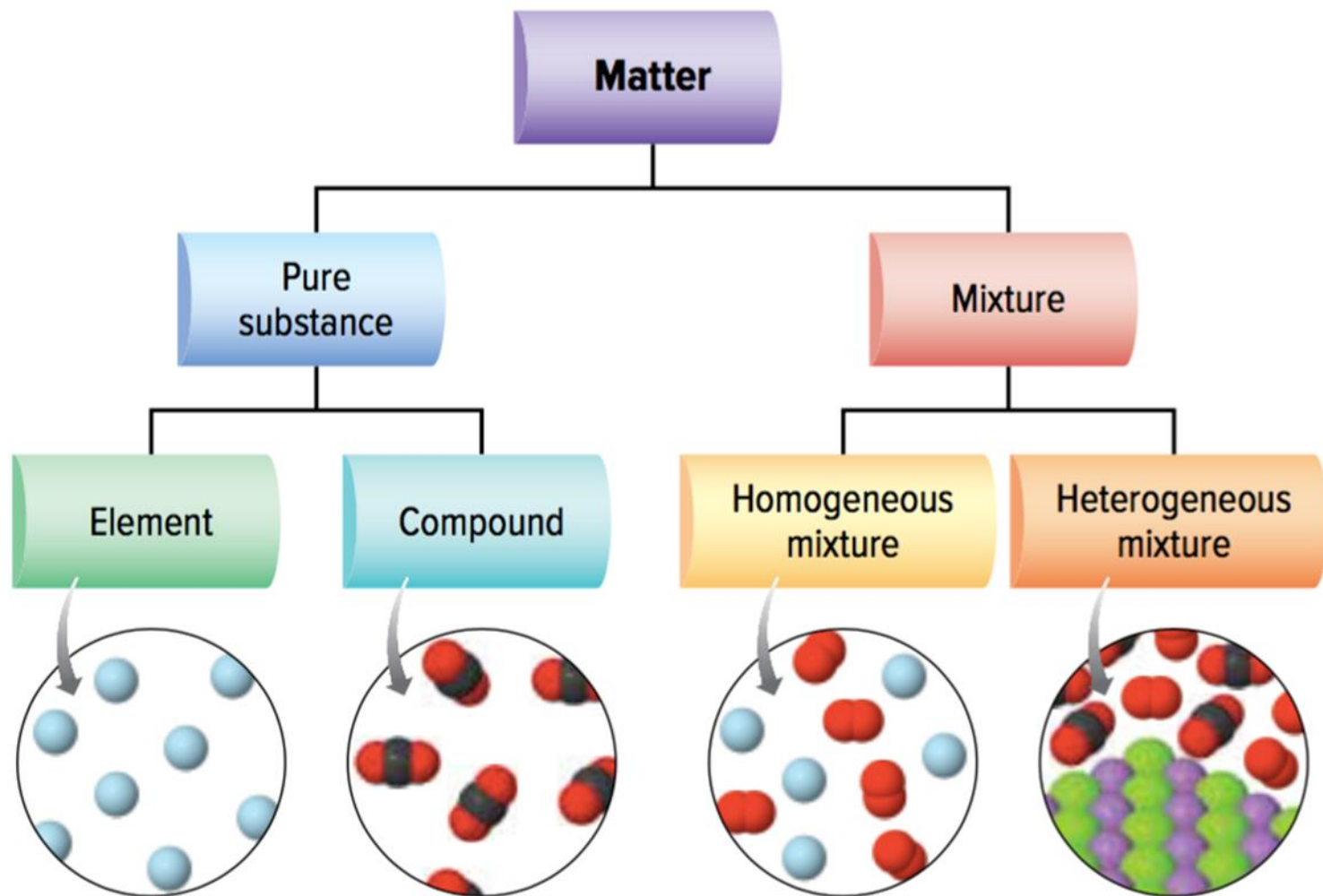
- **Mass** is the amount of matter in a substance or object.
 - Mass is often measured in grams or kilograms.



What is Matter?

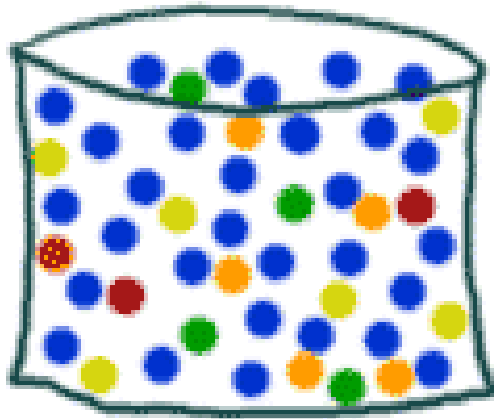
- **Volume** is the amount of space a substance or an object occupies.
- Volume is often measured in litres.



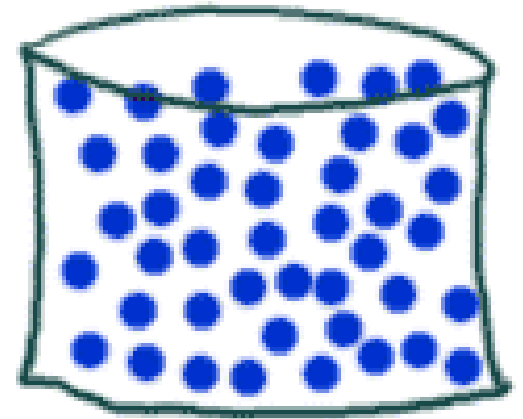


There are two types of Matter:

1. Pure Substance
2. Mixture



Tap Water

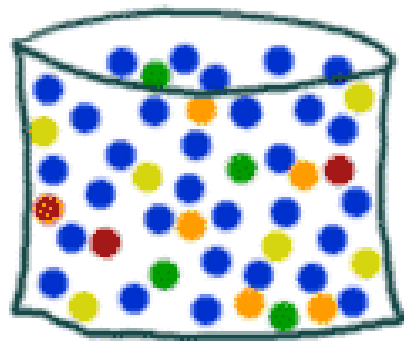


Distilled

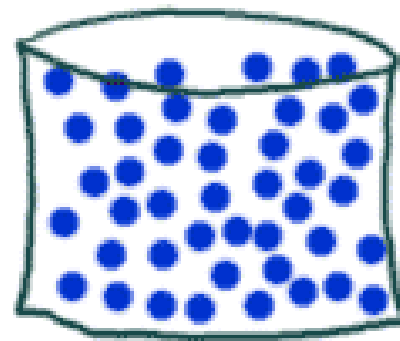
1. Pure Substance:

- Is matter that contains only one type of particle. Cannot be separated by physical means

Example: distilled water, pure copper wire



Tap Water

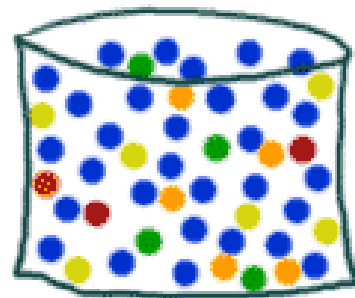


Distilled

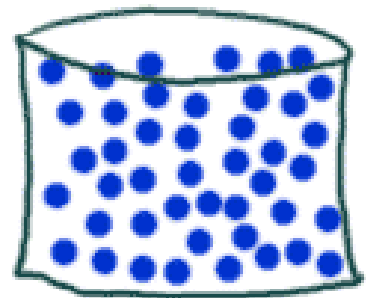
2. Mixture:

- Contains two or more pure substances.
Can be separated by physical means

Examples: tap water, table salt dissolved in water, iron mixed with sulfur



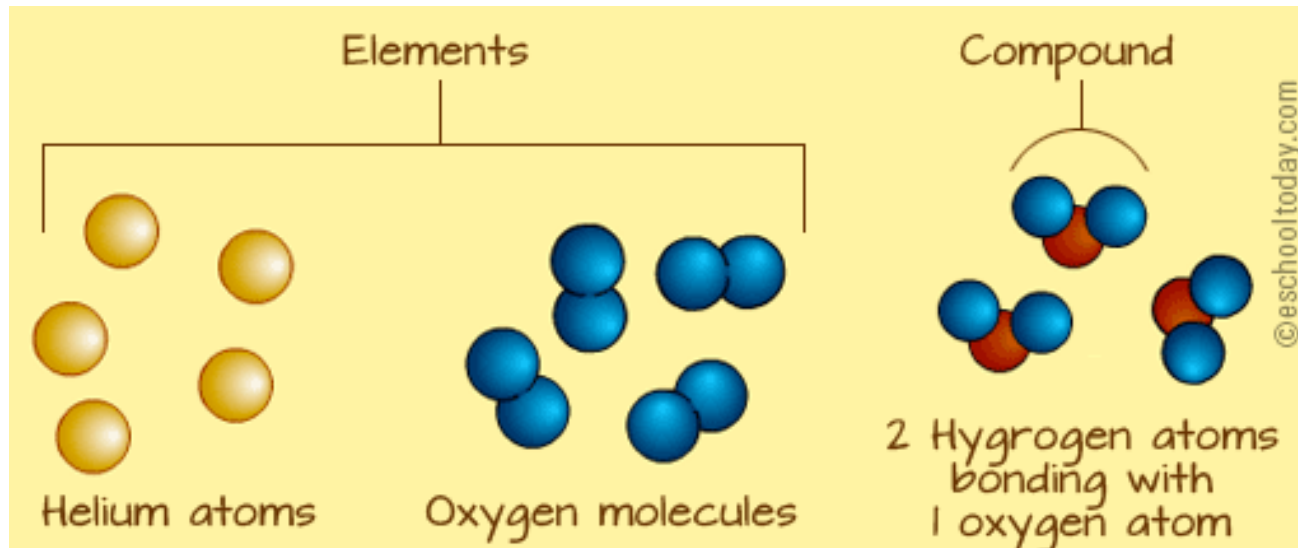
Tap Water



Distilled

Pure Substances have **two** types

1. Elements
2. Compounds



1. Elements

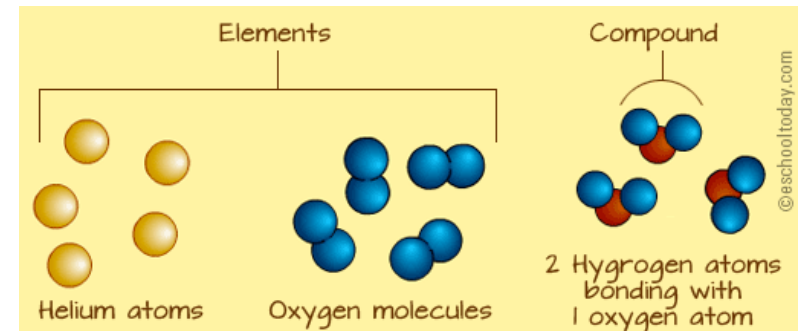
- Made up of one type of atom; cannot be broken down into simpler substances (example: gold)

Periodic Table of Elements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
Atomic # Symbol Name Atomic Mass																			
1 H Hydrogen 1.00794																		2 He Helium 4.002602	
3 Li Lithium 6.941	4 Be Beryllium 9.012182																		
C Solid																			
Hg Liquid																			
H Gas																			
Rf Unknown																			
		Metals										Nonmetals							
		Alkali metals					Alkaline earth metals					Transition metals		Poor metals		Other nonmetals		Noble gases	
		Lanthanoids					Actinoids												
11 Na Sodium 22.98976928	12 Mg Magnesium 24.304																		
13 Al Aluminum 26.9815386	14 Si Silicon 28.0855	15 P Phosphorus 30.973762	16 S Sulfur 32.06	17 Cl Chlorine 35.45	18 Ar Argon 39.948														
19 K Potassium 39.0983	20 Ca Calcium 40.078	21 Sc Scandium 44.955912	22 Ti Titanium 47.88	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938044	26 Fe Iron 55.845	27 Co Cobalt 58.933195	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.64	33 As Arsenic 74.9216	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.798		
37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.90584	40 Zr Zirconium 91.224	41 Nb Niobium 92.90638	42 Mo Molybdenum 95.94	43 Tc Technetium 98.9062	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.9055	46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.757	52 Te Tellurium 127.6	53 I Iodine 126.905	54 Xe Xenon 131.29		
55 Cs Cesium 132.90545196	56 Ba Barium 137.327																		
57-71		72 Hf Hafnium 178.49	73 Ta Tantalum 180.94788	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.222	78 Pt Platinum 195.084	79 Au Gold 196.966569	80 Hg Mercury 200.59	81 Tl Thallium 204.38	82 Pb Lead 207.2	83 Bi Bismuth 208.9804	84 Po Polonium 209	85 At Astatine 210	86 Rn Radon 222			
89-103		104 Rf Rutherfordium 261	105 Db Dubnium 262	106 Sg Seaborgium 266	107 Bh Bohrium 264	108 Hs Hassium 277	109 Mt Meitnerium 268	110 Ds Darmstadtium 271	111 Rg Roentgenium 272	112 Uub Ununbium 285	113 Uut Ununtrium 284	114 Uuq Ununquadium 289	115 Uup Ununpentium 288	116 Uuh Ununhexium 292	117 Uus Ununseptium 294	118 Uuo Ununoctium 294			

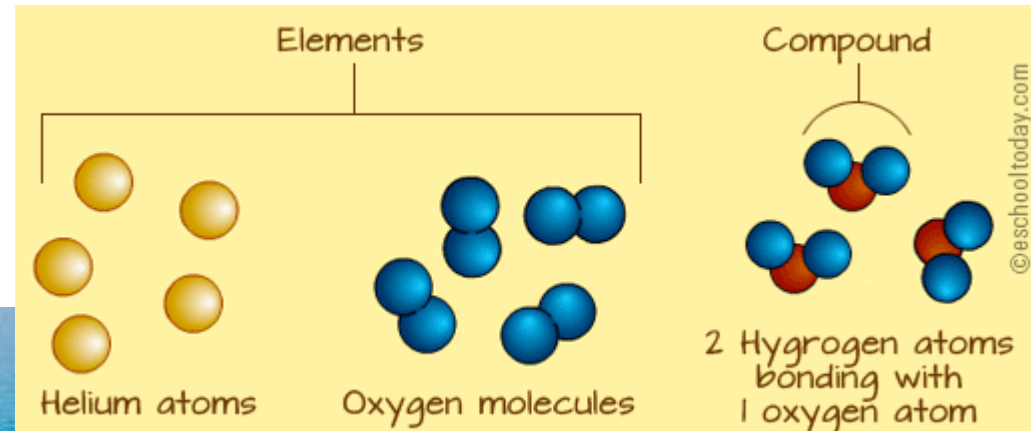
For elements with no stable isotopes, the mass number of the isotope with the longest half-life is in parentheses.

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2. Compounds

- Made up of two or more elements; can be broken down into simpler substances (example: sodium chloride)



Lets talk about mixtures!

Mixtures are formed when two or more pure substances are put together



Mixtures – **two** types!

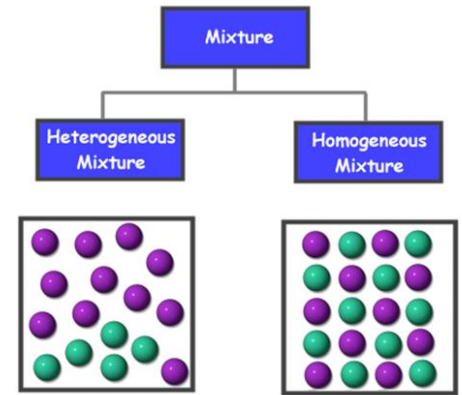
1. Heterogeneous mixtures
2. Homogenous mixtures

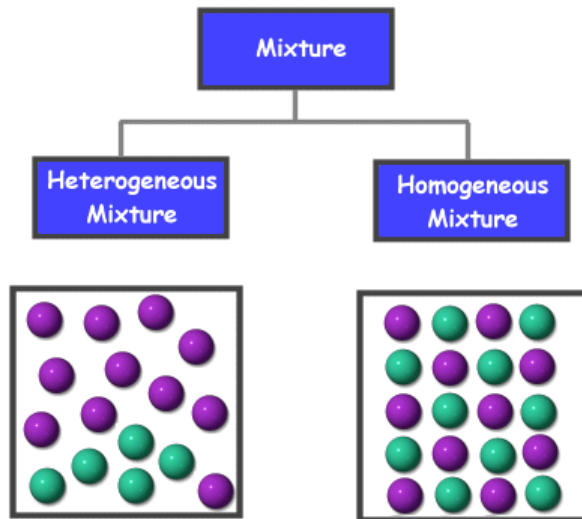


Mixtures – **two** types!

1. Heterogeneous mixtures

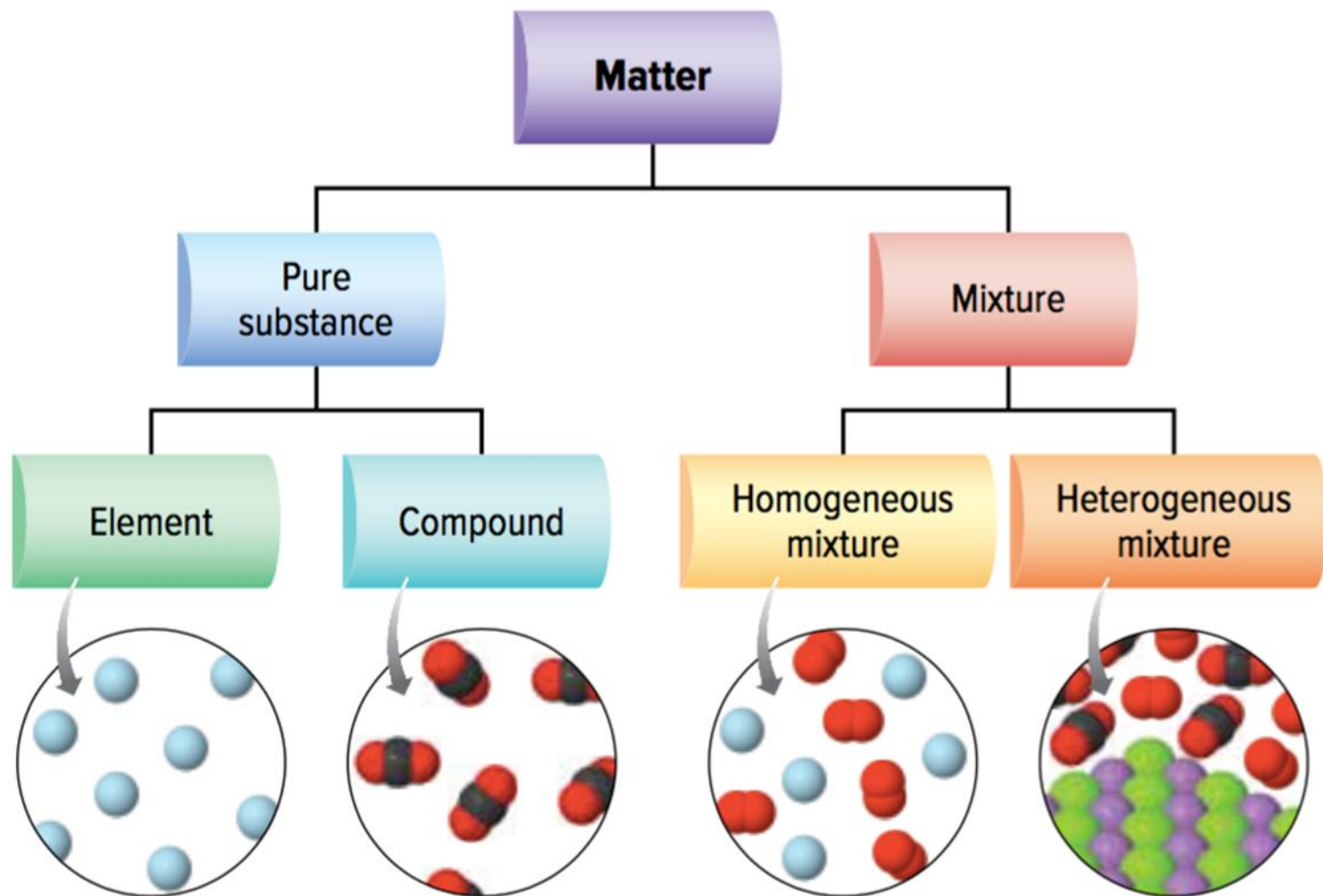
- A mixture that is not uniform in its composition
- have different components that you can see
- The particles exist in large, visible clumps – they can be distinguished!
- Example: beach sand, salad dressing, oil and water





2. Homogenous mixtures(Solutions)

- A mixture that is made of substances that are evenly mixed together
- You cannot see their components
- Example:
 - air (nitrogen, oxygen, hydrogen)
 - steel (iron and other elements)
 - sugar in pop
 - the air we breathe



Mixtures, Compounds, and Elements



This train runs on diesel fuel. Diesel is a mixture of chemical compounds made of the elements hydrogen and carbon.

The metal used to make the bridge is steel. Steel is a very strong solid mixture—an alloy—composed of iron and small amounts of other elements, such as carbon.

The rock of the hillside is a mixture that includes quartz, which is a compound made of the elements silicon and oxygen.

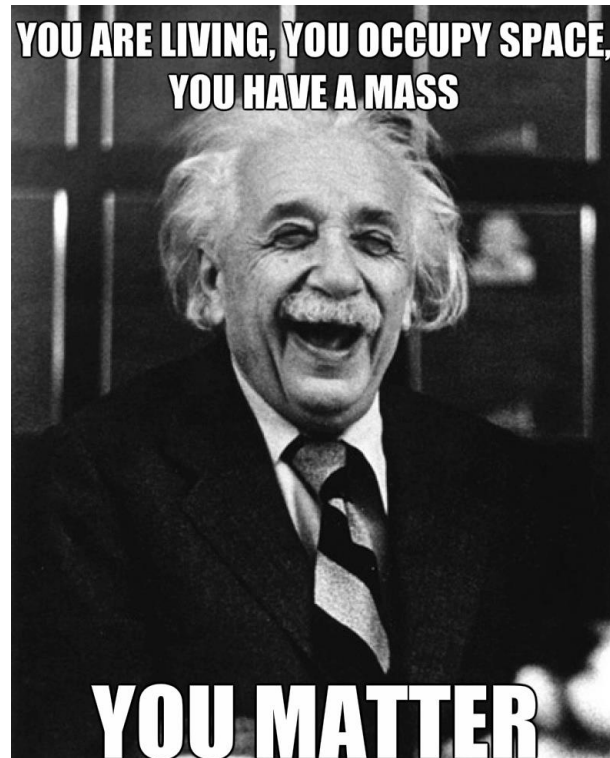
This river water is a mixture made up of the compound water, a variety of compounds and elements dissolved in the water, and suspended bits of rock.

Figure 2.2 This pair of railway bridges, called the Cisco bridges, is found at Siska, B.C. **Make a table to list the mixtures, compounds, and elements mentioned. Add one example not mentioned.**

Figure 2.2

Matter Tree Activity

Can you identify Pure Substances from Mixtures?



Properties

Properties = Characteristics or how we describe something

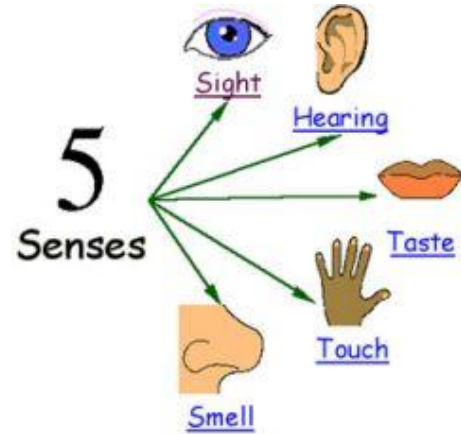


Properties of Matter

1. Physical Properties
2. Chemical Properties



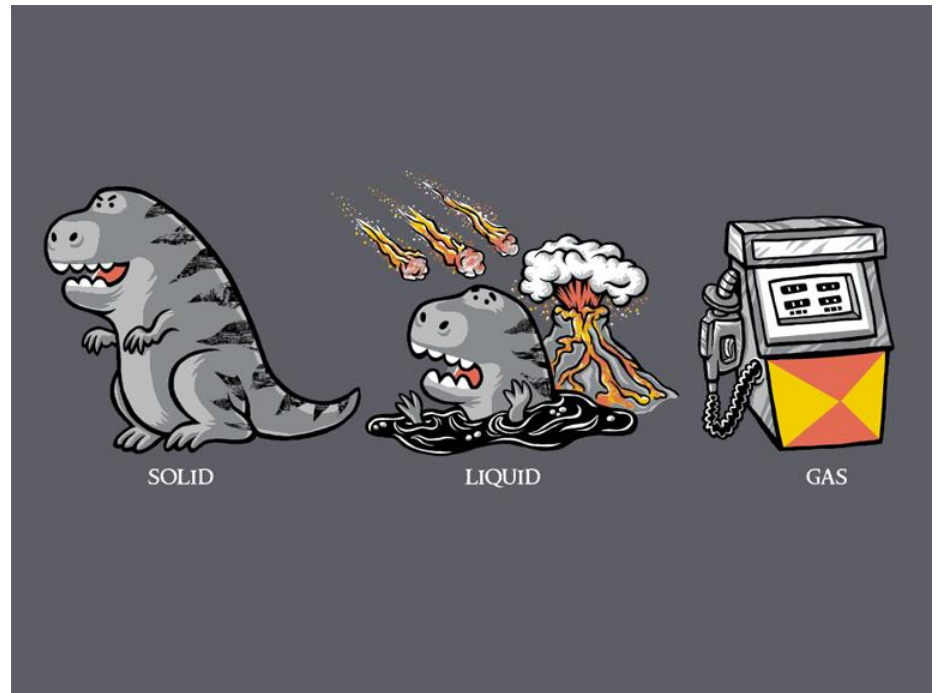
Physical Properties



Properties you can observe with your senses, measure or calculate

- Colour, hardness, density, melting temperature etc.

The most common physical property used to classify things =
STATE OF MATTER



State of Matter

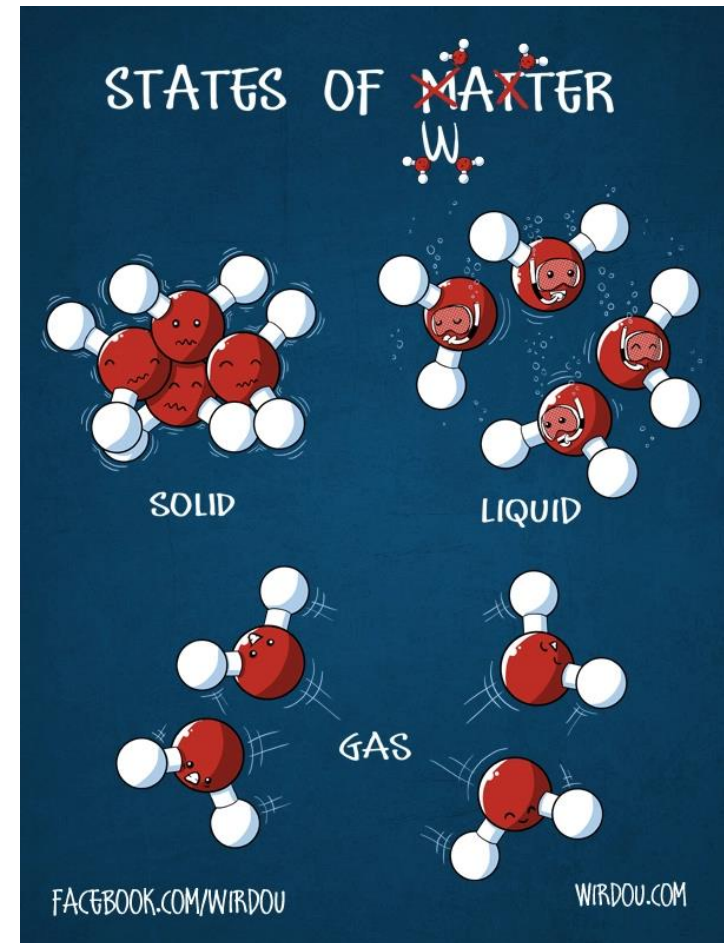
Substances can exist in more than one state

IMPORTANT: When it changes state it does not change into another substance

Example: Water (H_2O)

Three states:

- Solid, Liquid, Gas



Other Physical Properties

Malleability

- Metals that can be beaten into thin sheets are considered to be malleable



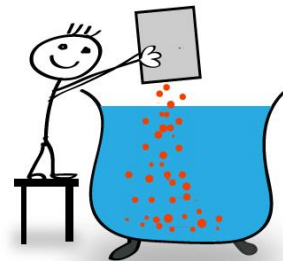
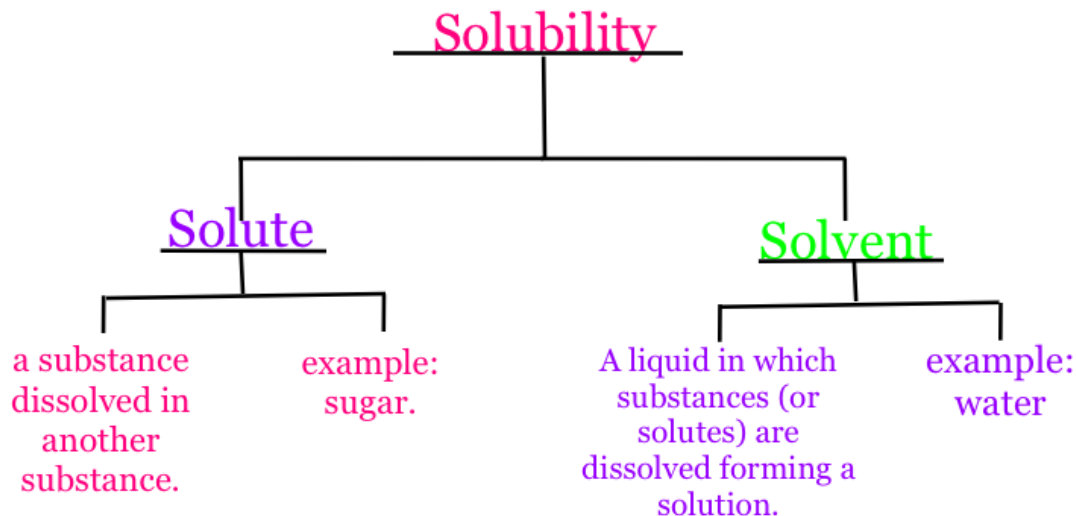
Ductility

- Softer metals which can be “drawn” into wires – you can pull at opposite ends of a metal rod and it will become thinner



Solubility

- Degree in which a substance will dissolve in a given amount of another substance

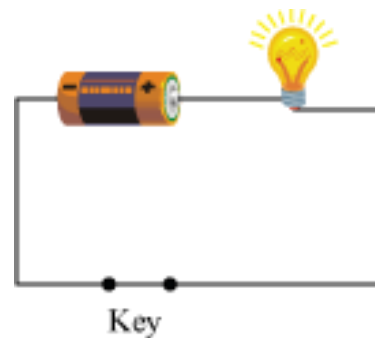
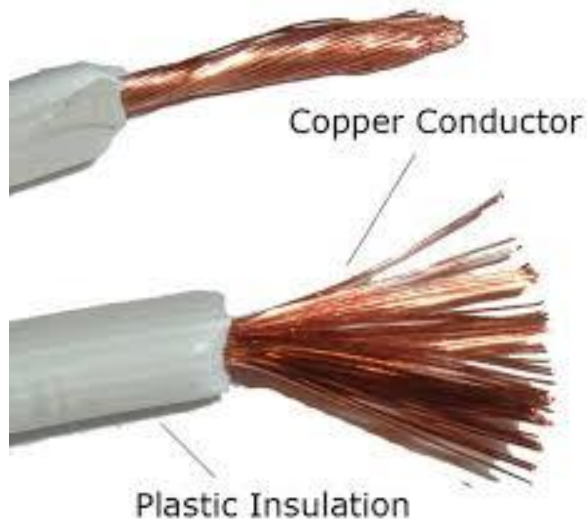


SOLUBILITY

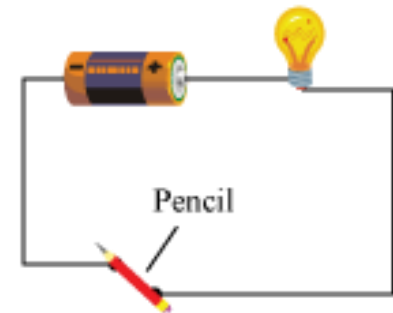
HOW MUCH WILL IT DISSOLVE?

Conductivity

- Ability of a material to conduct electricity or heat



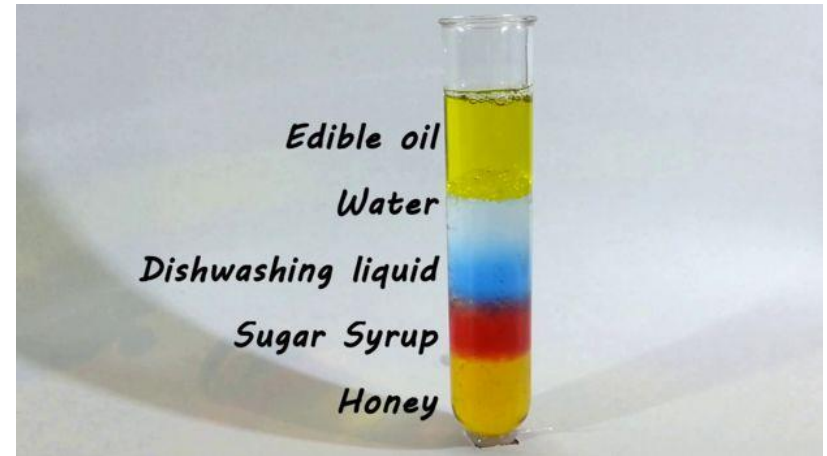
Key is a good conductor



Wood is a bad conductor

Density

- The mass per unit of volume of a substance
- It is always constant- no matter how much of a substance you have
- $\text{DENSITY} = \frac{\text{MASS}}{\text{Volume}}$



Chemical Properties

Describes the behaviour of a substance as it changes into a new substance

- Whether one substance will react with another substance
- Rate of reaction
- Amount of heat produced
- What proportion the substances react etc.



Common Chemical Properties

Flammability

- The rapid reaction of some substances with oxygen which result in the release of LOTS of energy



Common Chemical Properties

Corrosion

- The slow reaction of certain metals with oxygen to form metal oxides (oxidation) - RUST



Common Chemical Properties

Reactions with Acid

- Reaction of some metals that often produces gases
 - Limestone broken down by weak acid = Limestone caves



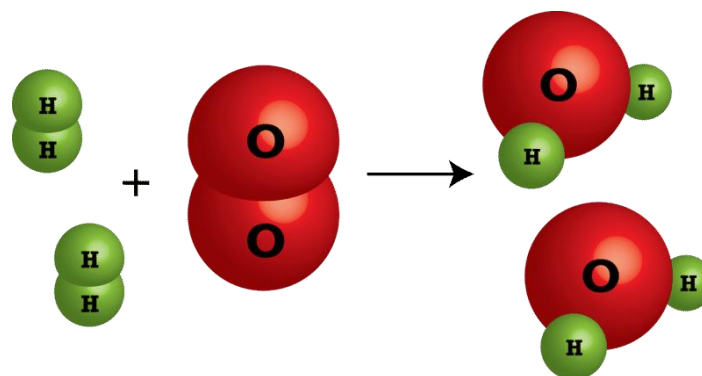
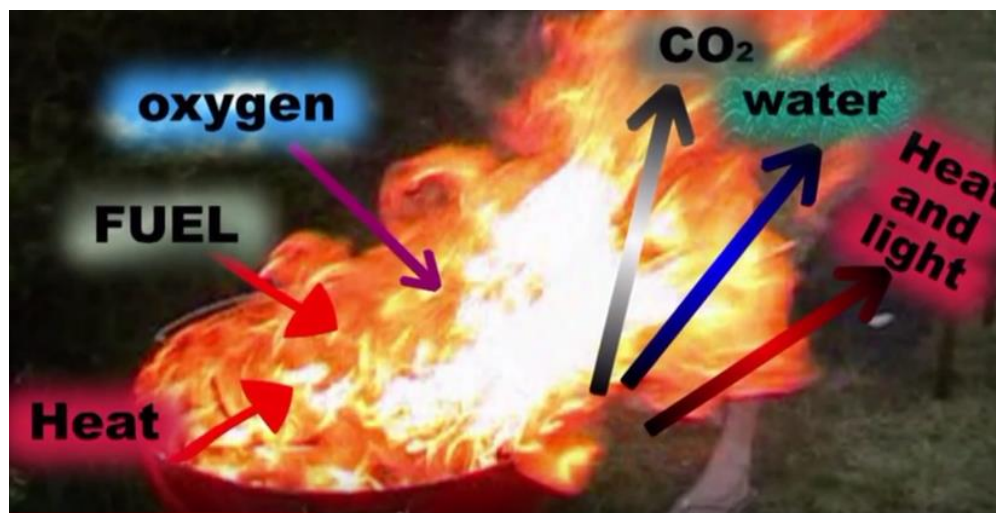
Physical and Chemical Properties

Table 2.1 Physical and Chemical Properties

Physical Properties		Chemical Properties
<ul style="list-style-type: none">• colour• malleability• texture• viscosity• ability to conduct heat and electricity	<ul style="list-style-type: none">• state of matter• melting point• boiling point• hardness• solubility	<ul style="list-style-type: none">• combustibility• reactivity with acids• reactivity with oxygen• lack of reactivity

Chemical Reactions

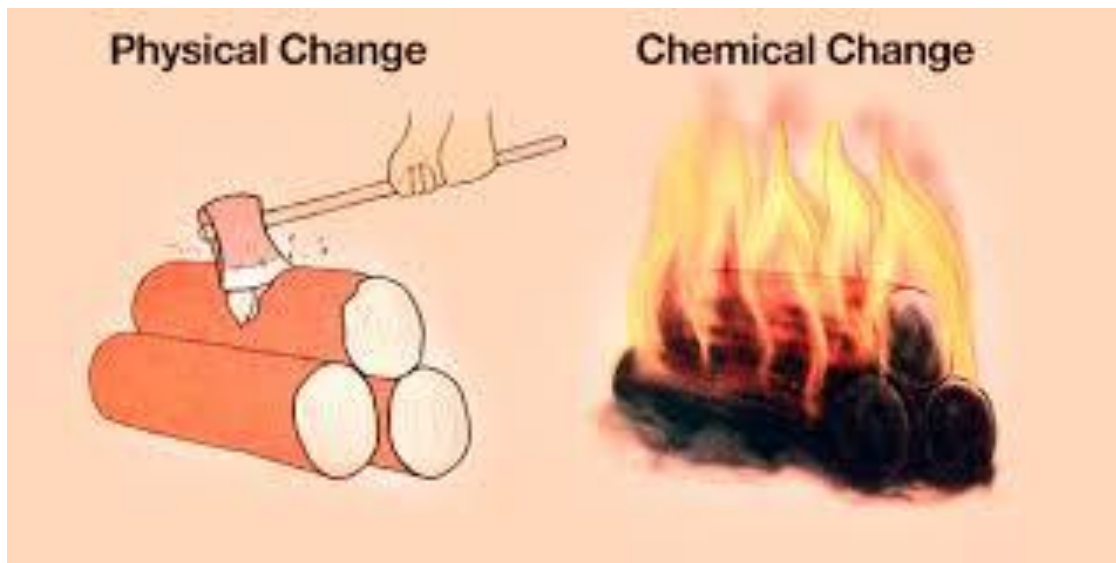
- Chemical reaction
 - one or more pure substances interact to form a different substance or substances
- Elements can react to form compounds
- Compounds and elements can react to form new compounds
- Compounds can break apart to form elements and simpler compounds



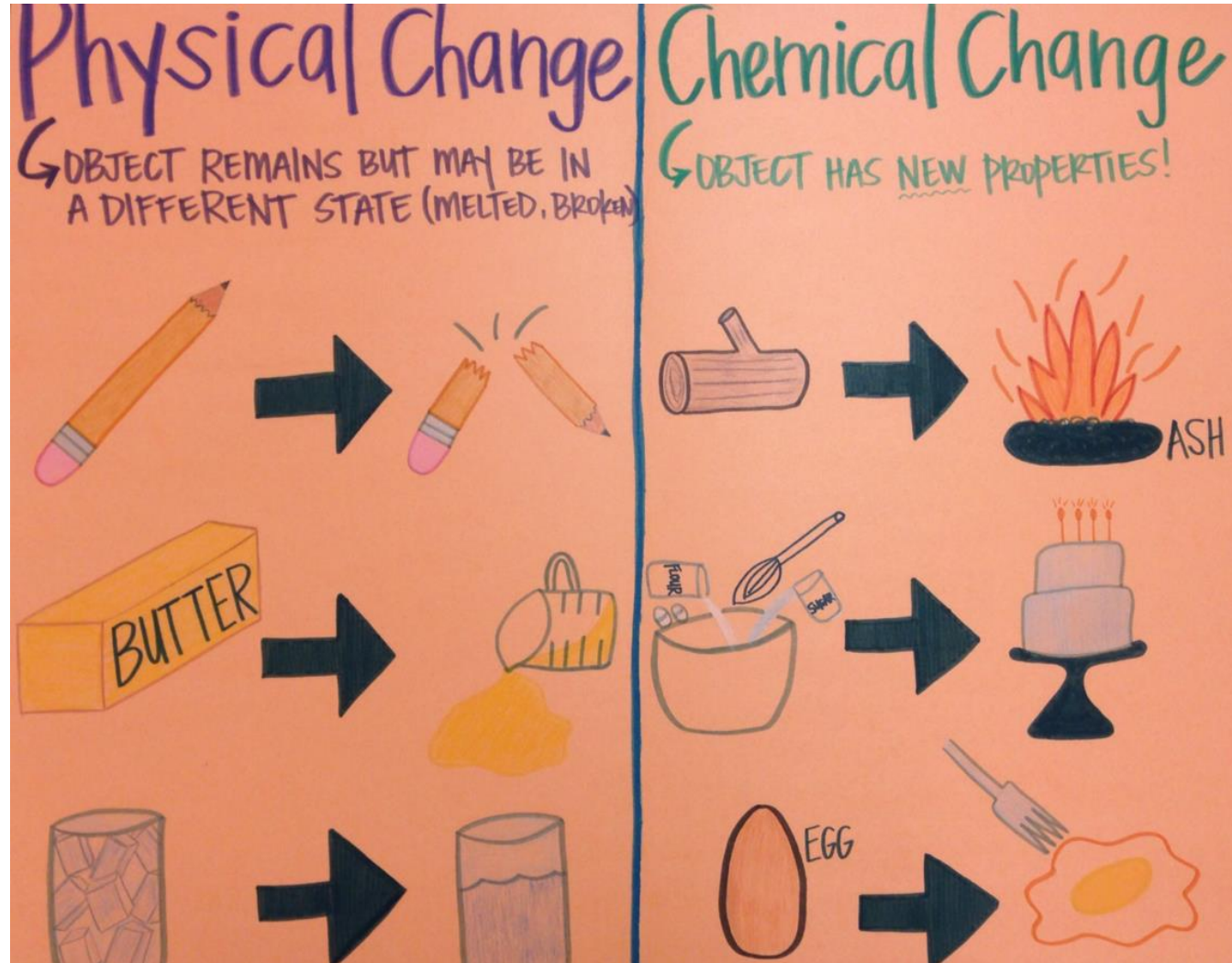
Chemical or Physical Change?

Chemical Change Check List:

1. The change is irreversible – you can't go back
2. A new substance forms
3. New properties are observed
4. An energy change may occur like heat or light given off or absorbed



Practice



Pg. 47-48

Physical and Chemical
change handout