Elements, Compounds, and Mixtures

MATTER

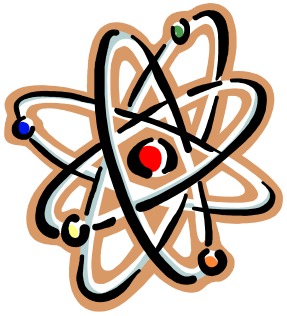
- Makes up everything
- Anything that has
- Mass
- Takes up space (volume)
- Is made up of atoms.

Pure Substances

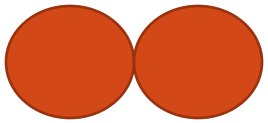
- **A sample of matter that has definite chemical and physical properties.**

Elements

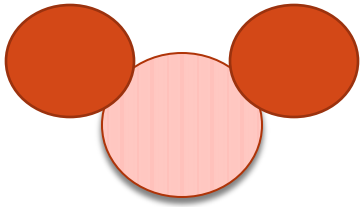
Atoms



Molecules



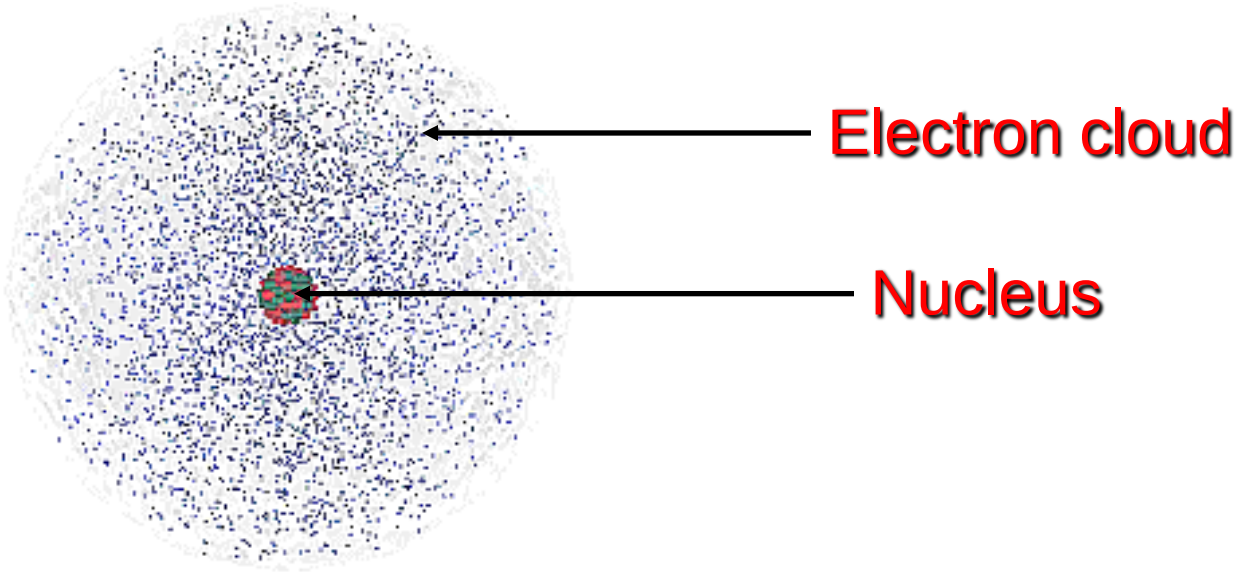
Compounds



The Atom

An atom consists of a

- **Nucleus** (protons and neutrons)
- **electrons** in space around the nucleus.

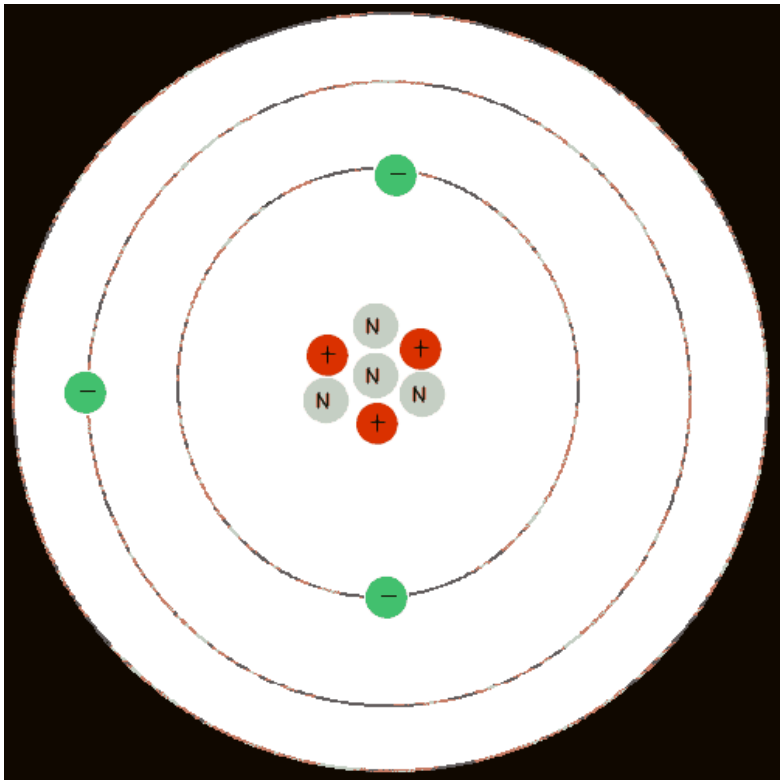


Atoms

- **The building blocks of Matter**

- **Consists of Protons (+), Electrons (-), and Neutrons (N).**

- **Smallest unit of an <u>element</u> that has all of he same properties of that element.**

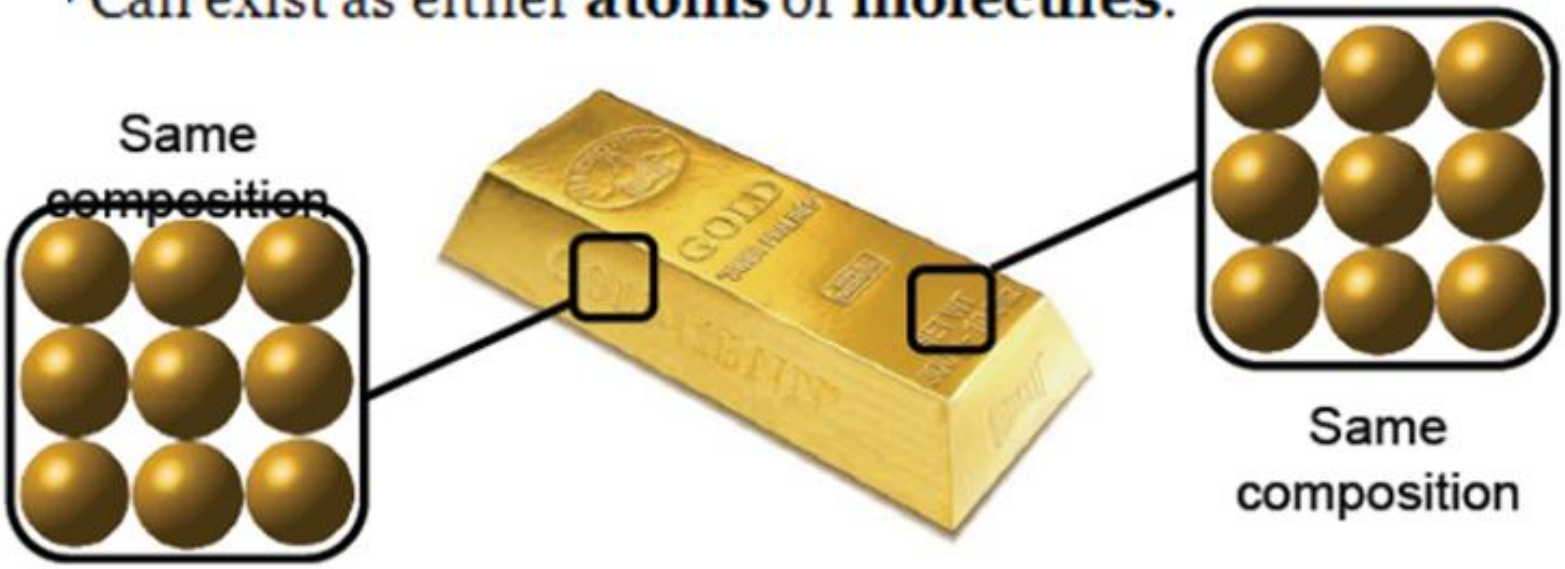


Images are from http://www.chem4kids.com

Elements

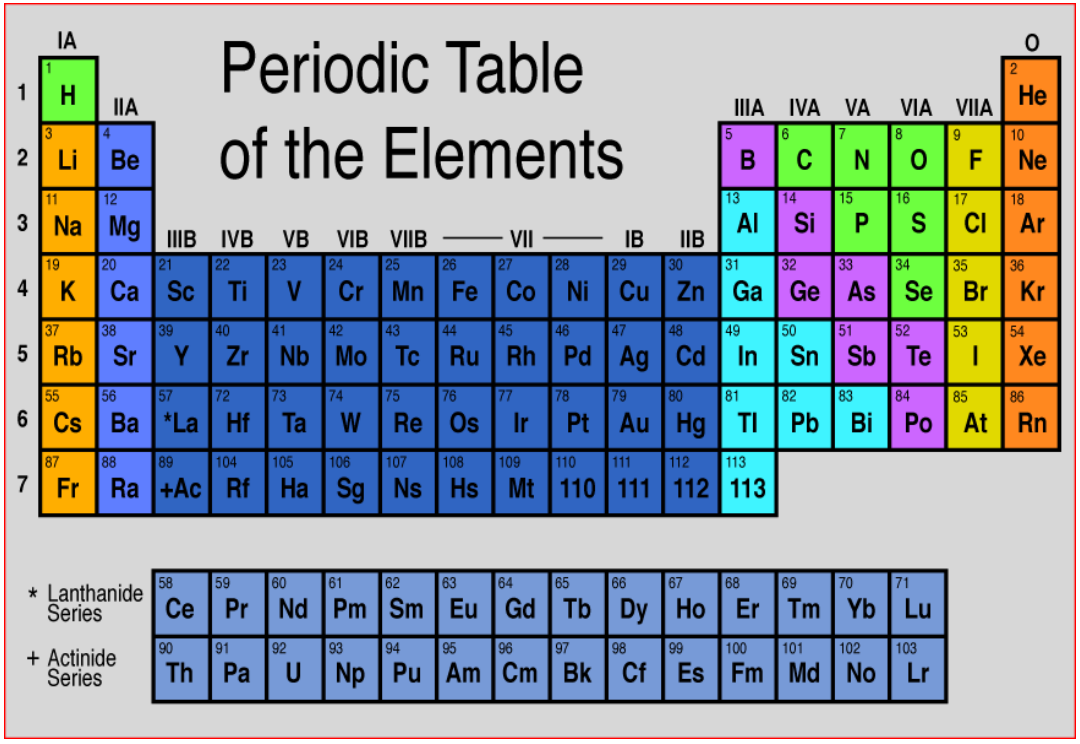
PARTS... PROTONS, NEU
AND ELECTRON

- Consists of only one kind of **atom**,
- Cannot be broken down into a simpler type of matter by either physical or chemical means
- Can exist as either **atoms** or **molecules**.



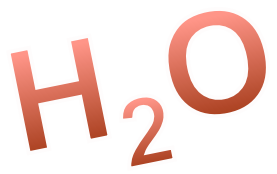
Elements

- **pure substance that <u>cannot</u> be <u>separated</u> into simpler substance by physical or chemical means.**

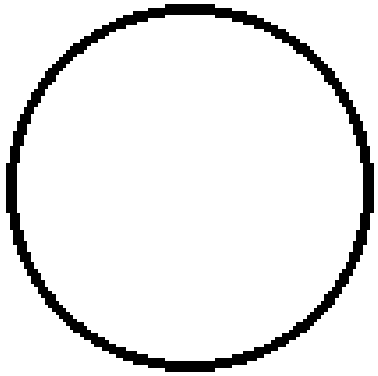


Compounds

- Made of elements in a specific ratio that is always the same
- Have their own physical and chemical properties.
- Can only be separated by chemical means, not physically
- Smallest particle is a molecule



Compounds

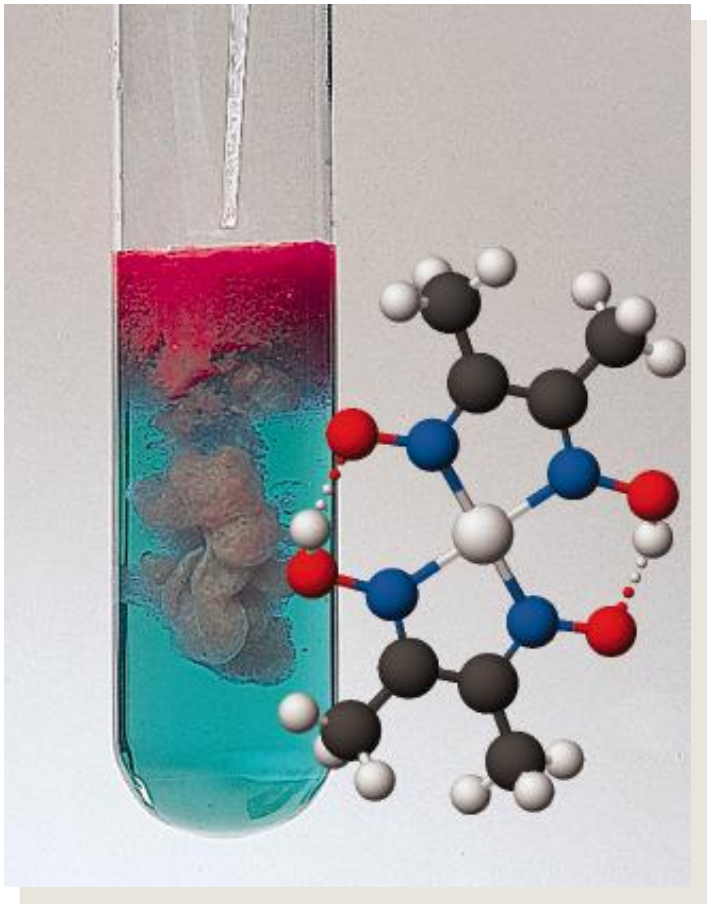


- Atoms of two or more **different** elements joined together by **chemical bonds.**

In the animation above, water (H_2O) is a compound made of Hydrogen and Oxygen.

Animated images and notes from http://www.chem.purdue.edu/gchelp/atoms/elements.html

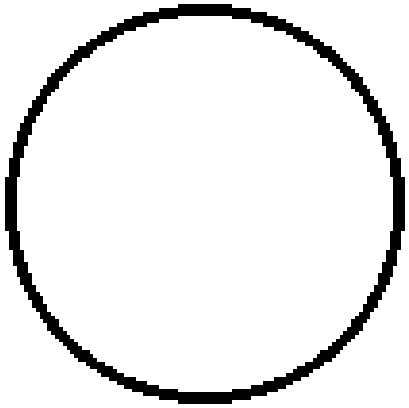
CHEMICAL COMPOUNDS are composed of atoms and so can be decomposed to those atoms.



The red compound is composed of

- nickel (Ni) (silver)
- carbon (C) (black)
- hydrogen (H) (white)
- oxygen (O) (red)
- nitrogen (N) (blue)

Molecules

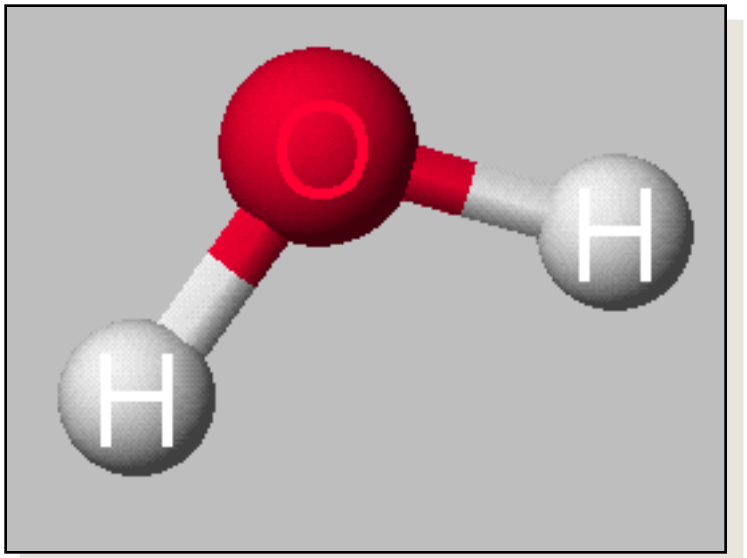


• A ***molecule*** consists of **two or more atoms** of the **same** element, or **different** elements, that are chemically bound together.

• In the animation above, two nitrogen atoms (N + N = N2) make one **Nitrogen molecule** .

Chemical Bonds

- **Molecules** are held together by bonds
- Ionic bonds
- Covalent bonds



IONS

- IONS are atoms or groups of atoms with a positive or negative charge. .
- To tell the difference between an atom and an ion, look to see if there is a charge in the superscript! Examples:

Ion →

Na^{+} Ca^{+2} I^{-} O^{-2}

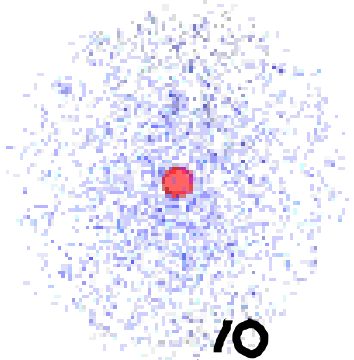
ions

Forming Positive & Negative Ions

A Positive ion forms when an atom loses one or more electrons.

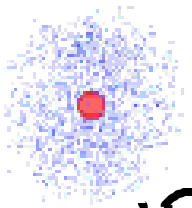
An Negative ion forms when an atom gains one or more electrons

Cation



$Mg \rightarrow Mg^{2+}$ (2 e- lost)

Anion

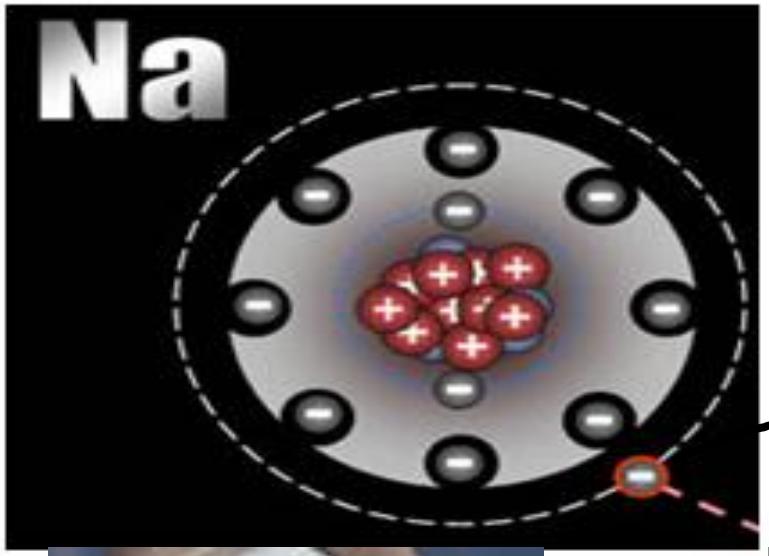


$F + e^- \rightarrow F^-$

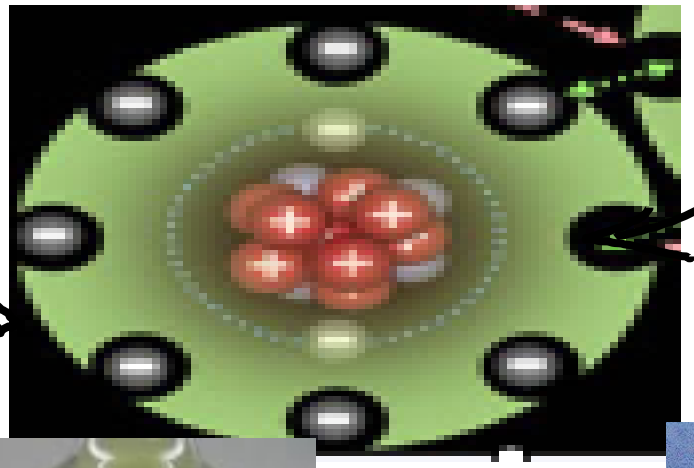
IONIC BONDS

- **metals** (Mg) lose electrons --→ **positive ion**
- **nonmetals** (F) gain electrons ---> **negative ion**
- **OPPOSITES ATTRACT EACH OTHER!**
- **positive ion IS ATTRACTED TO negative ion**

$Na^+ + Cl^- \rightarrow NaCl$



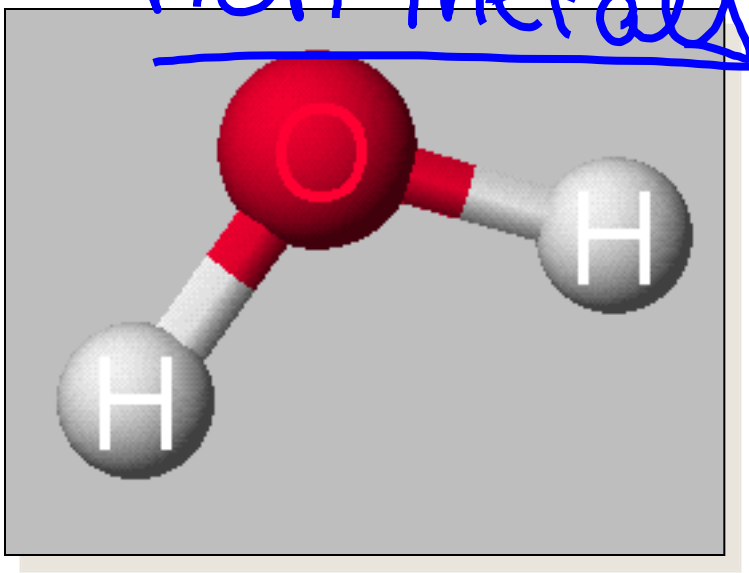
Cl



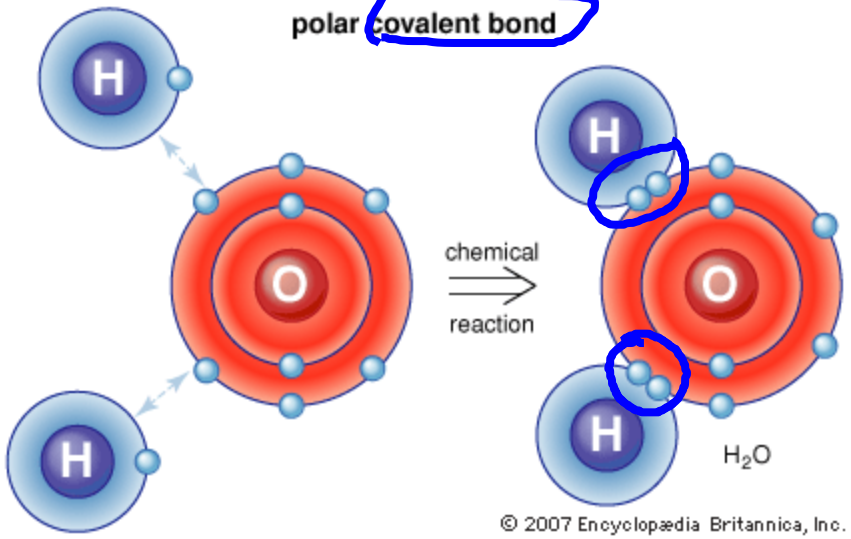
Covalent Bonds

Form when two or more atoms SHARE electrons

*Form between Non-Metals

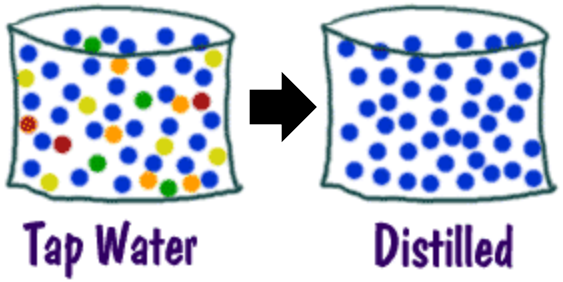


H_2O



Mixtures

- A combination of <u>two</u> or <u>more</u> pure substances that are <u>not</u> chemically combined.
- substances held together by *<u>physical forces</u>, not chemical*
- <u>No chemical</u> change takes place
- Each item <u>retains</u> its properties in the mixture
- They can be <u>separated physically</u>

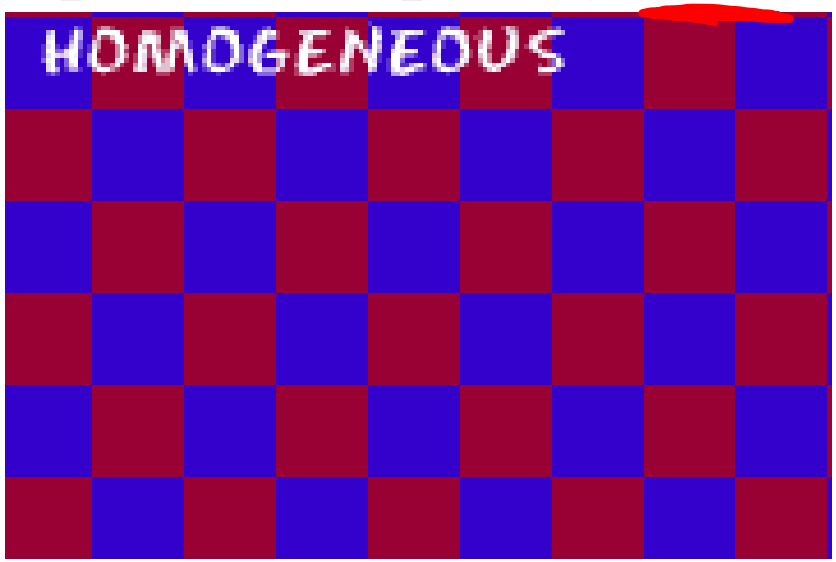


Homogeneous

- Uniform Distribution.
- Example: Sugar and Water

Solutions

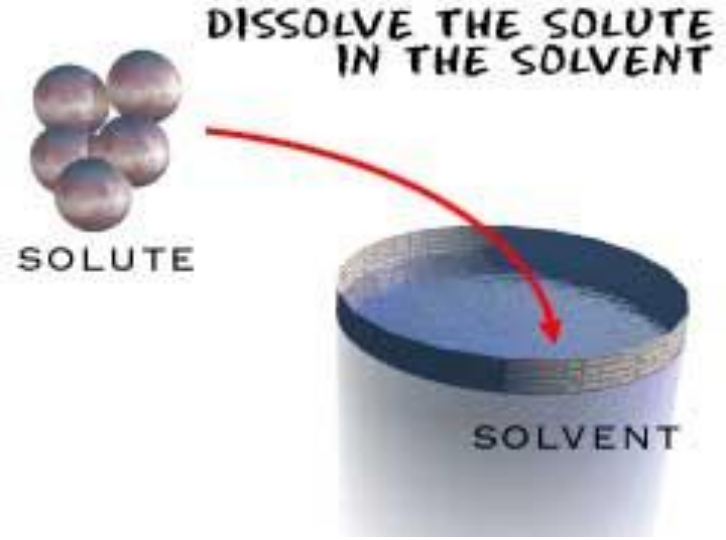
• Solutions are groups of molecules that are mixed up in a completely even distribution.



Images are from http://www.chem4kids.com

Solute

- The substance to be dissolved.

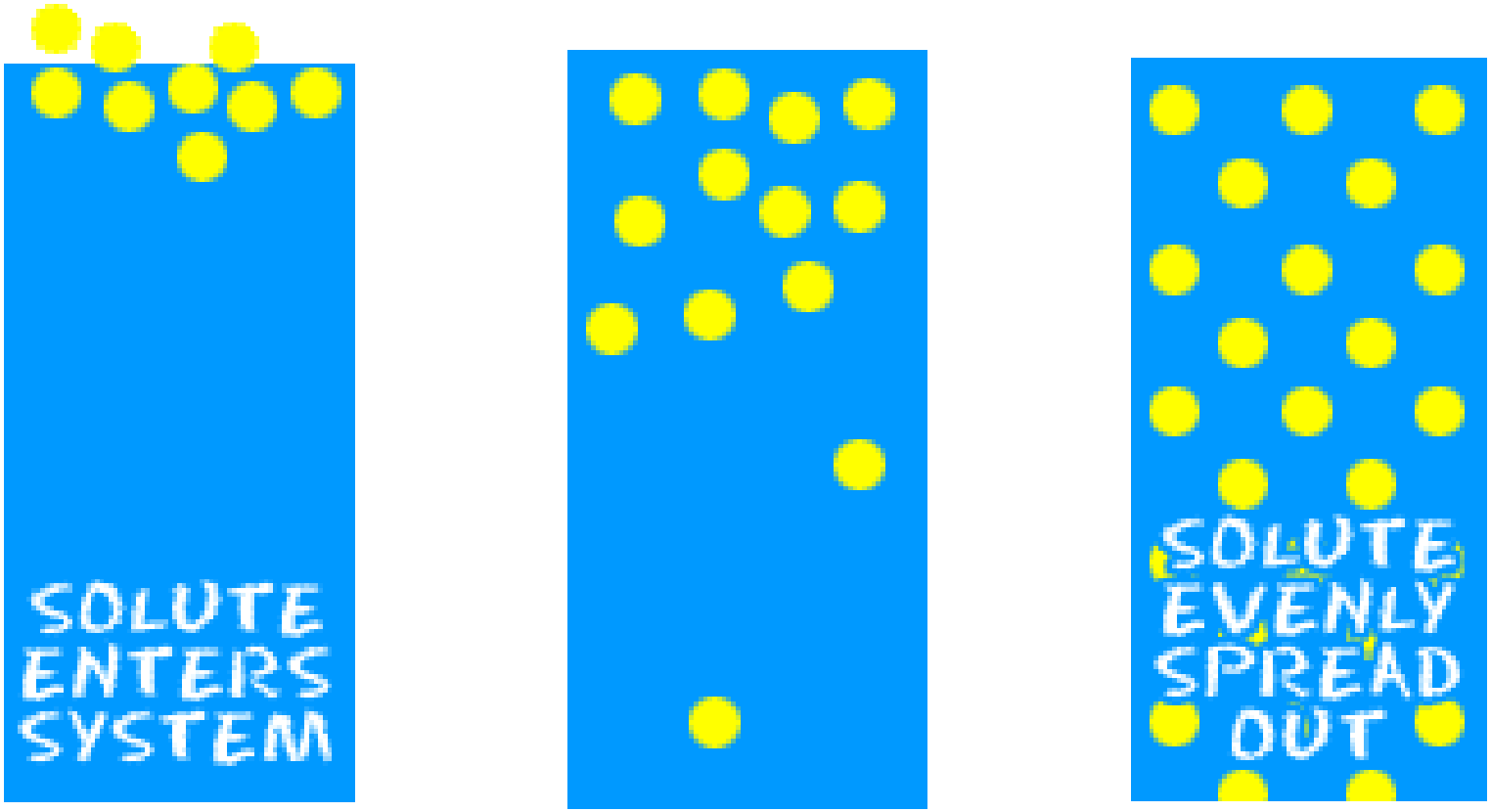


Solvent

- The one doing the dissolving.

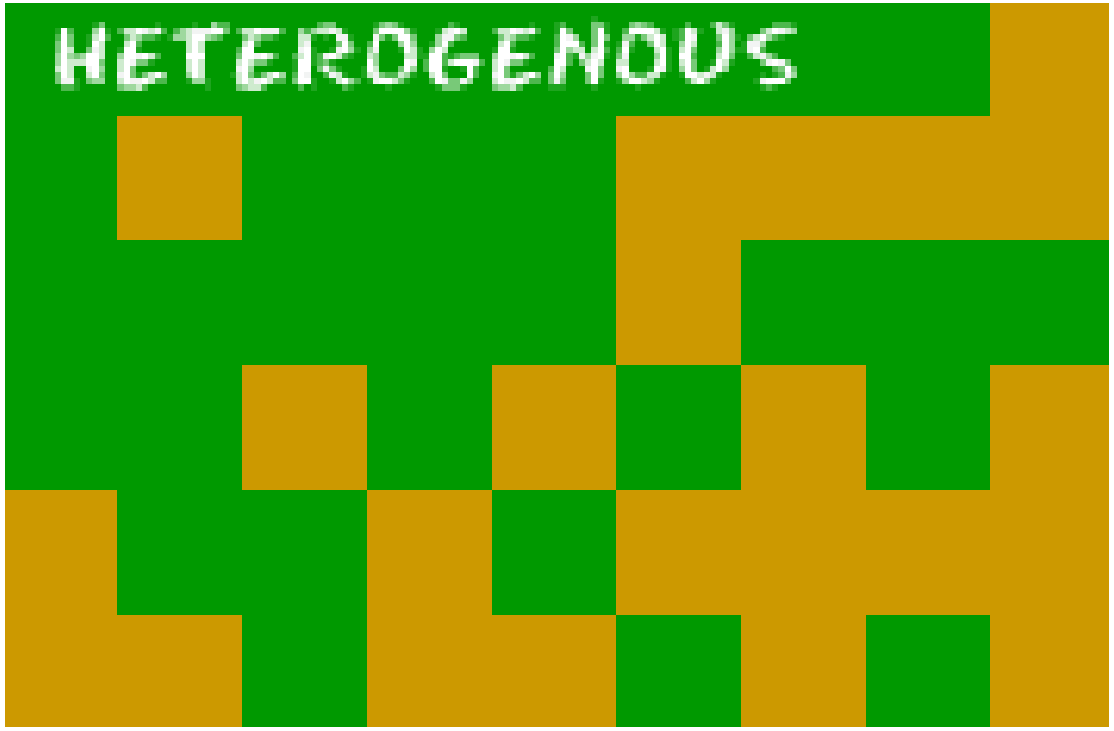
Images are from http://www.chem4kids.com

Making a Solution



Heterogeneous

- **The substances are <u>not</u> uniformly mixed.**
- **Example: Sand in a glass of water.**



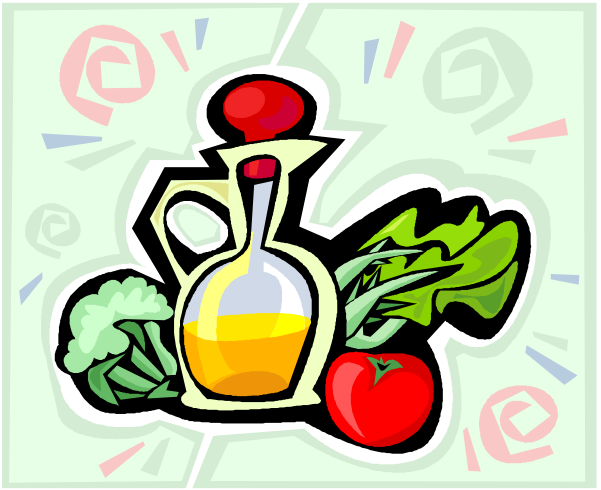
Images are from http://www.chem4kids.com

Mixtures

Suspensions

• Are **heterogeneous** mixtures consisting of parts that are visible to the naked eye.

• Substances will **settle** over time.



Example: the ingredients in salad dressing

Mixtures vs. Compounds

	Mixture	Compound
Composition	Variable composition – you can vary the amount of each substance in a mixture.	Definite composition – you cannot vary the amount of each element in a compound. ratio
Joined or not	The different substances are not chemically joined together.	The different elements are chemically joined together.
Properties	Each substance in the mixture keeps its own properties.	The compound has properties different from the elements it contains.
Separation	Each substance is easily separated from the mixture.	It can only be separated into its elements using chemical reactions.
Examples	Air, sea water, most rocks.	Water, carbon dioxide, magnesium oxide, sodium chloride.

H_2O

2 : 1

http://www.bbc.co.uk/schools/ks3bitesize/science/chemistry/elements_com_mix_6.shtml

Can you identify the following?

You will be shown a series of photos. Tell if each photo represents an item composed of an element, compound, or mixture.

Review:

- **An element contains just one type of atom.**
- **A compound contains two or more different atoms joined together.**
- **A mixture contains two or more different substances that are only physically joined together, not chemically.**
  - **A mixture can contain both elements and compounds.**

Element, Compound, or Mixture?

Copper

Element, Compound, or Mixture?

Copper

Cu

Element, Compound, or Mixture?

Jelly Beans

Element, Compound, or Mixture?

Jelly Beans

Element, Compound, or Mixture?

Table Sugar

Element, Compound, or Mixture?

Table Sugar

$C_{12}H_{22}O_{11}$

Element, Compound, or Mixture?

Diamond

Element, Compound, or Mixture?

Diamond

C

Element, Compound, or Mixture?

Tea

Element, Compound, or **Mixture**?

Tea

Element, Compound, or Mixture?

Salt

Element, **Compound,** or Mixture?

NaCl

Salt

Element, Compound, or Mixture?

Neon Gas

Element, Compound, or Mixture?

Ne

Neon Gas

Element, Compound, or Mixture?

Salad

Element, Compound, or Mixture?

Salad

Element, Compound, or Mixture?

Pure Water

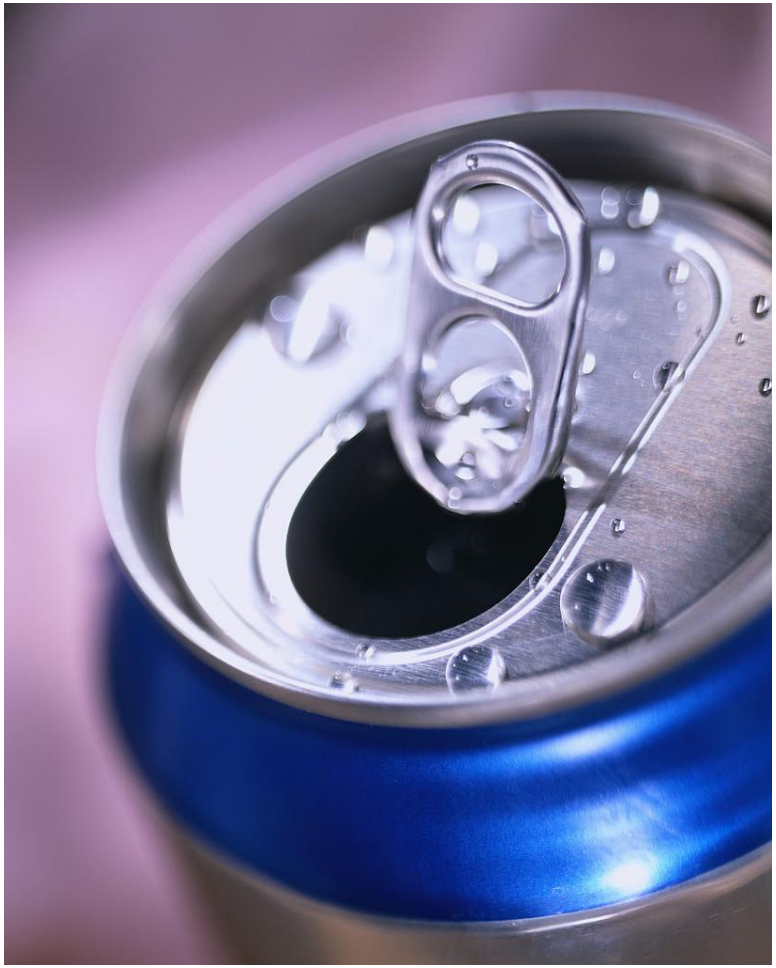
Element, Compound, or Mixture?

H_2O

Pure Water

Element, Compound, or Mixture?

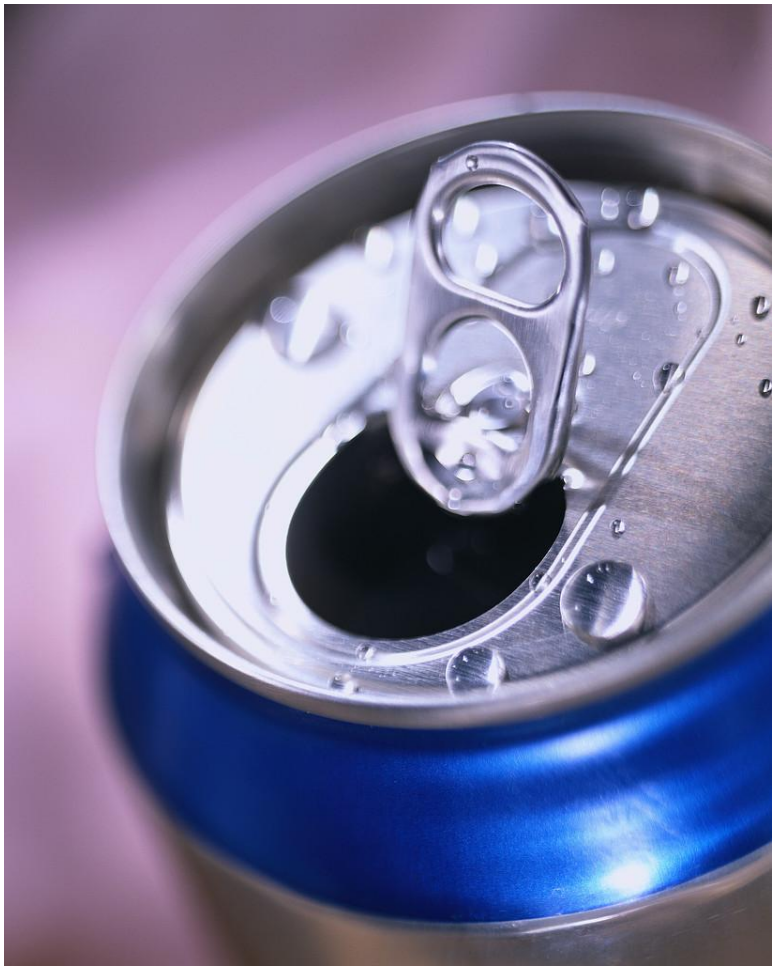
Aluminum



Element, Compound, or Mixture?

Al

Aluminum



Element, Compound, or Mixture?

Lemonade

Element, Compound, or **Mixture**?

Lemonade

Element, Compound, or Mixture?

Silver

Element, Compound, or Mixture?

Silver

Ag

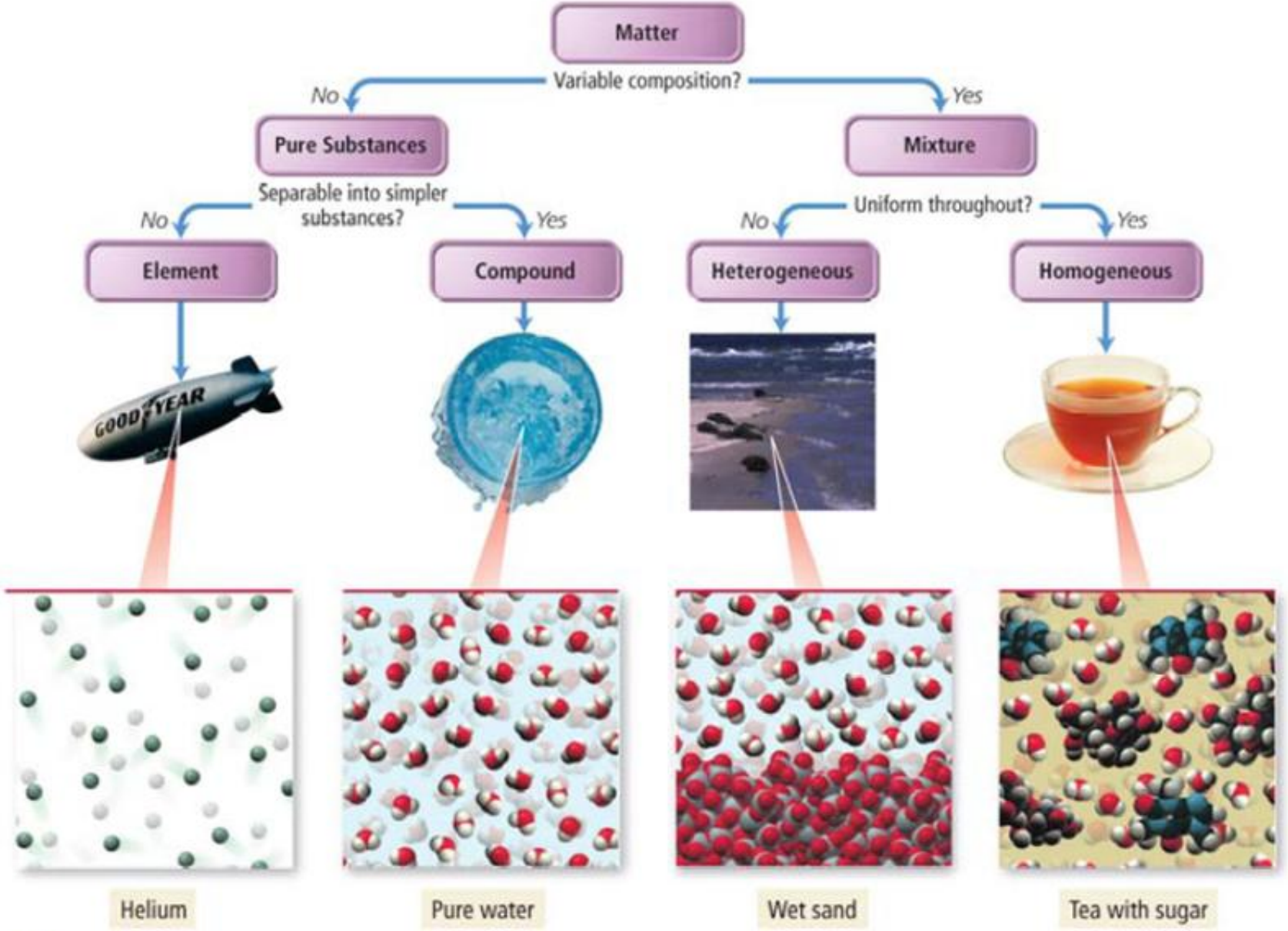
Element, Compound, or Mixture?

Sand

Element, Compound, or Mixture?

SiO_2

Sand



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Notes

- Detailed notes are located at:

http://www.middleschoolscience.com/elements-compounds-mixtures-notes-isn.pdf

- Flow Chart:

http://www.middleschoolscience.com/matter-flow-chart-isn.pdf