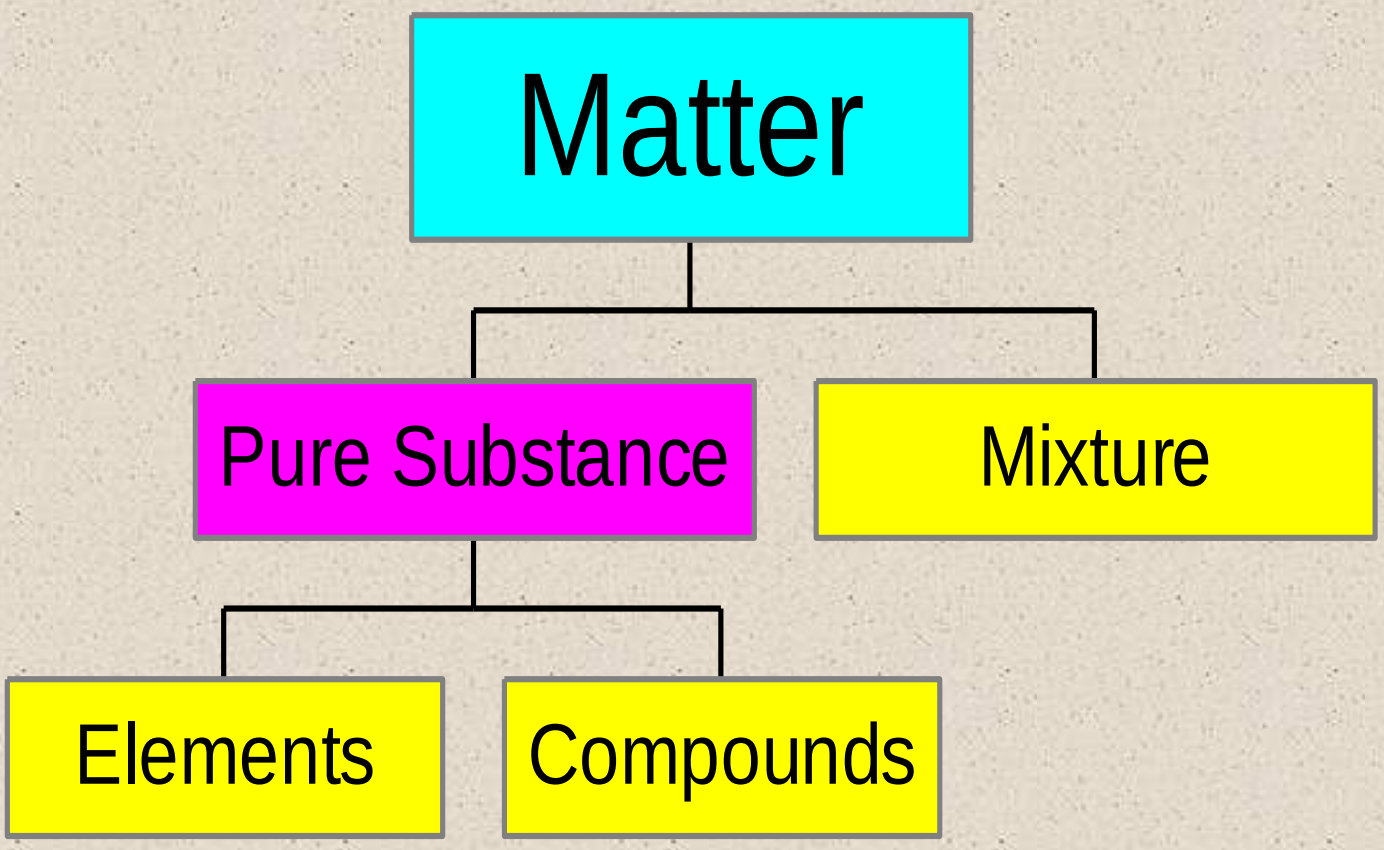
Elements, Compounds & Mixtures

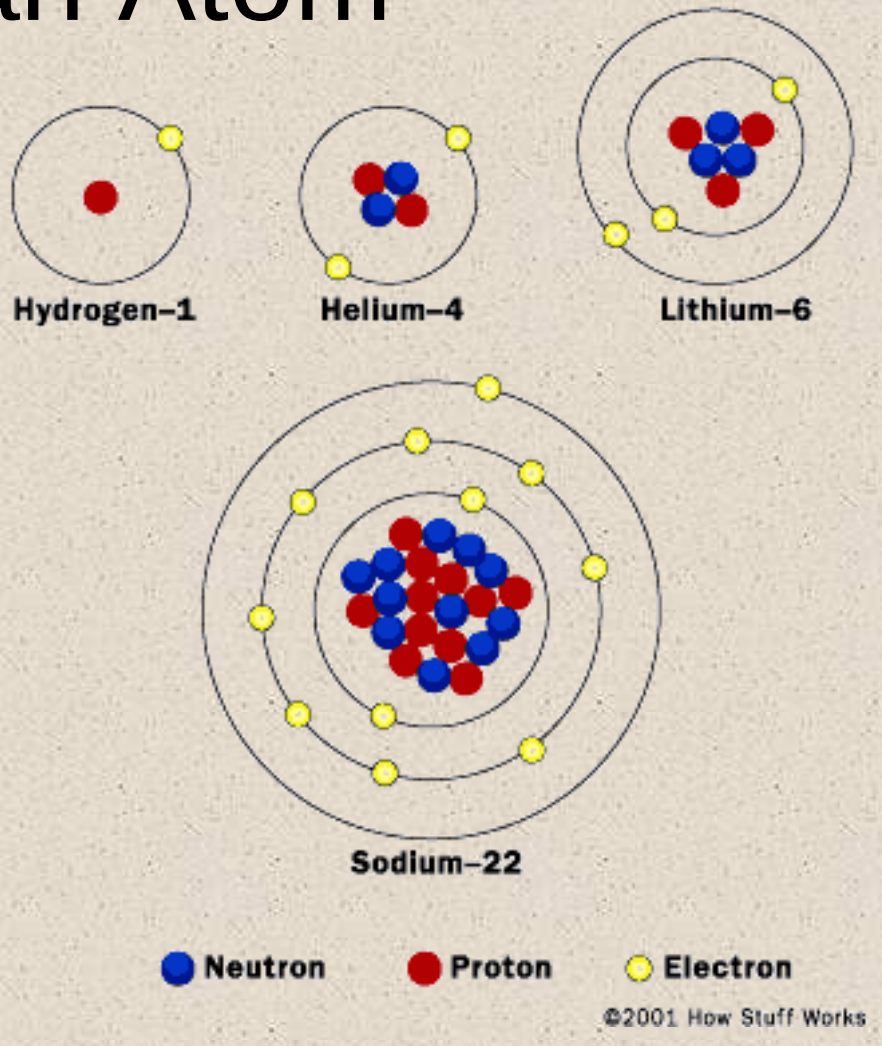


Elements

- **Pure substance that cannot be separated** into simpler substances by physical or chemical means
- Contain only **one type of particle (atom)**
- **Identified by** a **unique** set of **properties** (aka characteristic properties)
  - Boiling point, melting point, density, etc.

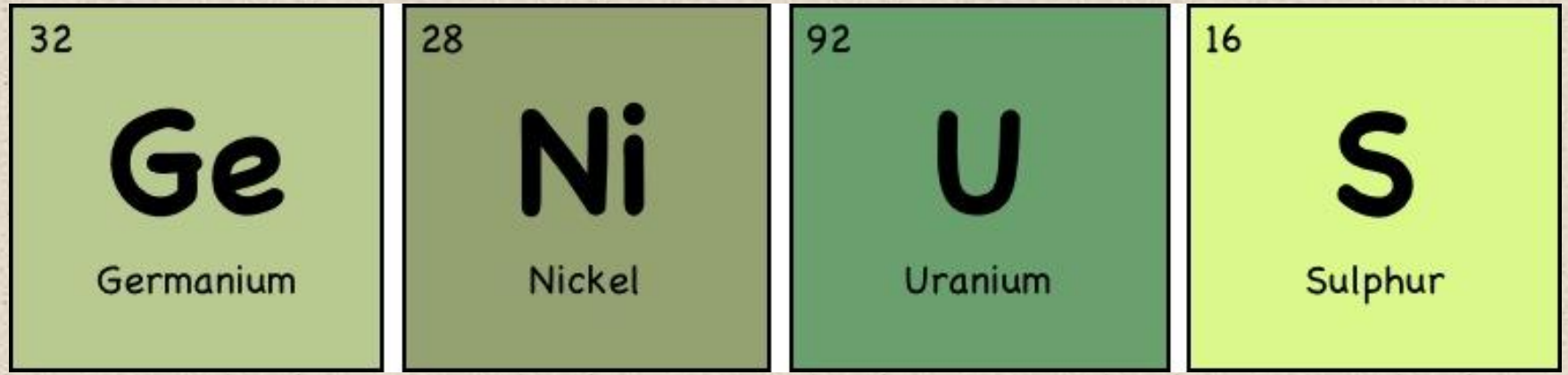
Parts of an Atom

- **Proton** – positively charged particle; in the nucleus of an atom
- **Neutron** – neutral particle (no charge); in the nucleus of an atom
- **Electron** – negatively charged particle; orbits around the nucleus of an atom in orbitals



Common Elements

- Hydrogen – H
- Oxygen – O
- Chlorine – Cl
- Sodium – Na

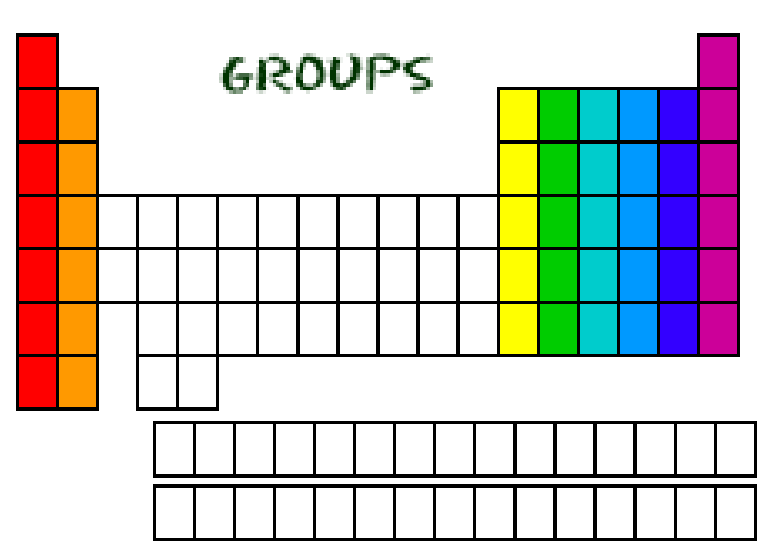


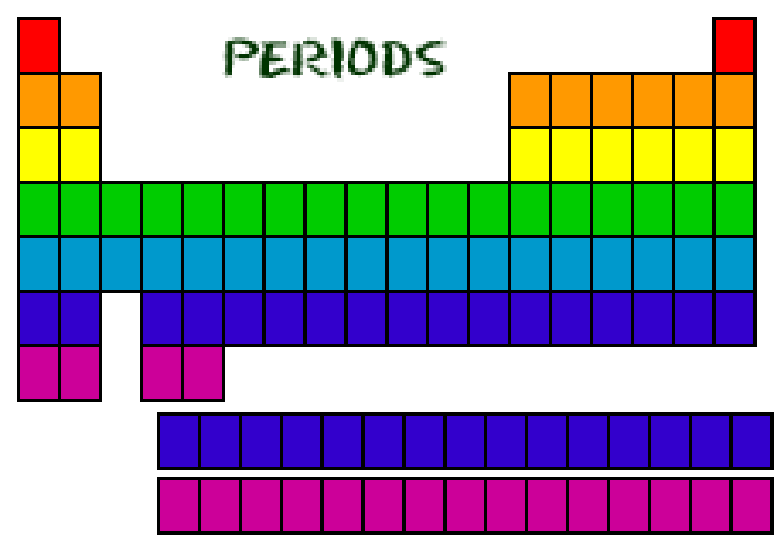
Organizing Elements

- Grouped into categories by **shared properties**
  - **Metals:** shiny, conductors
  - **Nonmetals:** dull, not conductors
  - **Metalloids:** properties of both metals & nonmentals (misfits!)
- Allows scientists to **predict** how an unfamiliar element will act **by knowing its group characteristics**

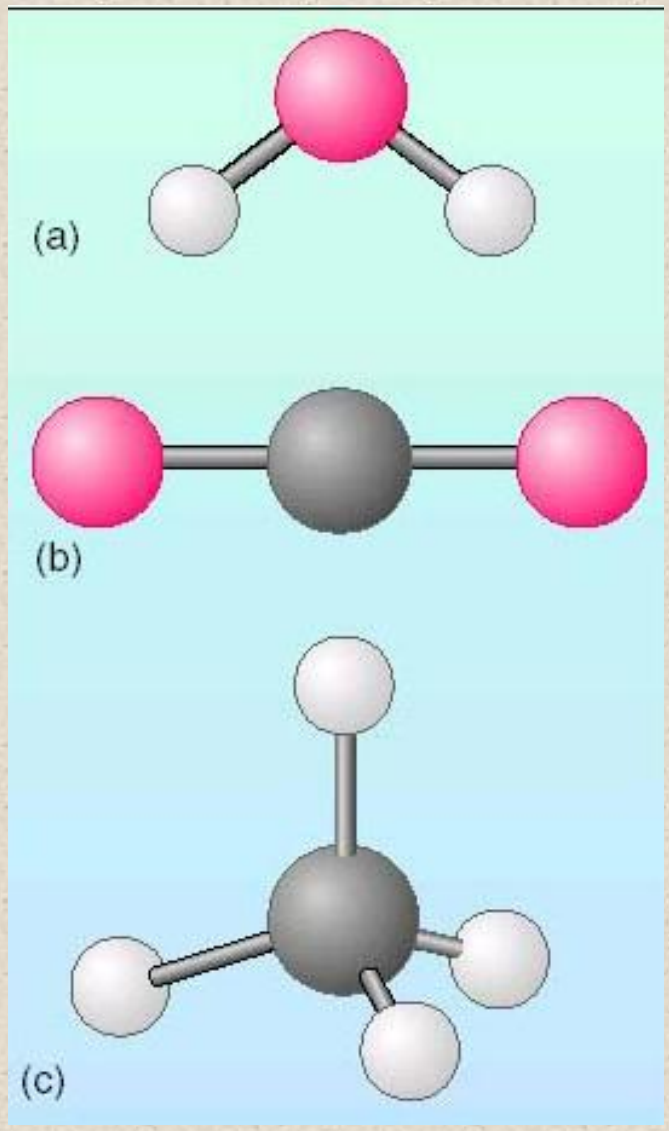
Periodic Table of Elements

- Organizational structure designed by Dmitri Mendeleev
- **Groups (columns)** – share number of valence electrons
- **Periods (rows)** – share number of atomic orbitals; row # tells you how many they have



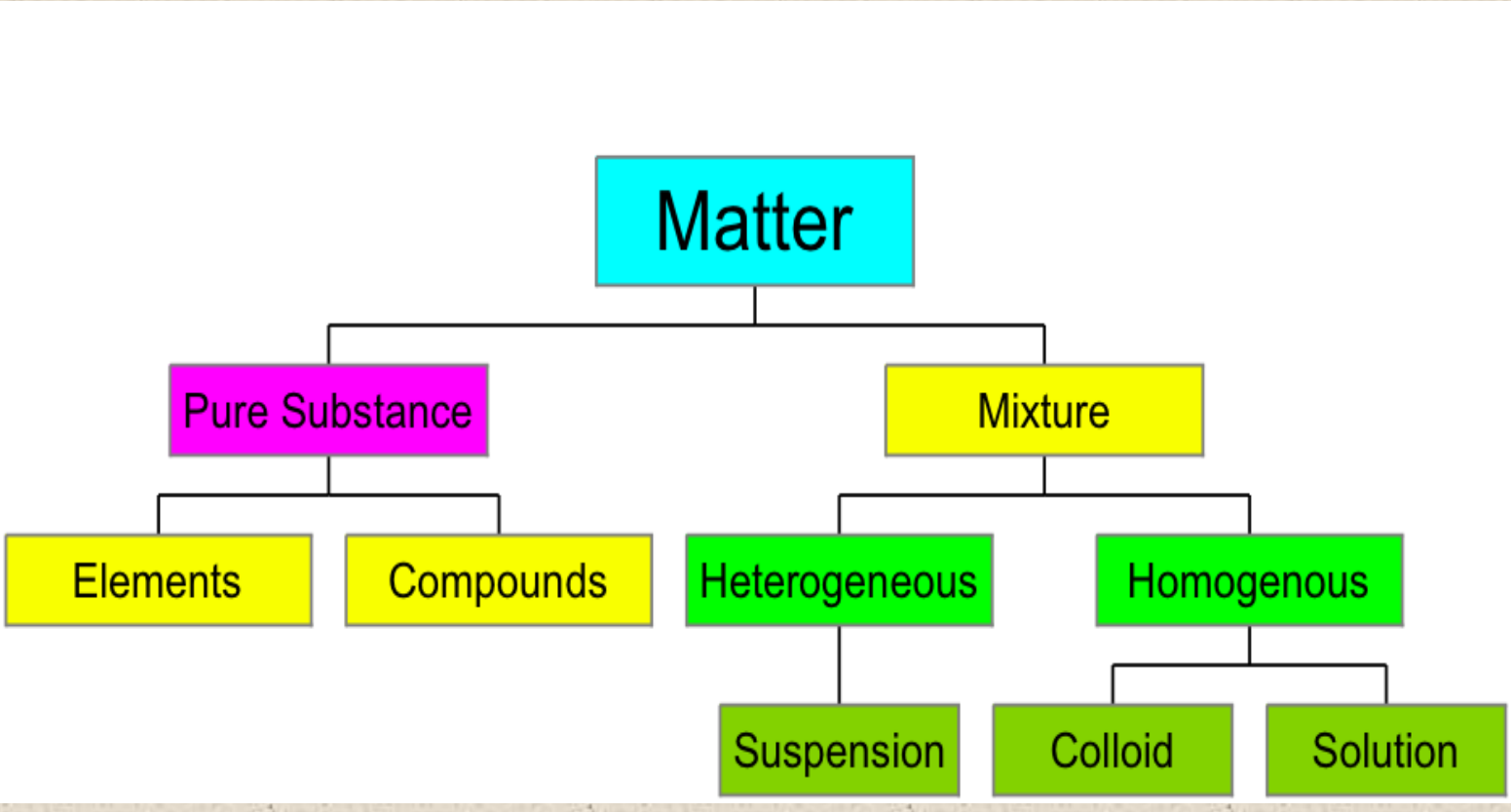


compound crazy!!



Classification of Matter + Compounds

✳ How do compounds fit into the classification of matter?



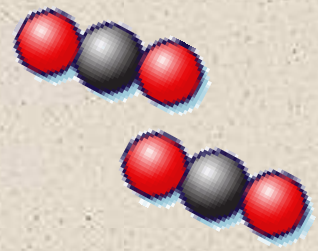
What is a pure substance?

- Pure substances **contain only one kind of matter**

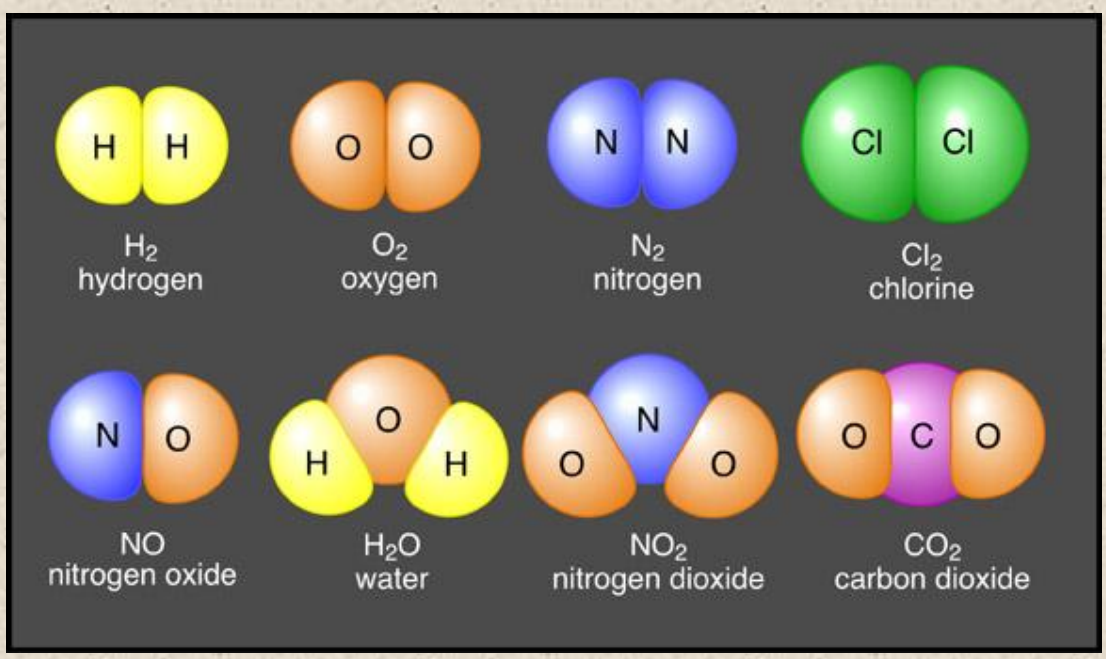
  - **Elements:** oxygen (O), gold (Au)

  - **Compounds**: salt, sugar, pure water, cake, rust, etc.

Compound basics



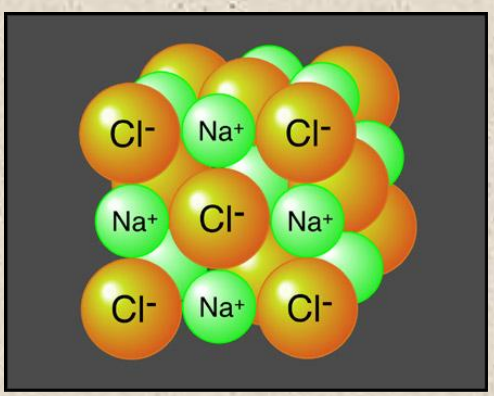
✳ Compounds are groups of **two or more elements in definite proportions that are bonded together**



Properties of compounds

- Compounds have **different properties than the elements that make them up**
  - Ex: hydrogen (H) and oxygen (O) are both gases at room temperature;
  - water (H_2O) is a liquid at room temperature

Another Example of new properties



- Salt!(NaCl)
- Made up of two elements:
  - Sodium (Na)
  - Chlorine (Cl)
- Sodium and chlorine alone are poisonous.
- But when sodium and chlorine combine, they form a safe substance called sodium chloride (Salt)
- The new compound is not toxic like the original elements. *It has a new life of its own with new properties.*

Review of compounds

- **Consist of atoms of two or more different elements bound together**
- **Can be broken down into a simpler type of matter (elements) by chemical means**
- **Have properties that are different from its component elements**
- **Always contains the same ratio of its component atoms (water is always H_2O)**

Mixture Mania

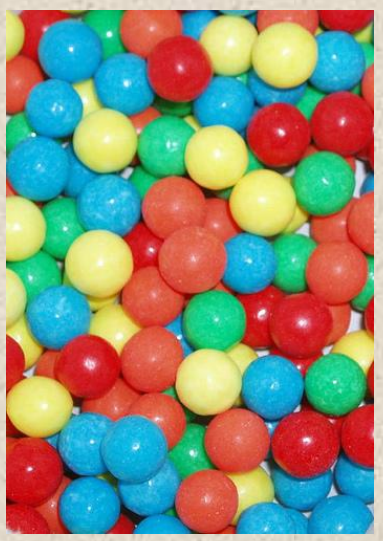
What is a Mixture?

- Combination of two or more substances that can be separated by physical means
- Composition will vary from sample to sample

Two Categories of Mixtures

- Mixtures fall into one of two categories:

– **Heterogeneous**



- **Homogeneous**

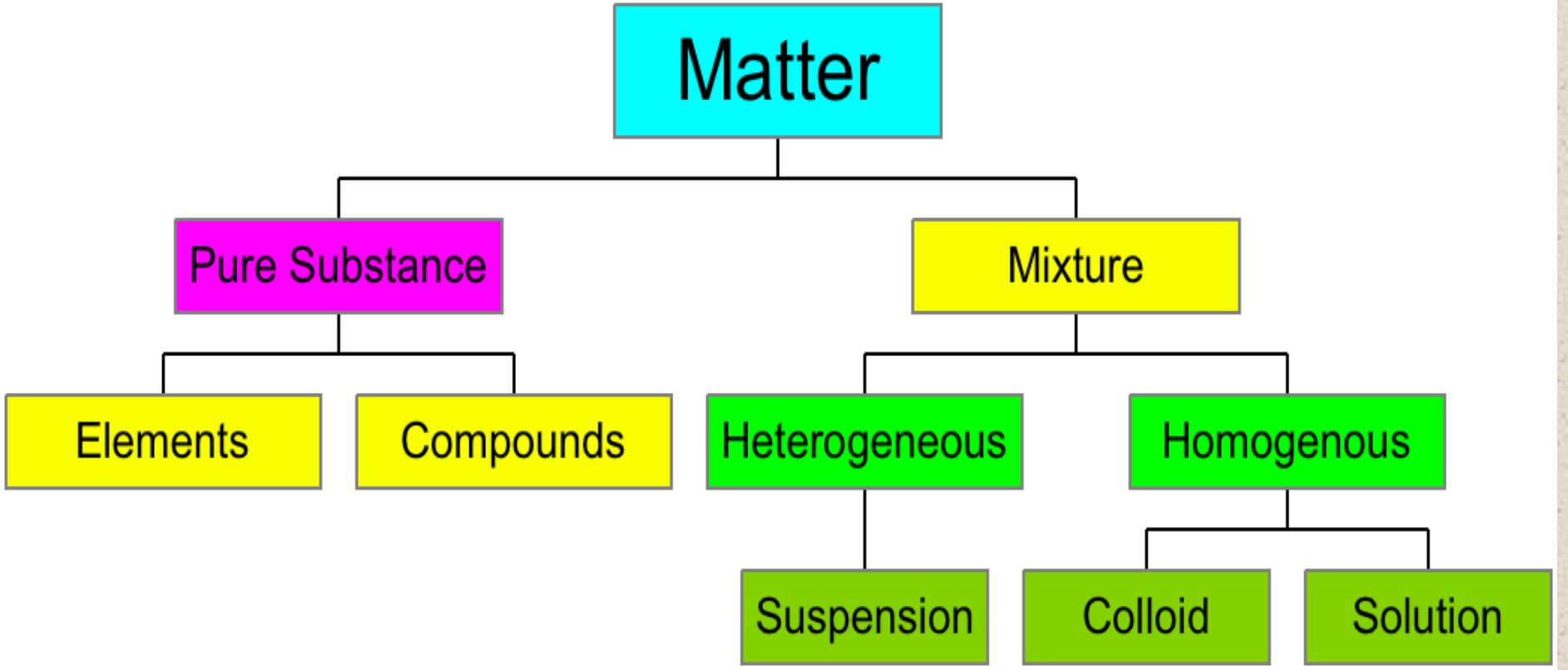
Homogeneous Mixtures

- Mixtures that are so well blended, they only contain **one phase**
- Prefix “homo” = **alike or same**
- Each sample taken is identical to all other samples
- Examples:
  - Sugar
  - **Salt water**

Heterogeneous Mixtures

- Mixtures that are made up of **more than one phase**
- Prefix “hetero” = **different**
- Examples:
  - Chocolate chip cookie

Sub-Categories of Mixtures



- Within each category of mixtures there are subcategories, or types within the bigger category.
- Sub-categories:
  - Homogeneous: **colloid, solution**
  - Heterogeneous: **suspension**

Suspension Mixture (hetero)

- Created by stirring together two or more ingredients
- **<u>Particles are usually large</u>** enough to be seen by the naked eye or a magnifying glass
- The ingredients are **<u>heterogeneous</u>** (not evenly distributed)

** Most mixtures are suspension mixtures

Examples: soil, smoke in the atmosphere, Orbitz drink, Italian dressing, trail mix

Colloidal Mixture (homo)

- **<u>Homogeneous</u>** combination of solid or liquid particles mixed in a liquid or gas
- The particles are usually **<u>not viewable with the unaided eye</u>**
- Particles can be seen when **<u>a light is shined on them</u>**
- Examples: mayonnaise, Jell-O, fog, butter & whipped cream

Solution (homo)

- A **homogeneous** mixture where one substance is **dissolved** in another substance.
- It has two general parts:
  - **Solvent:** substance that dissolves the solute; liquid or gas
  - **Solute:** substance that is dissolved; solid, liquid or gas

The Universal Solvent

- **Water** is the **universal solvent** because it dissolves so many materials
- Materials that dissolve IN the solvent are called **solutes**.
- Substances that do not dissolve in water (like oil) are called **insoluble.**