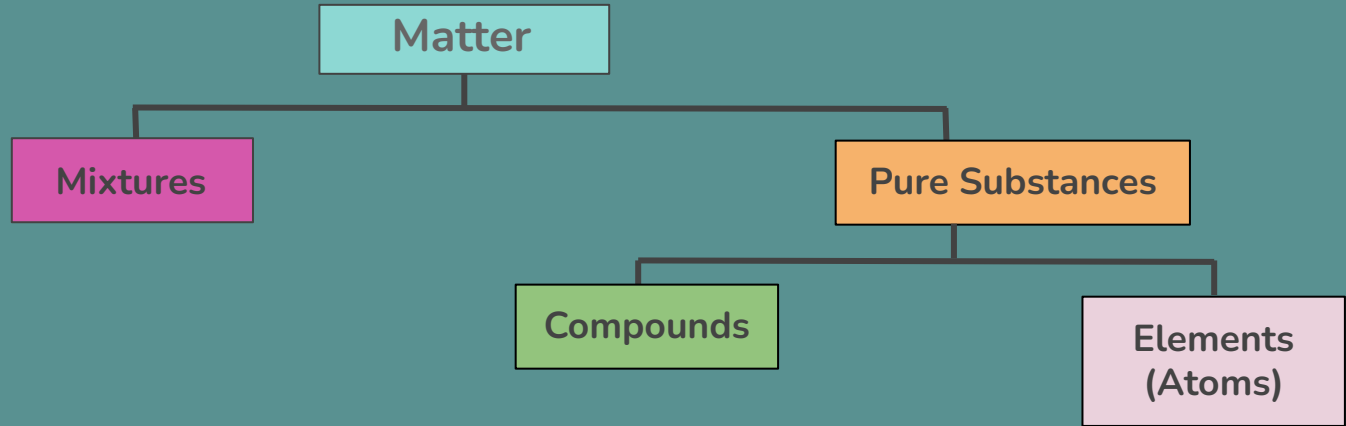


Unit 3- Lesson 6

Chemistry 0

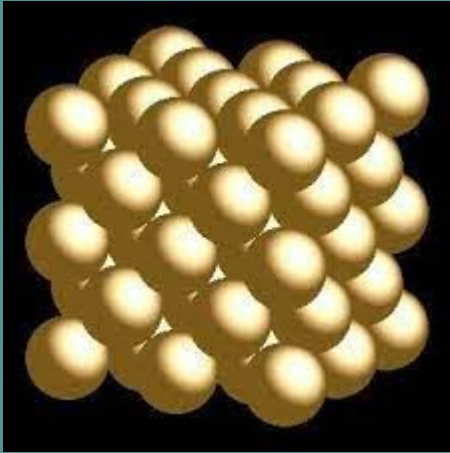
April 2022, L. Tracey Gao

Pure Substances and Mixtures



Pure Substance- Elements and Compounds

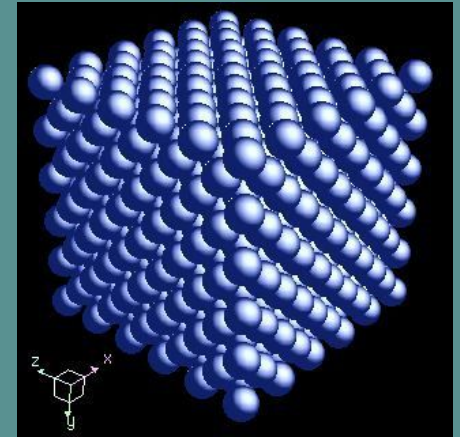
Elemental substances



Pure Gold



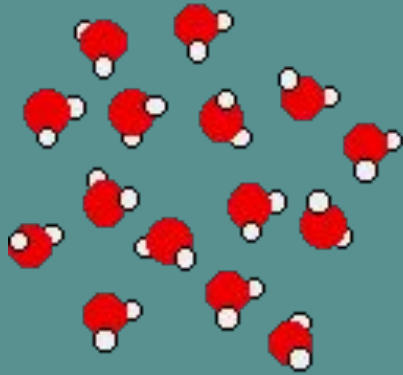
Pure oxygen gas



Pure copper

Pure Substance- Elements and Compounds

Compounds

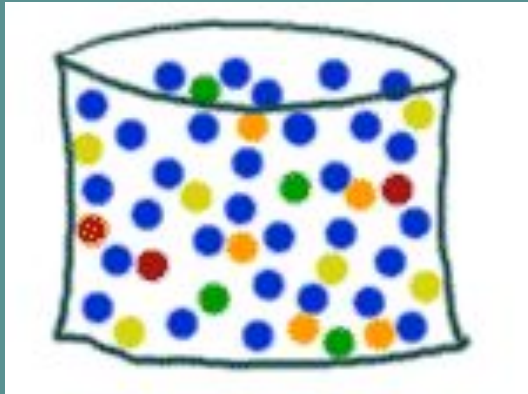


Pure water

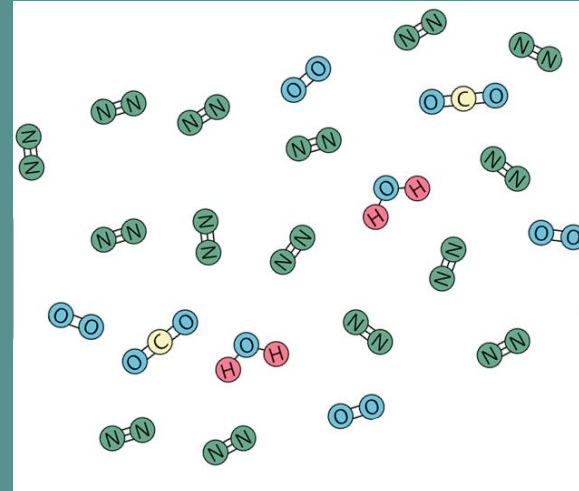


Pure carbon oxide

Mixtures



Tap water



Air



What is a Mixture?

- A compound, such as oxygen gas, carbon dioxide, or nitrogen, is chemically bonded.
- Mixtures are not chemically bonded.



Types of Mixtures

- Homogeneous Mixtures: It is a mixture that is the **same** throughout. The molecules are mixed on a molecular level so they are essentially invisible. It appears uniform.
- Heterogeneous Mixtures: It is a mixture that is **not the same** throughout. It has particles that are small, but much larger than molecules. They are on a macromolecular scale and are often visible. It appears either milky or even lumpy.

Solutions, Suspensions and Colloids

- **Solution** is a type of homogeneous mixture. It may be colored, but it is transparent, the molecules or ions are invisible, and they do not settle out on standing. It is a mixture of a solute in a solvent. Example: *Salt and water*.
- **Suspension** is a type of heterogeneous mixture. It is a mixture of water and non-dissolved material. The particles in suspensions are larger than those found in solutions. Example: *Oil and water*.
- **Colloids** are a type of heterogeneous mixtures. It has particles that are quite difficult to see individually, but are intermediate in size between those found in solutions and suspensions. It remains dispersed and doesn't settle at the bottom. Example: *Milk*.

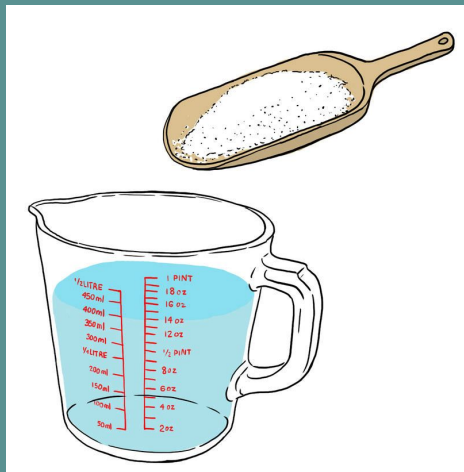


Solubility of Solutions

- Solubility is the relative ability of a solute to dissolve into a solvent.
- It is a physical property and not a chemical property because no chemical reaction takes place.
- When a molecule or compound dissolves in something, we say it is soluble.
- Soluble compounds form homogeneous mixtures, while insoluble compounds form heterogeneous mixtures.

Solubility of Solutions

- The substance that dissolves is called the solute, and the substance it dissolves into is called the solvent.
- The solubility of a solute is the maximum amount of solute that dissolves in a given volume of solvent at a given temperature.

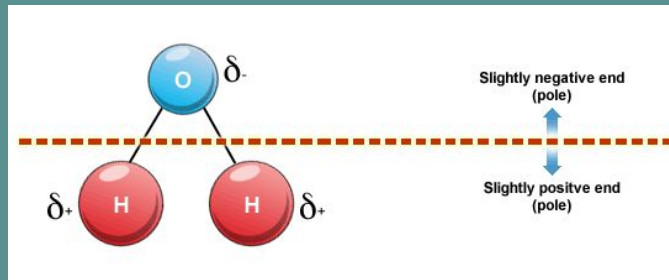


Salt water solution:

- Sodium chloride is the solute
- Water is the solvent
- The solubility of sodium chloride in water is 39.12 g/100 mL at 100 °C. That means that, at most, 39.12 grams of salt will dissolve in 100 mL of water at 100 °C.

Solubility and Polarity

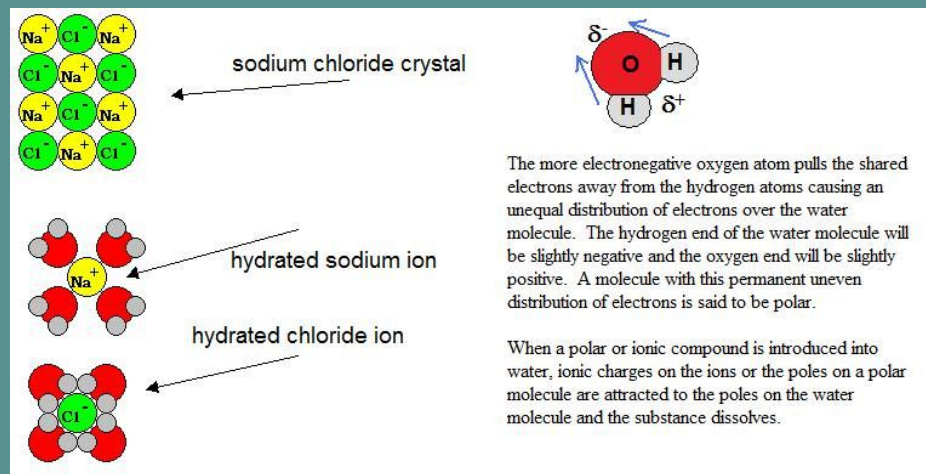
- The most important characteristic that determines whether a solute will dissolve in a given solvent is called **polarity**.
- A molecule that has poles with opposite charges is said to have polarity, or to be polar.
- For a molecule to be polar, the shape of the molecule matters.



<https://ifsa.my/articles/chemical-polarity-a-little-bit-of-physics-in-your-chemistry>

Like Dissolves Like

- The rule for solubility is:
Like Dissolves Like.
- Polar and ionic compounds tend to dissolve in polar solvents.
- Nonpolar (or weakly polar) molecules tend to dissolve in nonpolar (or weakly polar) solvents.



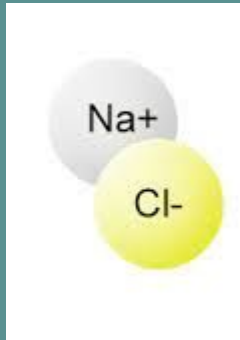
<https://www.ck12.org/section/why-solutions-occur/>

Hydrophilic molecules

- Polar substances are often called hydrophilic substances.
- Hydrophilic molecules love water and can be ionic, polar, or contain polar groups.

Ionic Molecules

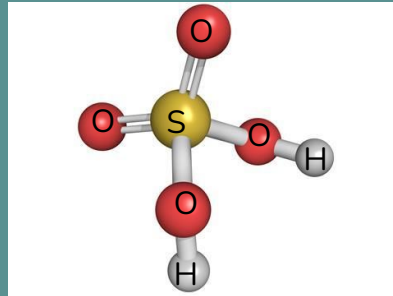
Example: Salts



Sodium chloride

Polar Molecules

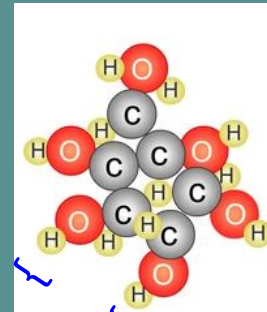
Example: Acids



Sulfuric acid

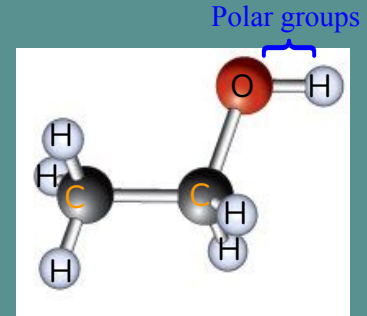
Polar Groups

Example: Sugars and large alcohols



Polar groups

Glucose

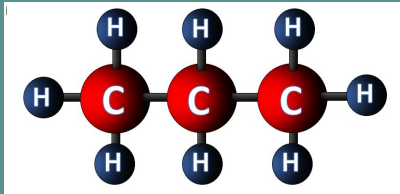


Ethanol

Hydrophobic molecules

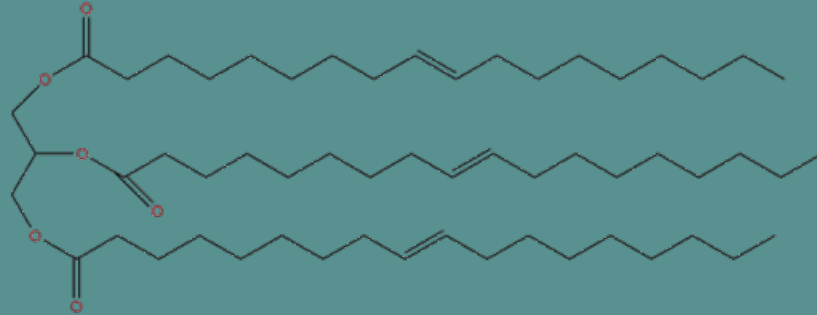
- Nonpolar substances are often called hydrophobic substances.
- Hydrophobic molecules do not love water, and so they do not dissolve in water.

Hydrocarbons



Propane

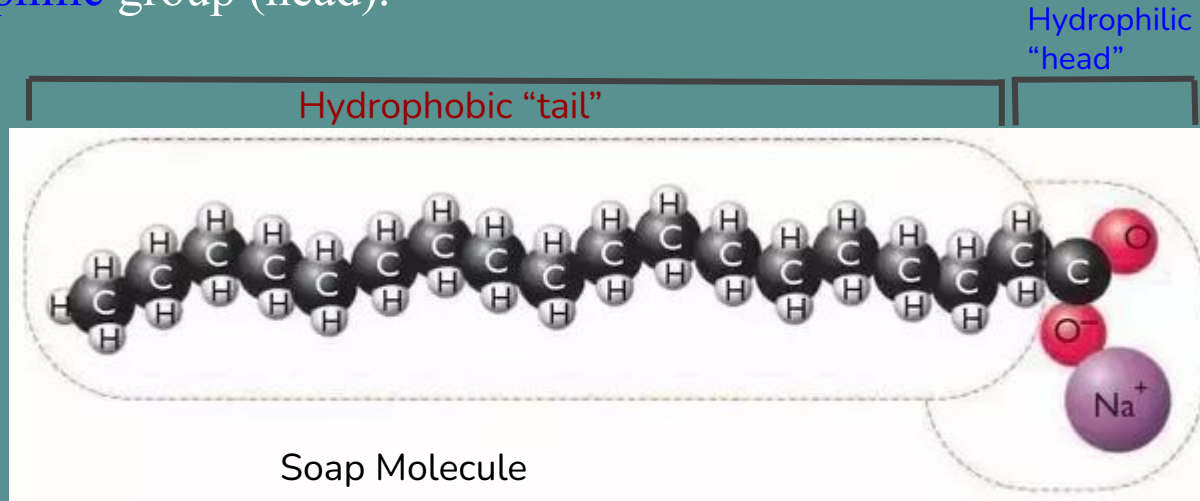
Fats and Oils



Vegetable oil (Glycerol trioleate)

Soaps

- Soaps are molecules that have both a **hydrophobic** group (tail) and a **hydrophilic** group (head).



<https://www.quora.com/Why-are-micelles-formed-by-soap>



Surfactants

- Soaps are part of a broader category of molecules called surfactants.
- Surfactants can make nonpolar, hydrophobic molecules “dissolve” in water.
- When a surfactant meets both water and oil, it forms a ball with the hydrophobic molecules (oil) surrounded by the surfactants.
- Because surfactants have both a hydrophobic tail and a hydrophilic head, they are able to trap hydrophobic molecules in micelles and bring them into an emulsion.