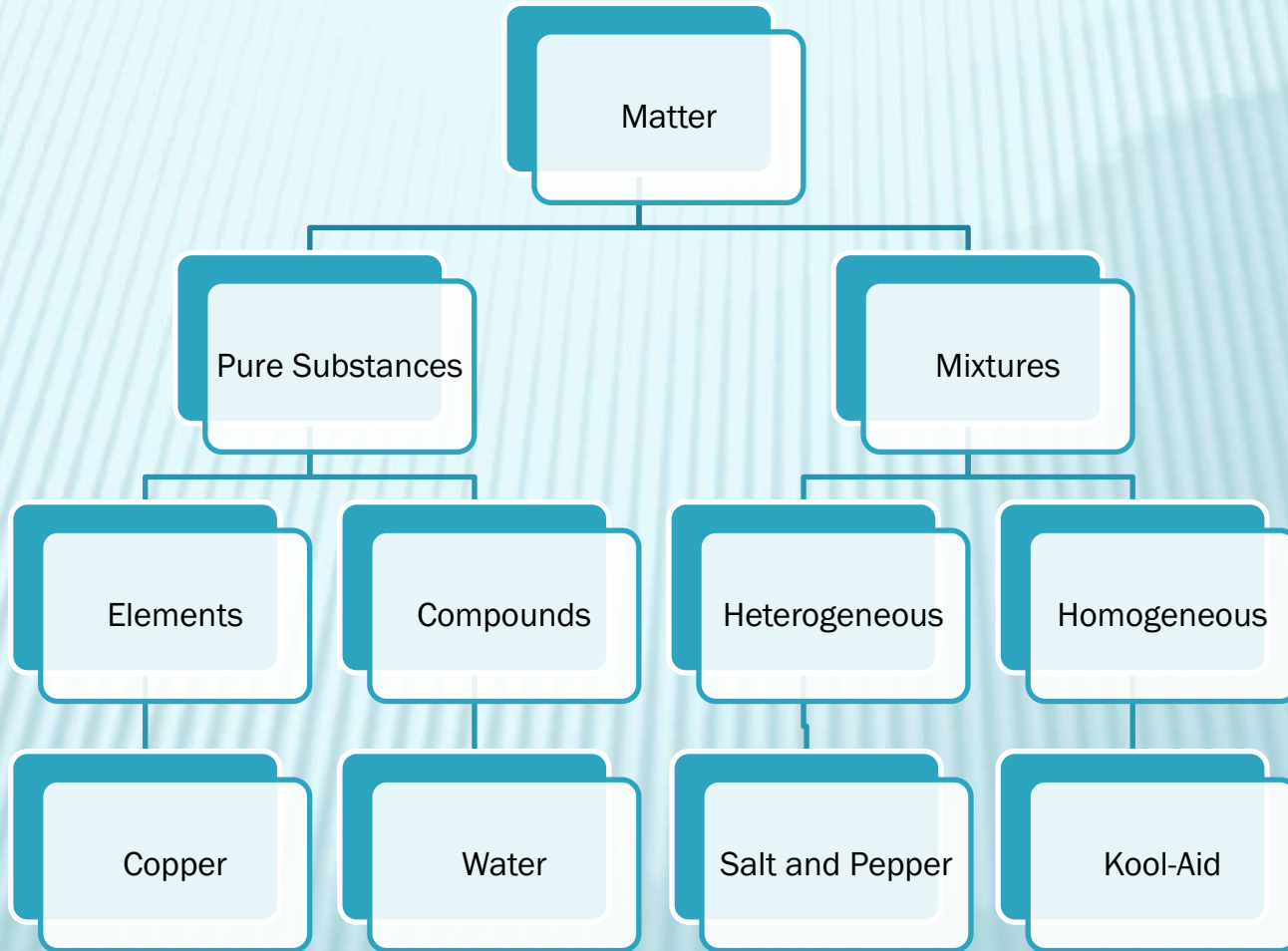


Chapter 5

ELEMENTS, COMPOUNDS, AND MIXTURES

Matter

```
graph TD; Matter[Matter] --> A[ ]; Matter --> B[ ]; A --> C[ ]; A --> D[ ]; B --> E[ ]; B --> F[ ]; C --> G[ ]; D --> H[ ]; E --> I[ ]; F --> J[ ]; G --> K[ ]; H --> L[ ]; I --> M[ ]; J --> N[ ]; K --> O[ ]; L --> P[ ]
```



PHYSICAL CHANGE

- Does not make a different substance

Ex:

- | | |
|-----------------------|----------------|
| ✕ Melting | ✕ Dissolving |
| ✕ Freezing | ✕ Bending |
| ✕ Boiling/evaporation | ✕ Crushing |
| ✕ Condensation | ✕ Breaking |
| ✕ Sublimation | ✕ Chopping |
| | ✕ Filtration |
| | ✕ distillation |

CHEMICAL CHANGE

- Produces new substances

Examples of Chemical Change		
Chemical Change	Description	Example
Combustion	Rapid combination of a fuel with oxygen; produces heat, light, and new substances	Gas, oil, or coal burning in a furnace
Electrolysis	Use of electricity to break a compound into elements or simpler compounds	Breaking down water into hydrogen and oxygen
Oxidation	Slow combination of a substance with oxygen	Rusting of an iron fence
Tarnishing	Slow combination of a bright metal with sulfur or another substance, producing a dark coating on the metal	Tarnishing of brass

PURE SUBSTANCES

- ✖ A single type of matter with a specific composition and a specific set of properties
- ✖ Includes elements and compounds

ELEMENTS

- ✖ Pure substance
- ✖ Simplest substances
- ✖ Cannot be broken down into simpler substances by physical or chemical means
- ✖ Made up of only one type of atom
- ✖ Have unique physical and chemical properties
- ✖ Examples: gold, silver, carbon, helium, calcium, etc. (over 100)

K24 Periodic Table of the Elements

<div><div><div>Key</div><div>C Solid</div><div>Br Liquid</div><div>H Gas</div><div>Tc Not found in nature</div></div><div><div>Key</div><div>Metal</div><div>Metalloid</div><div>Nonmetal</div><div>Properties not established</div></div></div>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	

*Name not officially assigned

Lanthanides

57 La Lanthanum 138.91	58 Ce Cerium 140.12	59 Pr Praseodymium 140.91	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.93	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93	68 Er Erbium 167.26	69 Tm Thulium 168.93	70 Yb Ytterbium 173.04
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Actinides

89 Ac Actinium (227)	90 Th Thorium 232.04	91 Pa Protactinium 231.04	92 U Uranium 238.03	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)
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COMPOUNDS

- ✖ Pure substance
- ✖ Made up of two or more elements that are chemically combined
- ✖ Can be broken down chemically but not physically
- ✖ Have own set of physical properties that may be very different from their original parts.
- ✖ Combine in definite ratios
- ✖ Examples: H_2O , NaCl , CO_2 , $\text{C}_6\text{H}_{12}\text{O}_6$

CHEMICAL FORMULAS

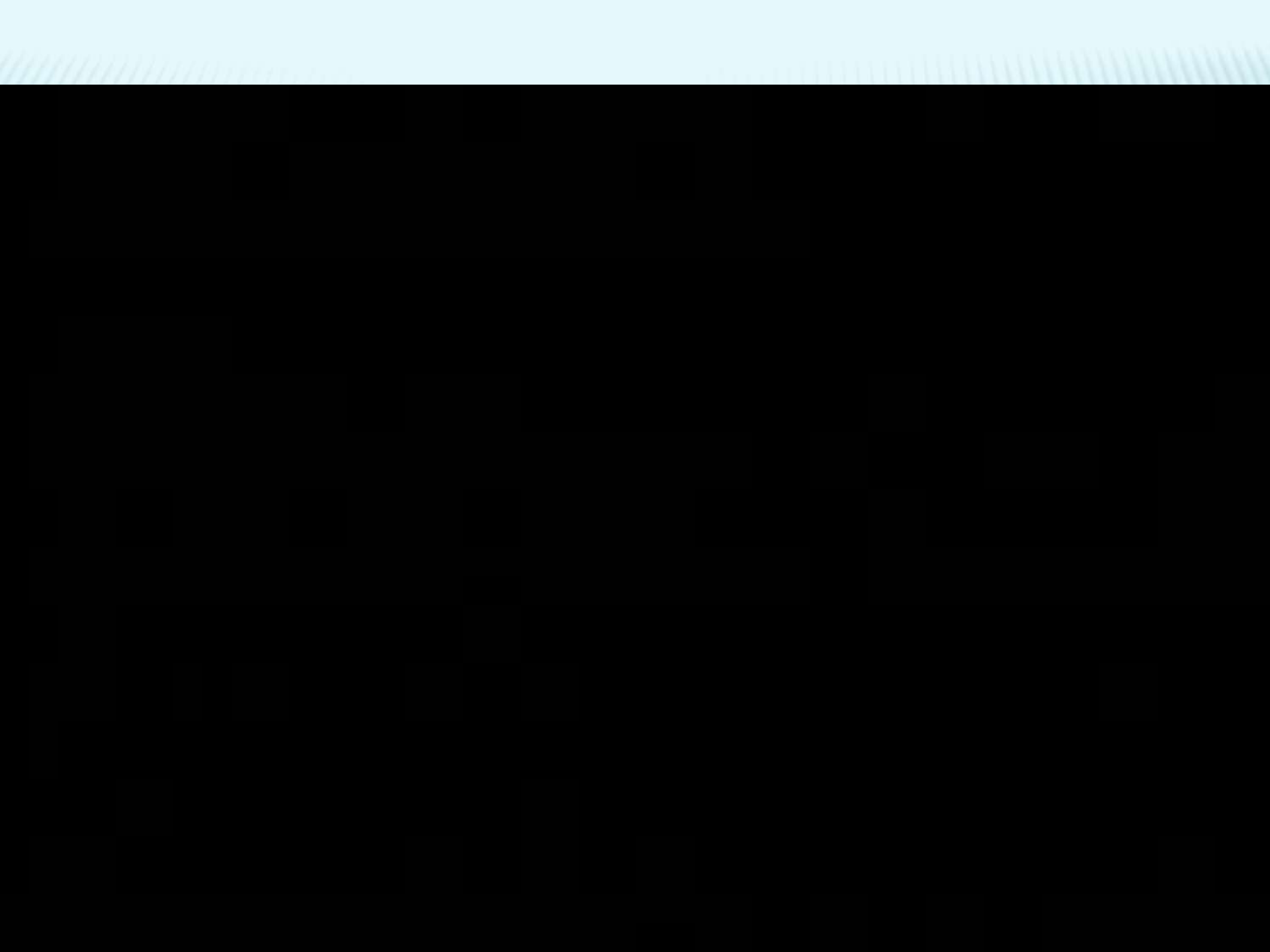
✕ H_2O = water

✕ NaCl = table salt

✕ CO_2 = carbon dioxide

✕ $\text{C}_6\text{H}_{12}\text{O}_6$ = sugar (glucose)

✕ ****the number of atoms for each element is determined by the number beside it. For example, water has 2 hydrogens and one oxygen.



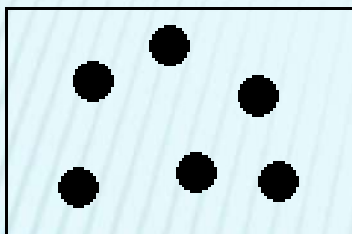
MIXTURES

- ✖ Two or more substances that are not chemically combined
- ✖ Substances in a mixture keep their own individual properties
- ✖ Parts of a mixture are not in set ratios
- ✖ Can be physically separated
- ✖ Examples: Salad, soil, Kool-Aid, salt water, air, brass, salt and pepper

SEPARATION TECHNIQUES

- ✕ Melting
- ✕ Boiling/Distilling
- ✕ Magnets
- ✕ Filtration
- ✕ Evaporation
- ✕ Chromatography

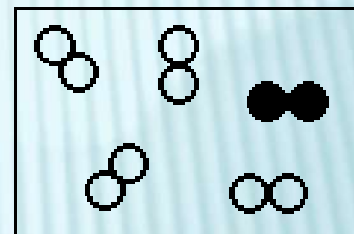
IDENTIFY THE FOLLOWING AS A ELEMENT, COMPOUND, OR MIXTURE



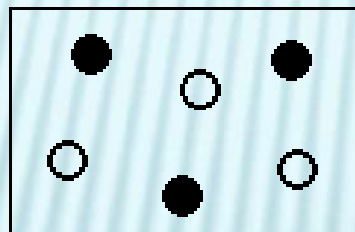
(a)



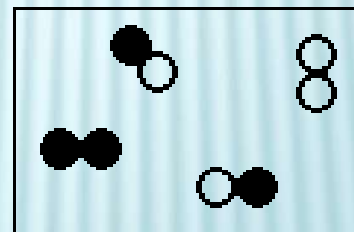
(b)



(c)



(d)



(e)

TYPES OF MIXTURES

- ✕ 1. Heterogeneous
- ✕ 2. Homogeneous

HETEROGENEOUS MIXTURES

- ✖ Mixtures that are “different” throughout
- ✖ Not evenly mixed; you can see the different parts
- ✖ Examples: salt and pepper, soil, salad

HOMOGENEOUS

- ✖ Mixtures that are the “same” throughout
- ✖ Evenly mixed; you cannot see the different parts
- ✖ Also called solutions
- ✖ Examples: salt water, Kool-aid, air, brass

SOLUTIONS

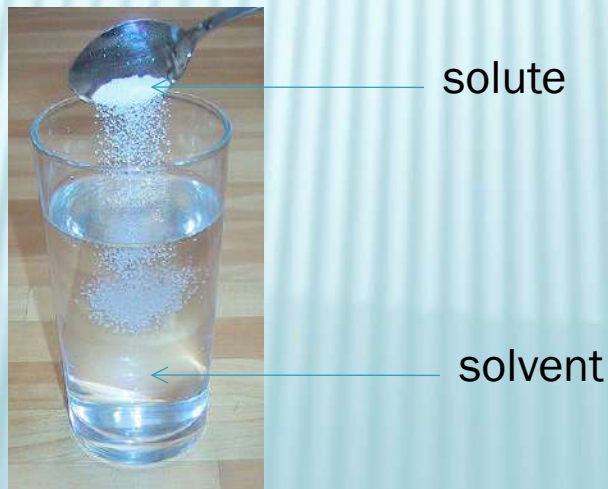
- ✖ Mixtures of two or more substances in which one or more of them seem to disappear in the other
- ✖ Another name for a homogeneous mixture
- ✖ Can be made up of solids, liquids, or gases.

TYPES OF SOLUTIONS

- ✕ Liquid:** Kool-aid, salt water
- ✕ Gas:** Atmosphere
- ✕ Solid:** Brass, stainless steel (alloys)

HOW DO SOLUTIONS FORM?

- ✖ By a process in which a substance breaks up into atoms, ions, and molecules.
- ✖ Have two parts:
 1. **Solute:** disappears or dissolves
 2. **Solvent:** dissolves the solute



EXAMPLE

✕ Kool-Aid

✕ Solute: powder mix

✕ Solvent: water

** usually more solvent

** because the solvent is usually water it is called the **universal solvent**

** solutions in which water is the solvent are called **aqueous** solutions

DETERMINING SOLUBILITY

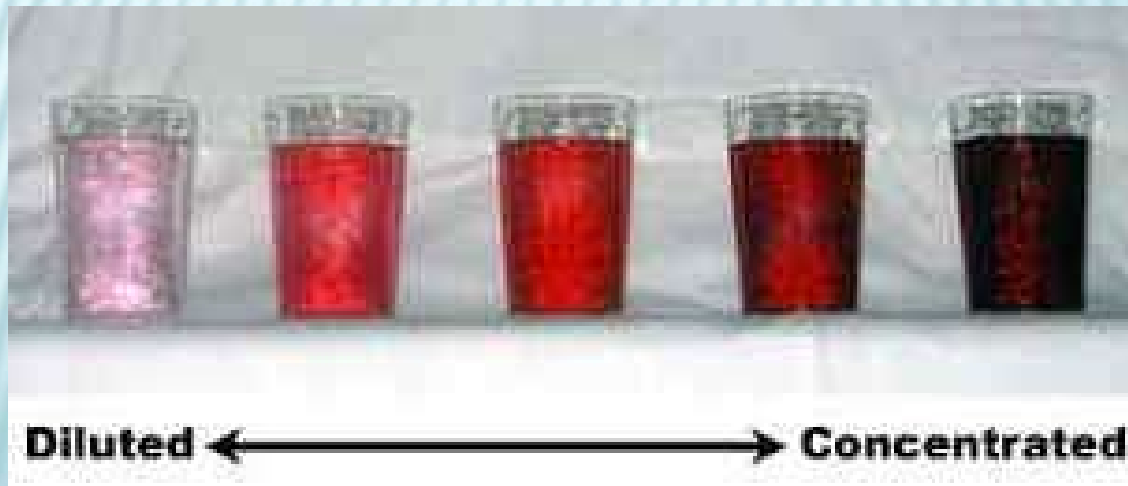
- ✖ Solubility: how much of a solute dissolves in a given solvent at a specific temperature
- ✖ If a solute can be dissolved it is said to be soluble
- ✖ If a solute cannot be dissolved it is said to be insoluble
- ✖ Saturated: solution that contains all of the solute it can
- ✖ Unsaturated: solution that does not hold all of the solute it can

FACTORS THAT AFFECT SOLUBILITY

- ✖ 1. Temperature: an increase in temperature causes an increase in solubility.
- ✖ 2. Pressure: an increase in pressure causes an increase in solubility

DETERMINING CONCENTRATION

- × Concentration is how much solute there is compared to the amount of solvent
- × Concentrated: large amount of solute
- × Dilute: small amount of solute



PRECIPITATE

- ✖ New solute that falls out of a solution by chemical means.
- ✖ Examples: soap scum, stalactites/stalagmites



