PURE SUBSTANCES AND MIXTURE NOTES

S8P1a: Develop and use a model to compare and contrast pure substances and mixtures .

Vocabulary from these notes

- **Pure substance**: a substance that cannot be broken down by physical means (examples: compounds, elements)
- **Element**: a pure substance made of only one type of atom (examples: gold, carbon)
  - **Compound**: a pure substance consisting of two or more atoms and two or more different elements chemically bonded together in a specific ratio (chemical formula) and cannot be separated by physical means.
  - **Molecule**: a pure substance made up of two or more atoms bonded together; they can be the same element
- **Mixture**: a combination of substances that are NOT chemically bonded and can be separated by physical means.

- **Heterogeneous mixture**: a mixture made up of two or more substances whose parts are easily identifiable (examples: Lucky Charms, mixed vegetables)
- **Homogeneous mixture**: a mixture made up of two or more substances but that are the same throughout (examples: Dr. Pepper, vanilla ice cream)
- **Solution**: a mixture of two or more substances that is identical throughout (example: black coffee)
- **Solute**: the part of a solution that is DISSOLVED (example: if you mix lemonade powder into water, the powder is the solute)
- **Solvent**: the part of the solution that DISSOLVES the other material (example: if you mix lemonade powder in water, the water is solvent)

Matter

- Everything around us is either a pure substance, a mixture, or a combination of both.

Mixtures

- Mixtures are a result of a physical change
- A mixture is a combination of substances that are NOT chemically bonded.
- Mixtures are different than pure substances because they can be taken apart by physical processes like boiling, filtering, magnets, using a dropper, distillation and centrifuging.
- Mixtures do not have a chemical formula
- Mixtures are either heterogeneous or homogeneous .
- Mixtures can be solid, liquid, or gas.

Heterogeneous Mixtures

- Heterogeneous means different. These are not the same throughout. One section may have bigger chunks than other sections.
- You can usually see that the parts are different.
- Example:
  - *Salad*
  - *Chili*
  - *Dirt*
  - *A toy box*

Homogeneous Mixtures

- Homogeneous mixtures are the same throughout. You can not usually see the parts.
- Examples of homogeneous mixtures:
  - *Homogenized milk*
  - *Ice cream*
  - *Soft drinks (Coke, Dr. Pepper)*
  - *Air*
  - *Brass*

What is a solution?

- A mixture of two or more substances that is identical throughout
- Almost anything can be a solution
  - *Solids dissolved in liquids*
  - *Gases dissolved in liquids (ex. Carbonated water)*
  - *Liquids in liquids; gases in gases; solids in solids*
- If you mix things up and they stay in an even distribution, it is a solution

Solutions

- **solution** - a mixture that appears to be a single substance

- contains particles from 2 or more substances

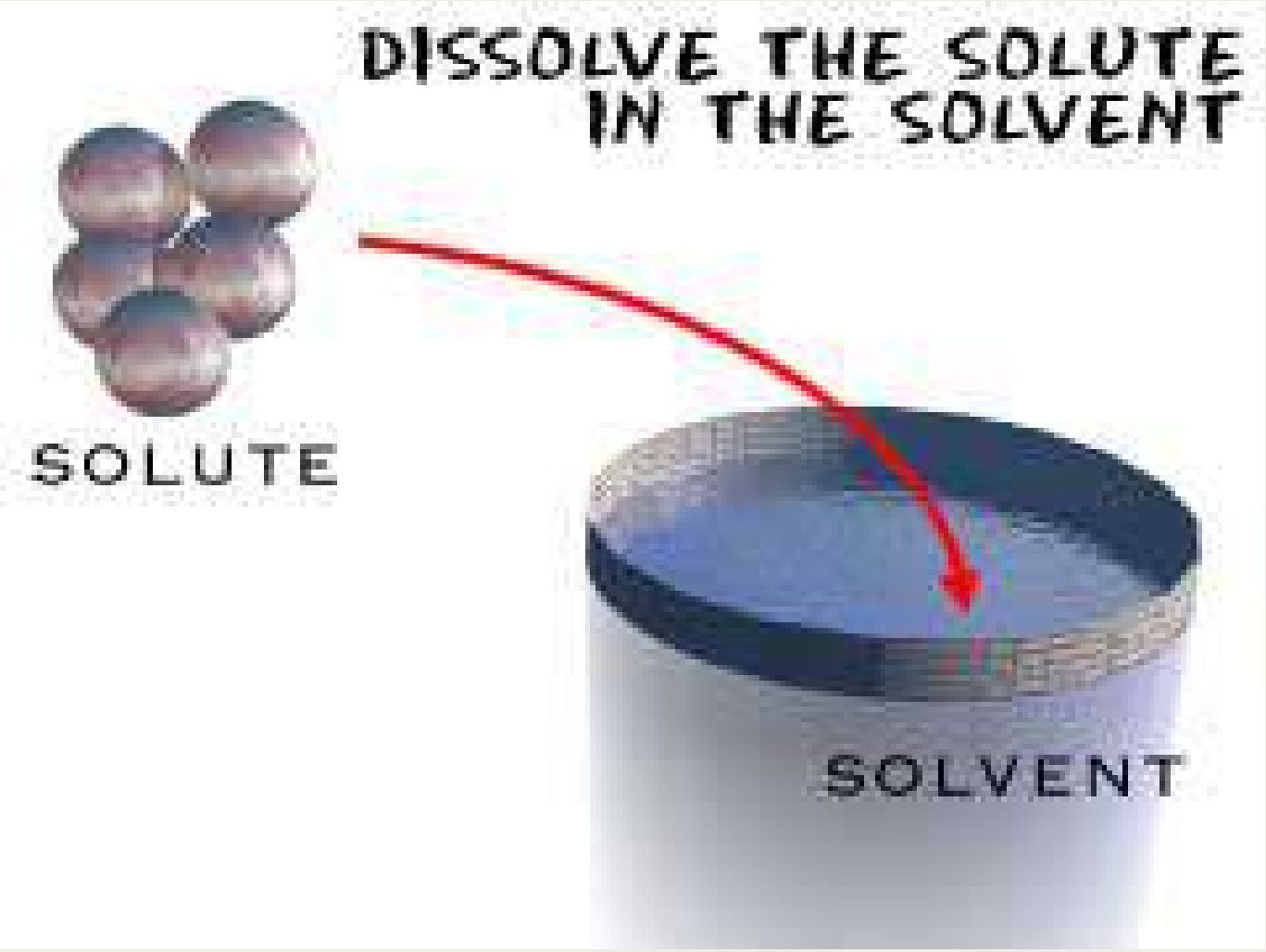
- described as **homogeneous solutions** because they have the same appearance and properties throughout the mixture

What makes up a solution?

- Solutions made up of 2 key parts
- Solute(s)
- Solvent(s)

Solutions

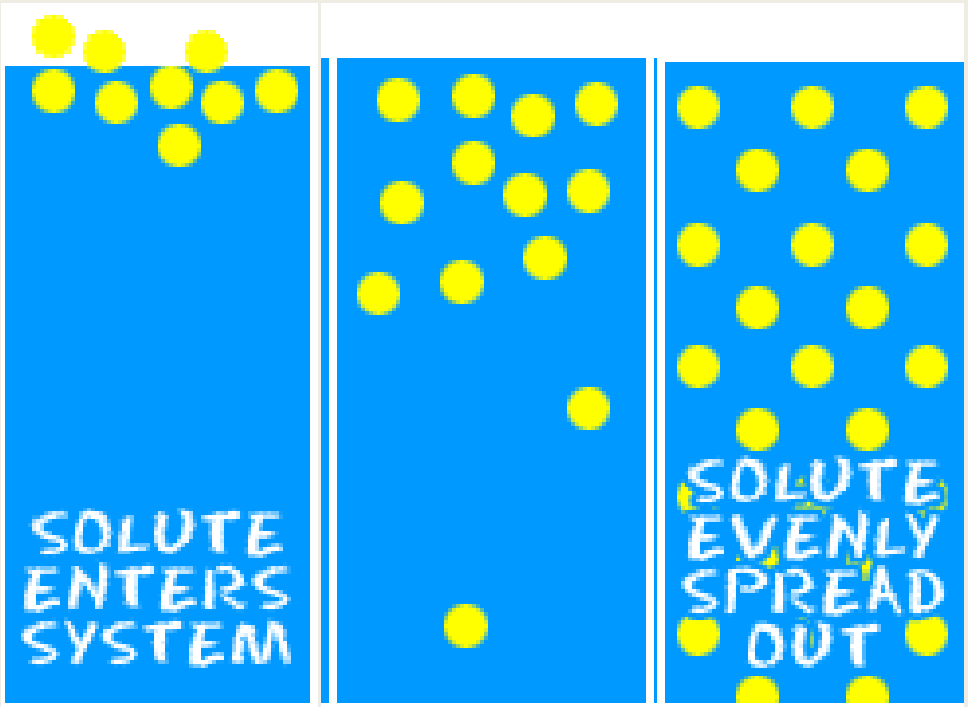
- made by dissolving
- the **solute** is the substance or matter being dissolved or is **soluble** (able to be dissolved) in the solvent
- the **solvent** is the substance into which the solute is dissolved


DISSOLVE THE SOLUTE
IN THE SOLVENT
SOLUTE
SOLVENT

How are solutions made?

- Solute is placed in the solvent.
- Solute slowly breaks into pieces.
- Molecules of the solvent begin to move out of the way and make room for the molecules of solute.
  - *Example: If I mixed salt into a glass of water, the water molecules would start moving out of the way for salt molecules.*
- The solute and solvent continue to interact with each other until the concentration is the same throughout.

How it works (In pictures)



Important to remember!

- Solutions are the same no matter where they are located in a mixture
- For example, if you mixed a solution of water and salt and took a sample from the top of the glass, it would have the same amount of salt as if you took it from the bottom or middle of the glass.

Special types of mixtures

- Alloys: are basically a mixture of two or more metals.
  - *Example: brass*
- Colloid: a mixture with small undisolved particles that do not settle out, but the particles are large enough to scatter a light beam
  - *Example: jello, milk*
- Suspension: a mixture in which particles are large enough to be seen and easily separated by settling or filtration
  - *Example: mixing pepper and water; paint; muddy water*

ALLOY

SUSPENSION

COLLOID

Pure Substances

- Pure substance cannot be broken down by physical means.
- This means you can’t take it apart unless you do some serious chemical process.
- Elements are pure substances.
- Compounds are pure substances.

Elements: pure substances

- An element is made of only one type of atom.
- Atoms cannot be broken down physically.
- Examples:
  - *Li (Lithium) is an element, made of only one type of atom. Therefore, it is a pure substance.*
  - *Au (Gold) is an element. So, it is a pure substance since the one type of atom can't be broken down.*

Compound: A pure substance

- A compound is made when two or more different elements are chemically bonded together.
- Compounds cannot be broken down except by a chemical process.
- Compounds have formulas that show the specific proportions of the elements that make them.
- A compound has different properties than the elements that make it up.

Examples of Compounds

- H_2O
- NaCl
- H_2O_2
- CO
- CO_2
- $C_6H_{12}O_6$

- Water
- Table salt
- Hydrogen peroxide
- Carbon monoxide
- Carbon dioxide
- Glucose

Molecule

- A molecule is a pure substance made up of at least two atoms bonded together.
- It is similar to a compound EXCEPT a molecule can have the same element.
- Example: The air we breathe has oxygen (O_2) which is two oxygen atoms bonded together.
- SO: all compounds are molecules; however not all molecules are compounds

Mixtures vs. Compounds

Mixtures vs. Compounds	
1. Components are elements, compounds, or both	1. Components are elements
2. Components keep their original properties	2. Components lose their original properties
3. Separated by physical means	3. Separated by chemical means
4. Formed using varying amounts of each substance in the mixture	4. Formed using a set ratio of components
5. Examples: Air, Sea Water, Rocks	5. Examples: Water, Carbon Dioxide, Magnesium Oxide, Sodium Chloride