

Mixtures & Solutions

Chapter 4, Lect 2

Quick Review from Last Time

- What do you know about **elements**?
 - Pure substances
 - Cannot be broken down
 - Each element has unique properties
 - Classified into metals, nonmetals, metalloids.
 - Examples: Argon gas, Nitrogen gas



Quick Review from Last Time

- What do you know about **compounds**?
 - Pure substances
 - Made of 2 or more elements
 - Each compound has unique properties that may differ from its individual elements
 - Always form in definite ratios
 - CAN be broken down into simple substances
 - Example: water (H_2O , $NaCl$, CO_2)



Pizza Pizza

- What does it take to make the perfect pizza?
- A perfectly round and rolled out pizza dough, covered with an even layer of mouth-watering red sauce, buried beneath freshly grated mozzarella, and topped with your favorite toppings (pineapple!)
- What does this make? A **mixture!!!**

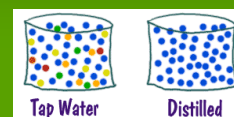


It's called a **Mixture**

- A pizza is a perfect example of a **mixture**.
- A **mixture** is a **combination** of two or more substances - that are **NOT chemically** combined.
- If they react and combine chemically, it will become a **compound** instead.
- The ingredients in a pizza are all mixed together, but you still have separate ingredients.
- The cheese and sauce haven't combined to make a brand new substance.

Example of a **Mixture**: Water

- When you see distilled water, it's a pure substance.
- That fact means that there are just water molecules in the liquid.
- Your tap water is a **mixture** of water with other things dissolved inside, maybe salt.



More, more, & more mixtures!

- Air consists of nitrogen, oxygen and other small amounts of various gases.
- Seawater is a mixture of water with dissolved chemicals such as sodium chloride.
- Gasoline is a mixture of hydrocarbons and other additives.
- People are highly complex mixtures made of mostly organic compounds.
- Medicine, perfume, the list goes on and on.



Don't change me!

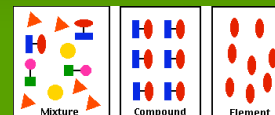
- **Mixtures** don't like change & keep their identity.
- In other words, because no chemical reactions took place, substances are the same before and after you mix them together.
- Because of this, it is still possible to **physically separate** the substances from one another.
- Remember that with **compounds**, we can only separate them using chemical means (heating and electrolysis).

1. Mixtures & Compounds

Mixtures and Compounds

Yes, I am different & special

- What else makes a **compound** different from a **mixture**?
- In a **mixture**, the components do not have a definite ratio.
- In your pizza, you can add as much cheese or as little sauce as your heart desires.



Mixtures Vs. Compounds

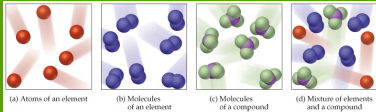
- This is where it gets complicated - being able to tell the difference between a **mixture** and a **compound**.
- Think of water, a **compound**, made up of the elements hydrogen and oxygen.
- Not only is water totally different from its elements, but you can't easily separate the elements from the water.

Mixtures Vs. Compounds

- On the other hand, if you mixed sugar and sand in water, the **mixture** is both sweet (from the sugar) and gritty (from the sand).
- This sugar dissolves, but the sand doesn't - which lets you separate them easily.
- Isn't that genius?

Mixtures Vs. Compounds:

Mixtures	Compounds
Made of elements, compounds, or both	Made of elements
Components keep their original properties	Components lose their original properties
Separated by physical means	Separated by chemical means
Formed using any ratio of components (variable)	Formed using a set ratio of components (fixed)



And now Tim & Mobey

BrainPOP

Brainpop: Mixtures/Compounds

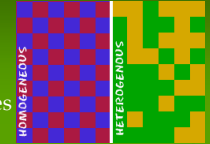
BrainPOP COMPOUNDS AND MIXTURES August 23, 2010 elaine

SCORE: 10/10

- How are mixtures created?
 - A) Through physical changes
 - B) Through chemical reactions
 - C) Through both matter changes
- How are compounds created?
 - A) Through physical changes
 - B) Through chemical reactions
 - C) Through both matter changes
- What is true of a solution?
 - A) It is always thicker than the two chemicals that go into it
 - B) It retains the properties of the substances that make it up
 - C) It can never be separated into its constituent substances
- What is true of a compound?
 - A) It loses all the properties of the substances that make it
 - B) It must have water as one of its components
 - C) It requires heat energy to make
- Which of these is a compound?
 - A) Salt
 - B) Fruit juice
 - C) Ice
- Which of these is a mixture?
 - A) A chocolate chip cookie
 - B) Salt
 - C) Ice
- What is the compound water made of?
 - A) Two hydrogen atoms and one oxygen atom
 - B) Three hydrogen atoms
 - C) Two oxygen atoms and one hydrogen atom
- How many elements can bond together to form a compound?
 - A) Just one
 - B) More than three
 - C) Two or more
- What can be separated into its elements fairly easily?
 - A) A compound
 - B) A mixture
 - C) A pure substance
- What can mix together?
 - A) Solids, liquids, and gases
 - B) Only liquids
 - C) Only solids and gases

Solutions

■ A **solution** is a mixture that appears to be a single substance, but is made of particles of 2 or more substances that are evenly distributed among each other.

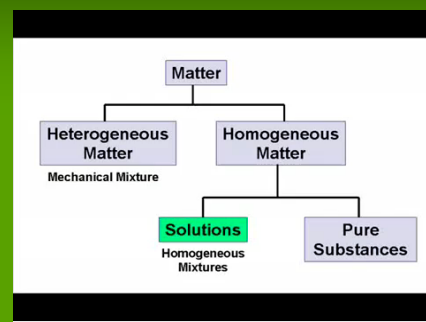


- They are also referred to as **homogeneous mixtures**.
- In short, a **solution** is a mixture, where the particles are so well mixed that the composition is the same throughout and we can't see distinct molecules, even with a microscope.

Solutes & Solvents

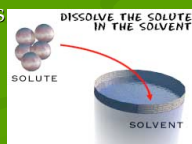
- **Dissolving** is when substances separate and spread evenly throughout the mixture.
- **Solute** = the dissolved substance.
- **Solvent** = the substance the solute dissolves in
- If something is **soluble**, that means it can dissolve in the solvent.
- If it is **insoluble**, that means it cannot dissolve in the solvent (rocks in water).
- Confused yet?

2. Solute & Solvent



Example: Salt Water

- Salt is highly soluble in water - that means it dissolves in water.
 - Salt = the solute
 - Water = the solvent
- In fact, water dissolves so many substances, that it is called the universal solvent.



Special Solutions

- Not all solutions are liquids.
- Alloys are solid solutions of metals and nonmetals that have dissolved in metals.
- Brass is an example of an alloy - it is zinc dissolved in copper.
- Steel is carbon and other elements dissolved in iron.
- Gases can be solutions too.



Particles in Solution

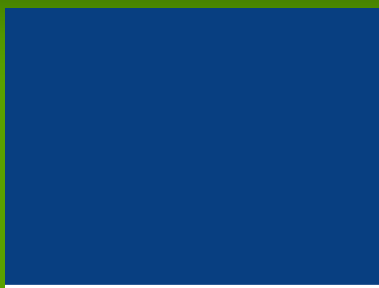
- The particles in a solution are so small that they never settle out and they can't be filtered.
- They are even too small to scatter light, which means light shines right through the solution.

How much are you dissolving?

- Concentration is the amount of solute dissolved in the solvent.
- A lot of times, it is in grams per milliliter of solvent, or g/mL
- Dilute = less solute
- Concentrated = more solute
- If the solute is colored, then a dilute solution is usually pale, whereas a concentrated solution is dark



3. Concentration



Speed it up!

There are 3 methods to make a particle dissolve faster:

- Mixing - stirring or shaking causes the particles to separate and spread more quickly
- Heating - causes particles to move more quickly and separate
- Crushing - increases the amount of contact between the solute and solvent and causes better mixing

Suspensions

- A **suspension** is a **mixture** where the particles are mixed in a solvent, but do not dissolve because they are large.
- Think of a snow globe. The snow particles are mixed in with the fluid, but do not dissolve.

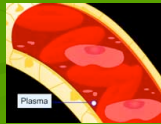


Suspensions

- Dirty air is a suspension
- Think about dust that floats around in the air, and you can see it when a beam of light falls on it.
- The dust particles are too big to fully mix and combine with the air / gas particles.
- Salad dressing is another example.

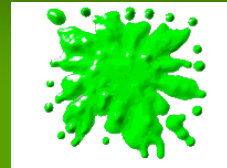
Blood!!

- Blood is a special type of suspension.
- It consists of red and white blood cells and platelets - which are actually suspended in a solution called **plasma**.
- The **solution** - surprise surprise - is water.
- This plasma is 90% water and 10% particles (sugars, vitamins, ions).



Colloids

- A colloid is a **mixture** in which the particles are spread throughout the solvent, but cannot settle.
- The particles are a whole lot smaller than those in a suspension.
- Also called emulsions
- Examples: slime, ice cream, jello...



4. And now...we solute you!

