Mixtures and Solutions

Part 1: Mixtures
What Is Matter?

Everything in the universe is made of matter.

Matter is anything that has mass and volume.

Matter is made of tiny particles called atoms.

All the matter around us is classified in two major groups...
Matter

Pure Substances
Made of only ONE kind of atom or molecule.

Mixtures
Made of only TWO or MORE kinds of atoms or molecules.
Pure substances are the **same** throughout.

The composition **doesn’t change**, no matter what part of the substance you look at!
Mixtures are **not the same** throughout.

The composition of mixtures **changes**, depending on what part you look at!
Pure Substance or Mixture?

A

Pure Substance
Pure Substance or Mixture?

B

Mixture
Pure Substance or Mixture?

Pure Substance
Pure Substance or Mixture?

D

Pure Substance
Pure Substance or Mixture?

Mixture
Pure Substance or Mixture?

Pure Substance
Pure Substance or Mixture?

Mixture
A mixture is made of **2 or more** types of atoms that are **NOT** chemically combined together.

**Mixtures can take many forms:**

- **2+ Solids**
- **2+ Liquids**
- **2+ Gases**

**ANY** combination of solids, liquids & gases
Mixtures of Solids
Mixtures of Liquids
Mixtures of Gases
Types Of Mixtures

There are 2 major types of mixtures:

Heterogeneous
Means “different”

Homogeneous
Means “the same”
Heterogeneous Mixtures
Homogeneous Mixtures
Which Kind of Mixture?

Classify each type of mixture as:

- Heterogeneous
- Homogeneous

Heterogeneous: Cereal
Homogeneous: Grape Juice
Heterogeneous: Candy Eggs
Any Questions?
A solution is a special type of mixture.

A solution is a homogeneous mixture that combines a solute and a solvent.

A solution involves one substance dissolving in another substance, which is usually a liquid.
A solution is a special type of mixture.

A solution is a **homogeneous mixture** that combines a **solute** and a **solvent**.

**Solute**
- The **solid** part that gets dissolved.
  - e.g. salt, sugar

**Solvent**
- The **liquid** part that does the dissolving.
  - e.g. water
How To Make A Solution

Solute + Solvent = Solution

Salt + Water = Salt Solution
We can **measure** how **easily** a solute will dissolve in a certain solvent.

This measurement is called **solubility**.

**HIGH Solubility**

The solute dissolves quickly & easily

e.g. **salt** in water

**LOW Solubility**

The solute does not dissolve easily

e.g. **sand** in water
We can add a LITTLE or a LOT of solute!

For example, putting spoonfuls of sugar into a cup of tea...

A solution with only a small amount of solute is called a dilute solution.
Dilute vs. Concentrated

We can add a **LITTLE** or a **LOT** of solute!

For example, putting spoonfuls of sugar into a cup of tea...

A solution with a **large amount** of solute is called **concentrated**.
Eventually, a solvent can’t hold anymore!

A **saturated solution** CANNOT hold any more solute at a **certain temperature**.
But, by heating a solvent up, we can make it hold **even more** solute than normal.

A **super-saturated** solution contains more solute than it can normally dissolve.
Any Questions?
Mixtures and Solutions

Part 3: Separating Mixtures
A mixture is made of 2 or more types of atoms that are NOT chemically combined together.

Recall: Mixtures
Each part of a mixture is called a phase.

Since the phases are not chemically joined together, they can be separated...
There are **5 ways** to separate mixtures:

- **Sieving**
- **Filtration**
- **Evaporation**
- **Distillation**
- **Chromatography**
Sieving

Separates different sized/shaped solids.

You can do it by hand or with a sieve.

Smaller solids will pass through the sieve.

Larger solids will be left inside the sieve.
Filtration

Separates **solids** mixed with **liquids**.

You need a **funnel** and **filter paper**.

The liquid that passes **through** is the **filtrate**.

Solids that gets **stuck** in the filter is **residue**.
Filtration

residue

Insoluble in water

Soluble in water

filtrate
Evaporation

Separates solids **dissolved fully** in a liquid.

You need an evaporation dish and heater.

The **liquid** will **evaporate** into the air.

The **solid residue** will **remain** behind.
Evaporation

- Evaporation evaporates liquid
- Residue left behind
Distillation

Separates a solid dissolved in a liquid, but you want to **keep the liquid** instead!

You need a **distillation apparatus.**

The liquid **evaporates and is collected.**

The **solid residue** will **remain** in the flask.
Distillation

flask

condenser

cools down the gas

gas drips out here

burner

flask
Chromatography

Separates different **dyes** and **inks** mixed together in one solution.

You need **chromatography paper** and a solvent.

All the different dyes are dissolved in water.

Some dyes are **more soluble** than others…
Drop of the ink mixture is put near bottom. More soluble dyes are carried higher. Less soluble dyes stay lower. Chromatography paper strip. Solvent, usually water.
Any Questions?