



# Mixtures

## Matter

### Pure substance:

- Fixed (constant) composition and unique properties.
- Contains only 1 type of particle
- Can be an element (like Cu) or a compound (like NaCl)
- *Homogeneous (looks the same throughout)*

### Mixture:

- Contains at least 2 **PHYSICALLY** combined substances
- can be *homogeneous* or *heterogeneous*.

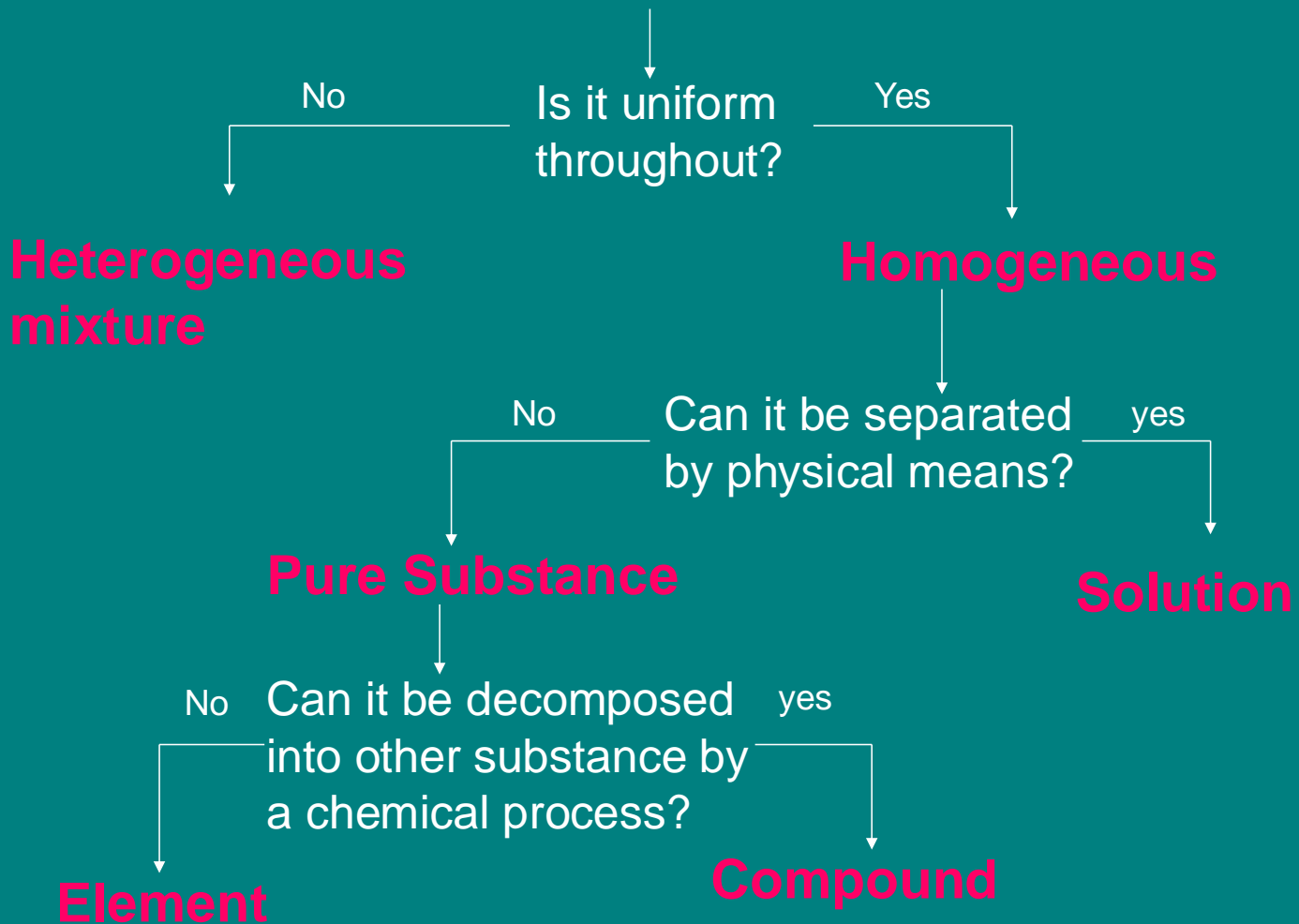
# Homogeneous Matter

- Looks the same throughout
  - Particles are evenly distributed
  - Properties are uniform
  - Can be pure or a mixture
- Element: pure substance, only 1 type of atom
  - Compound: pure substance, 2 or more **CHEMICALLY** combined elements
    - (not easily separated from each other)
    - Ex: water, CO<sub>2</sub>, NaCl
  - Solution: a special kind of mixture
    - SOLUTE dissolves & SOLVENT does the dissolving
    - **PHYSICALLY** combined and can be **PHYSICALLY** separated
- Ex: food coloring and water  
salt water

# Heterogeneous Matter

- Does not look the same throughout
- Particles are not evenly distributed
- Properties are not uniform
- Always a MIXTURE (solutions are mixtures that are NOT heterogeneous)
- 2 or more PHYSICALLY combined substances

# MATTER



## Homogeneous Mixtures (Solutions)

- Homogeneous mixture:
  - a mixture in which the components are evenly distributed among each other.
  - You cannot see the component parts.
- **Homogeneous** means the same throughout.
- It has a constant composition throughout.

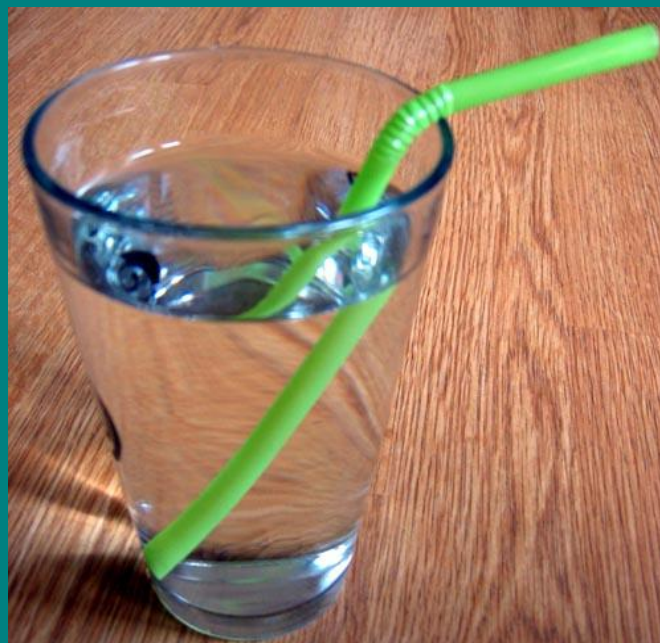
Examples: Salt dissolved in water, sugar dissolved in water, apple juice, tea, copper (II) sulfate solution in water, alloys....



**C** Copper(II) sulfate ( $\text{CuSO}_4$ ) in water, a homogeneous mixture (solution)

# Solutions

- Well-mixed (uniform) – single phase
- homogeneous
- transparent (if liquid)
- cannot be separated by filter
- do not separate on standing



## States of Matter in Solution

## Examples of Solutions

gas in gas

air (  $N_2$ ,  $O_2$ , Ar,  $CO_2$ , other gases)

gas in liquid

soda pop ( $CO_2$  in water)

liquid in liquid

gasoline (a mixture of hydrocarbon compounds)

solid in liquid

Salt water

gas in solid

$H_2$  in platinum or palladium

liquid in solid

dental amalgams (mercury in silver)

solid in solid

alloys ( brass, (Cu/Zn), solder (Sn/Pb), Steel (Fe/C ))

Q: Can a solution be separated by filtration?

A. Yes

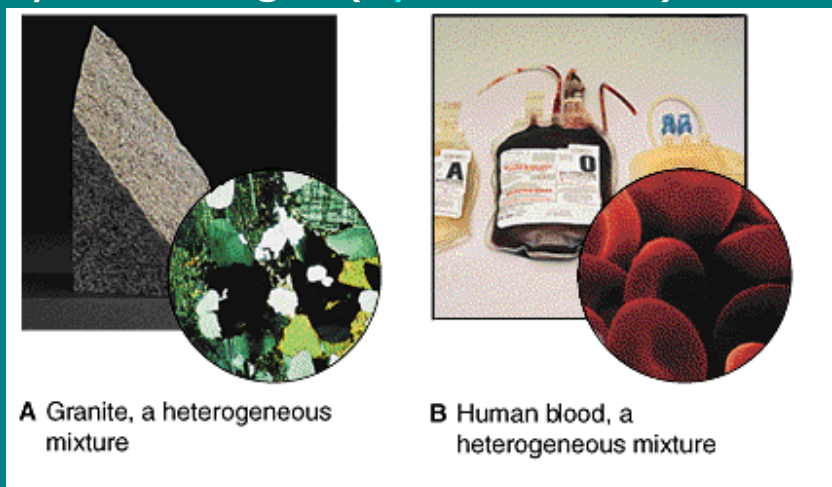
✓ B. No

## Heterogeneous Mixtures

Heterogeneous Mixture (Suspension or Colloid):

- the components are not evenly distributed among each other
- has **two or more distinct phases** that are usually visible
- does NOT have uniform properties.
- Heterogeneous mixtures that look like solutions can be distinguished because they scatter light (**Tyndall Effect**).

Ex: muddy water, oil and water, milk, sulfur and iron, granite, blood...



Q: After passing through a muddy pond, the water in a stream contains dirt particles. Which of the following describes the stream?

- A. solution
- ✓ B. suspension
- C. pure substance
- D. colloid



## Suspensions

- A **suspension** is a mixture where the particles are dispersed but are big enough to settle out or be filtered out.
- A mixture that needs to be shaken before use is probably a suspension.
- Ex.
  - Mud or muddy water, where soil, clay, or silt particles are suspended in water.
  - Paint (needs to be mixed before use)
  - Snow globe (eventually settles)
  - Orange Juice (needs to be shaken before use)





- Suspensions like coffee are easily filtered to take out the tiny solid clumps floating in the liquid.

- Solutions are mixtures that have particles that are so small they pass through most filters.

## Colloids



Non-transparent, uniform, large particles, cloudy (milky)  
but stable system

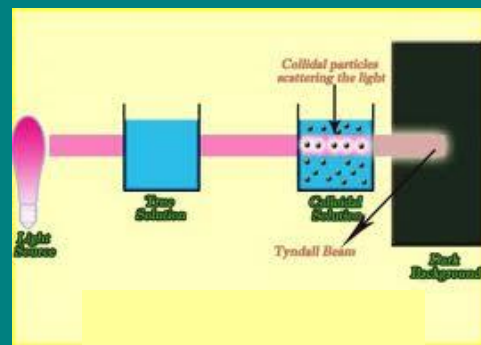
# Tyndall Effect



- You can see the light beam as it passes through a colloid or suspension.

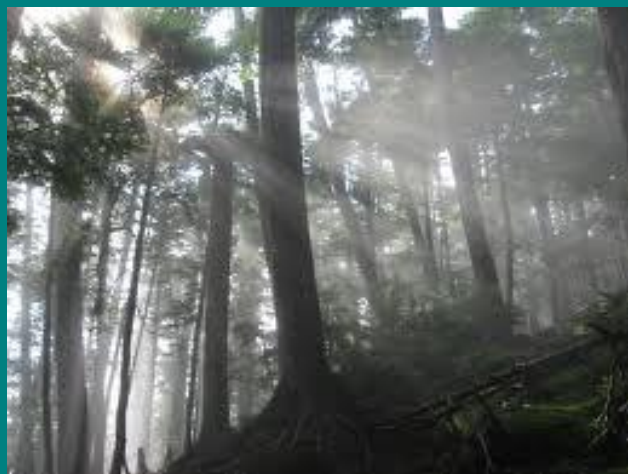


- particles scatter light



Q: Which of the following will show the Tyndall Effect?

- A. water
- B. sugar water
- C. oxygen gas
- ✓ D. fog





Q: Which of the following is a colloid?

- ✓ A. milk
- B. NaCl in water
- C. sand and water
- D. raisin bread

## 3 Types of MIXTURES

	Solution	Colloid	Suspension
Examples	salt water, air, brass	Jello, fog, milk	Muddy water, Italian dressing
Particle Type	ions, atoms, molecules	Small Clusters	Large Clusters
Particle Size	small	medium	large
Scatter Light? ( <b>TYNDALL EFFECT</b> )	No	yes	yes
Settle while standing?	No	No	yes
Separate by filtration?	No	No	yes

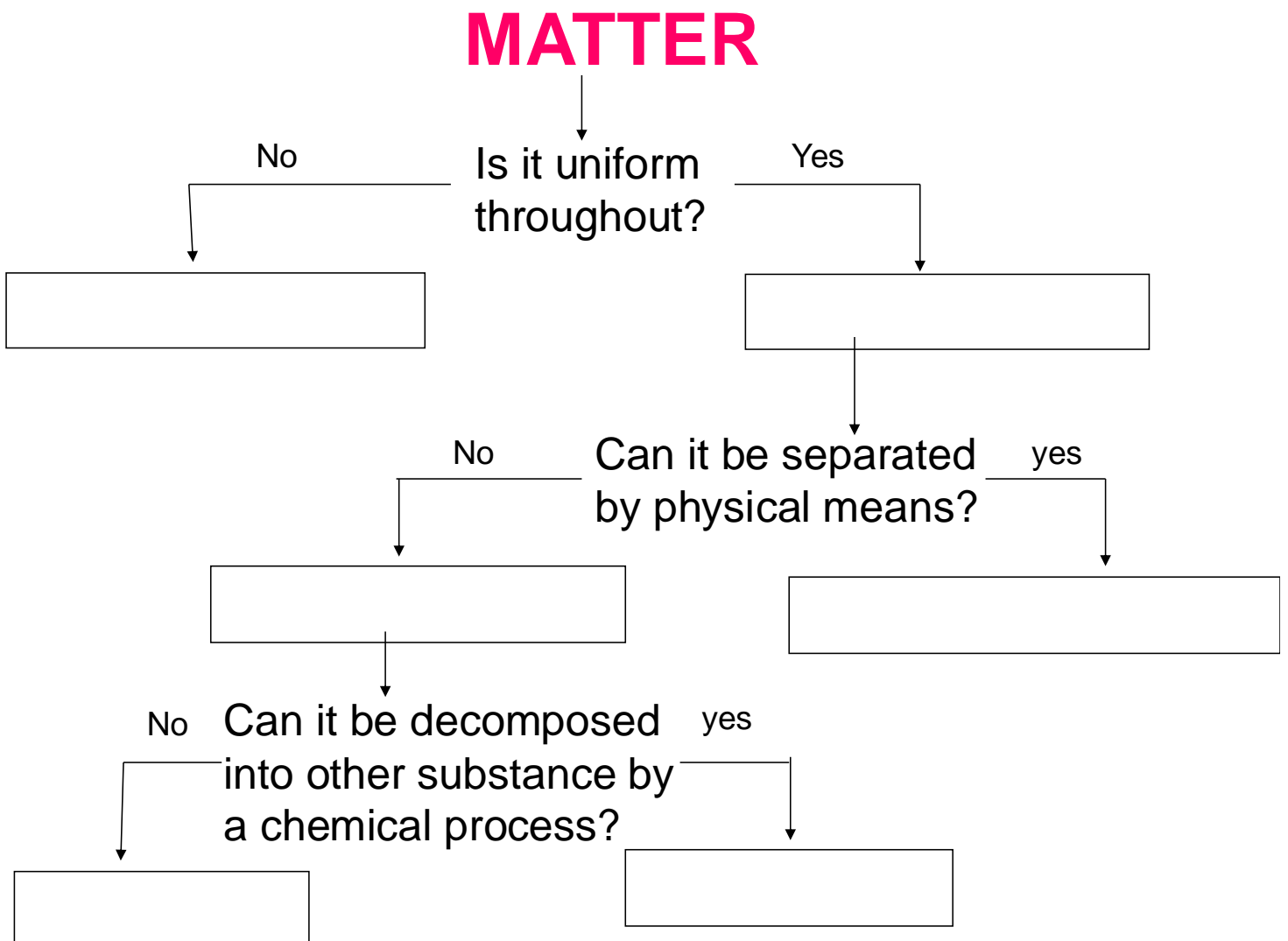
- Matter can also be classified according to its composition.
- Mixtures can be homogeneous or heterogeneous.
- Mixtures can be separated into pure substances, and pure substances can be either compounds or elements.

- **Homogeneous Matter**

- Looks the \_\_\_\_\_ throughout
- Particles are \_\_\_\_\_ distributed
- Properties are \_\_\_\_\_

- **Heterogeneous Matter**

- \_\_\_\_\_ look the same throughout
  - Particles are \_\_\_\_\_ distributed
  - Properties are \_\_\_\_\_
- Always a \_\_\_\_\_
  - 2 or more \_\_\_\_\_ combined substances (elements/compounds)



# 3 Types of MIXTURES

	Solution	Colloid	Suspension
Examples			
Particle Type			
Particle Size			
Scatter Light? (TYNDALL EFFECT)			
Settle while standing?			
Separate by filtration?			