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

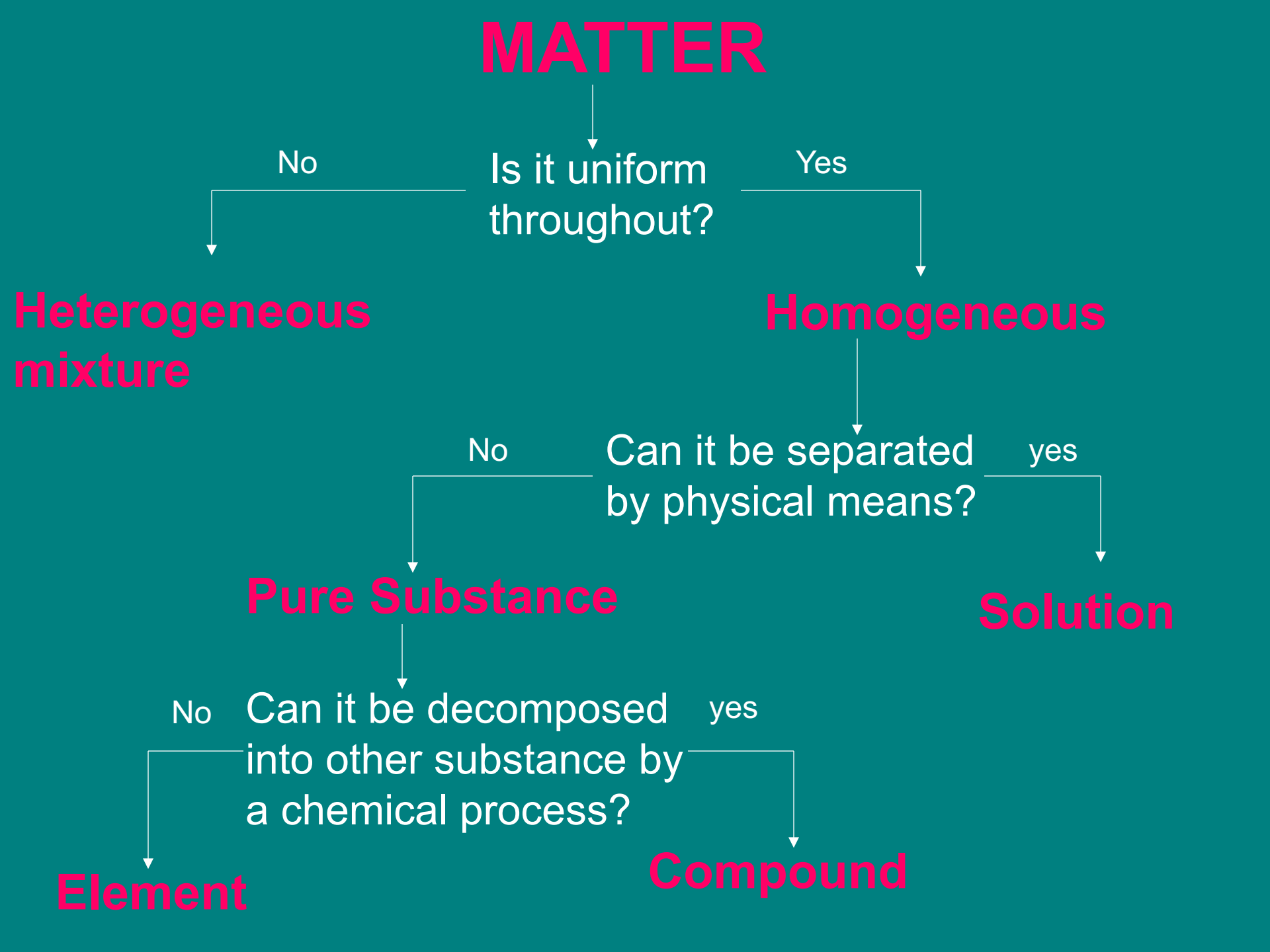
  - Element: pure substance, only 1 type of atom
  - Compound: pure substance, 2 or more **CHEMICALLY** combined elements
    - (not easily separated from each other)
    - Ex: water, CO_2 , NaCl
  - Solution: a special kind of mixture
    - SOLUTE dissolves & SOLVENT does the dissolving
    - **PHYSICALLY** 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
Is it uniform throughout?
No
Yes
Heterogeneous mixture
Homogeneous
Can it be separated by physical means?
No
yes
Pure Substance
Solution
Can it be decomposed into other substance by a chemical process?
No
yes
Element
Compound

Homogeneus 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 ($CuSO_4$) 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?

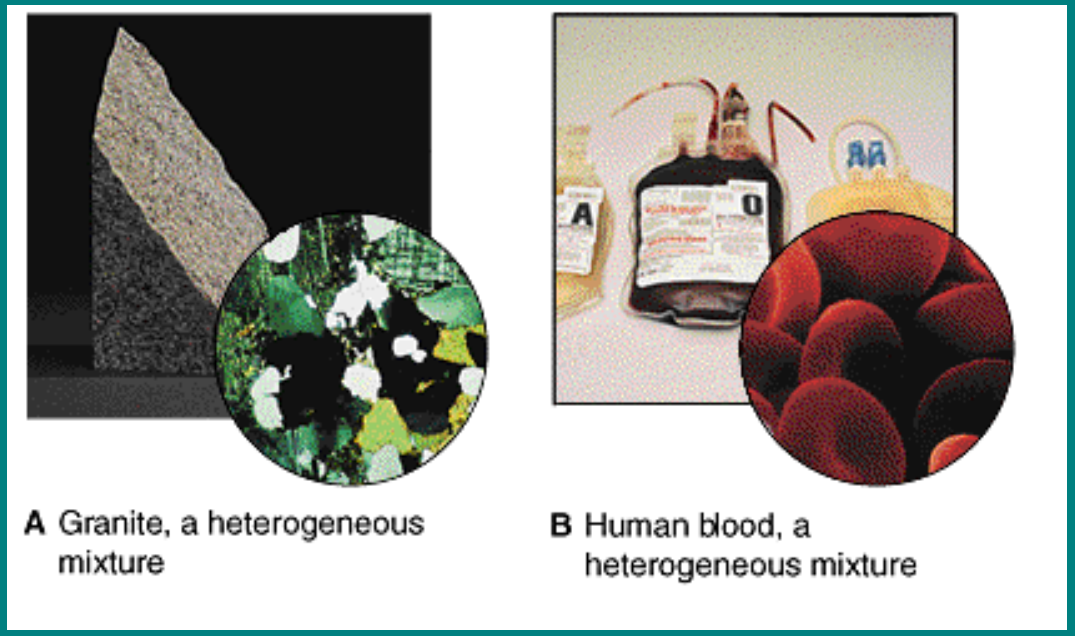
- Yes
- No

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...



A Granite, a heterogeneous mixture

B Human blood, a heterogeneous mixture

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

- solution
- ✓ suspension
- pure substance
- 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)

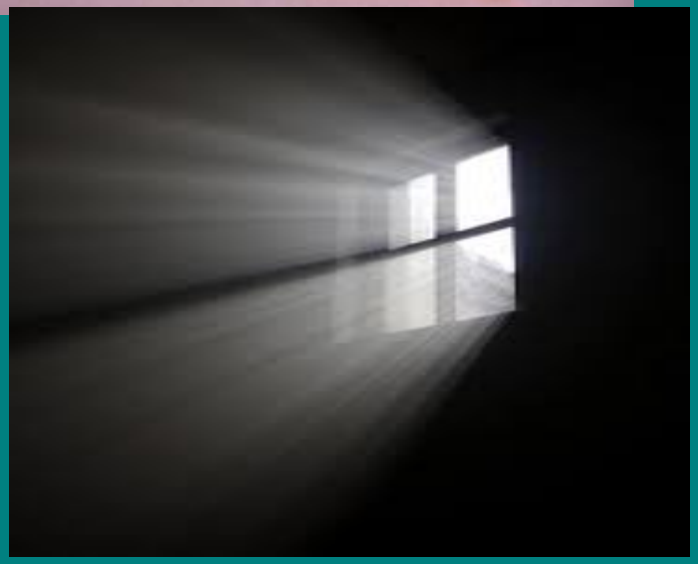
•Suspensions like coffee are easily filtered to take out the tiny solid clumps floating in the liquid.

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

Colloids

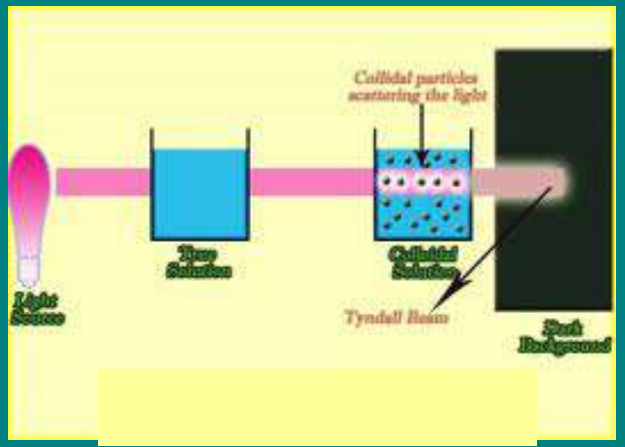
Non-transparent, uniform, large particles, cloudy (milky) but stable system

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?

- water
- sugar water
- oxygen gas
- ✓ fog

Q: Which of the following is a colloid?

- milk
- NaCl in water
- sand and water
- 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? (**TYNDALL EFFECT**)	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)

MATTER

Is it uniform throughout?

No

Yes

Can it be separated by physical means?

No

yes

Can it be decomposed into other substance by a chemical process?

No

yes

3 Types of MIXTURES

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