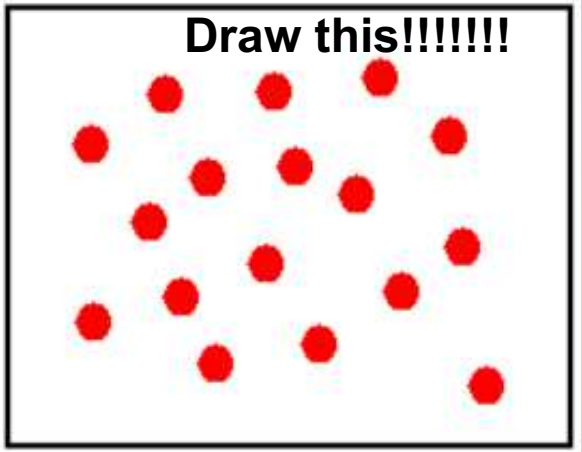
Classifying Matter: Elements, Compounds, and Mixtures

S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter.

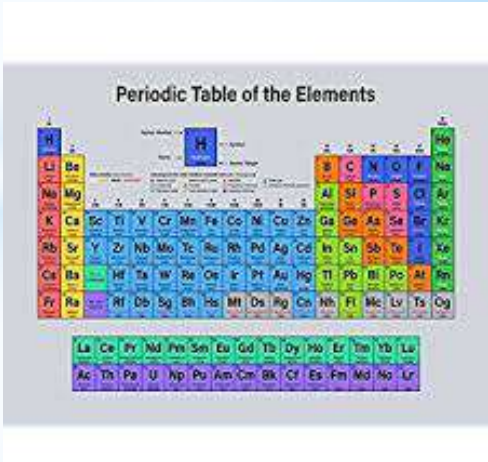
a. Develop and use a model to compare and contrast pure substances (elements and compounds) and mixtures.

Pure Substance – a sample of matter that has definite and constant chemical & physical properties.

Element – pure substance that cannot be separated into simpler substance by physical or chemical means.

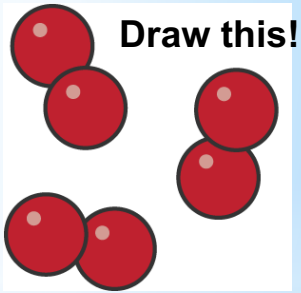


Sample of the Element Lead

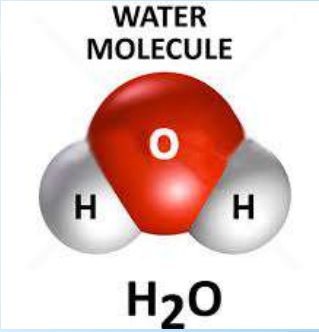


Atoms - The smallest unit of an element that maintains the properties of that element.

Molecules – composed of *two or more* elements that are joined by chemical bonds



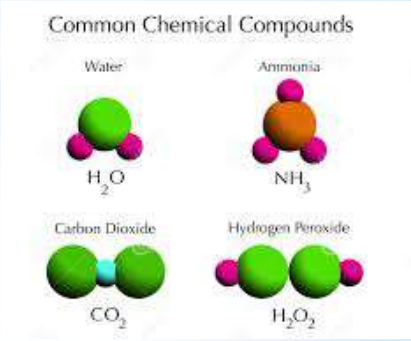
- Elements can be the **same**: Ex: H_2, 0_2, N_2
- Elements can be **different**: Ex: $C_6H_{12}0_6$, H_20



Compounds – pure substance composed of two or more *different* elements joined by chemical bonds.

- Made of elements in a specific ratio that is always the same
- Water is H_20 – It will always have 2 hydrogen atoms and 1 oxygen atom joined together
- Can only be separated by chemical means, not physically
- Have their own *physical* and *chemical* properties
- Chemical and physical properties are different than the elements they are made from

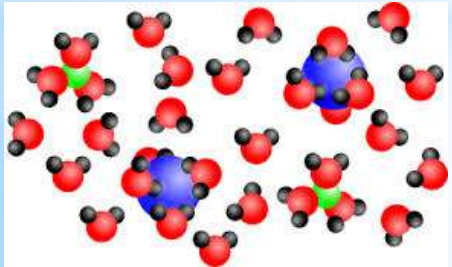
- Example H_20
  - Hydrogen is a gas
  - Oxygen is a gas
  - Water is a liquid at room temperature



Mixtures – a combination of two or more pure substances that are **not** chemically combined.

- Substances held together by physical forces, not chemical
- No chemical change takes place
- Each item retains its properties in the mixture
- They can be separated physically

*composition varies from sample to sample



*Ex: tea, perfume, air, salad, beach sand

	Mixture	Compound
Composition	Variable composition – you can vary the amount of each substance in a mixture.	Definite composition – you cannot vary the amount of each element in a compound.
Joined or not	The different substances are not chemically joined together.	The different elements are chemically joined together.
Properties	Each substance in the mixture keeps its own properties.	The compound has properties different from the elements it contains.
Separation	Each substance is easily separated from the mixture.	It can only be separated into its elements using chemical reactions.
Examples	Air, sea water, most rocks.	Water, carbon dioxide, magnesium oxide, sodium chloride.

Types of Mixtures – There are two main categories

1. Homogeneous – molecules are mixed up in an even distribution (looks the same throughout)

Solutions – a mixture that appears to be a single substance

Solute – the substance **being** dissolved

Solvent – the substance **in which** the solute is being dissolved

Water is considered a universal solvent

Particles do not scatter light

Ex: sugar water, lemonade, Kool-Aid , soda, air

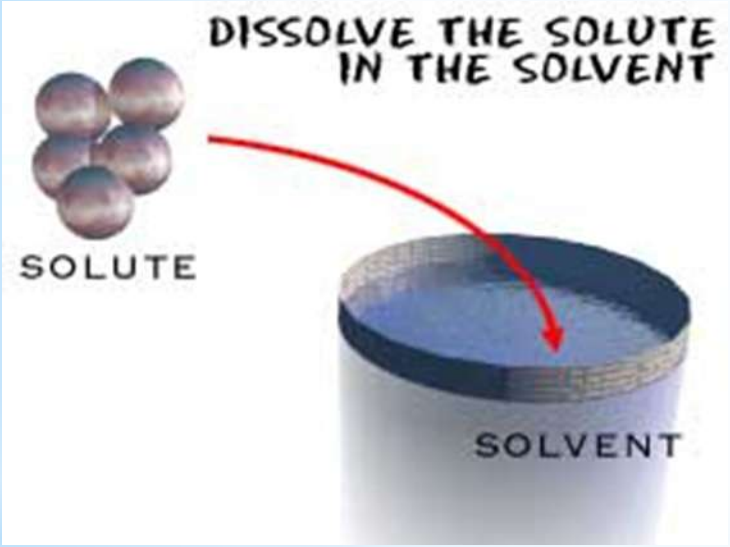
Colloids* – a mixture of tiny particles that are bigger than those in a solution, but smaller than in a suspension

Do not settle out over time

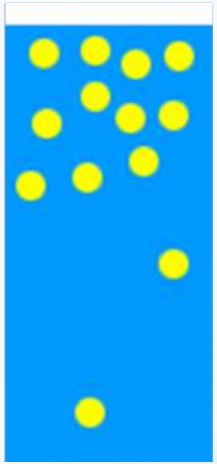
➔ Scatter light

- Ex: Mayonnaise, milk, gelatin, whipped cream

*some sources say that colloids are homogeneous mixtures while others say they are heterogeneous mixtures, some also say it should be in its own category.


DISSOLVE THE SOLUTE IN THE SOLVENT
SOLUTE
SOLVENT


SOLUTE ENTERS SYSTEM




SOLUTE EVENLY SPREAD OUT

2. Heterogeneous - molecules are not mixed up in an even distribution (parts are often visible)

<u>Suspensions</u> – a mixture in which particles are dispersed in liquid or a gas and will eventually settle out

- Particles can scatter light
- Can be filtered out using a filter
    - Ex: snow globe, sand in a bucket of water, muddy water, Italian dressing, salad

*Mixtures Study Jams Video

http://studyjams.scholastic.com/studyjams/jams/science/matter/mixtures.htm

Review:

- An **element** contains just one type of atom.
- A **compound** contains two or more different atoms joined together.
- A **mixture** contains two or more different substances that are only physically joined together, not chemically.
- A mixture can contain both elements and compounds.

Element, Compound, or mixture?

Copper

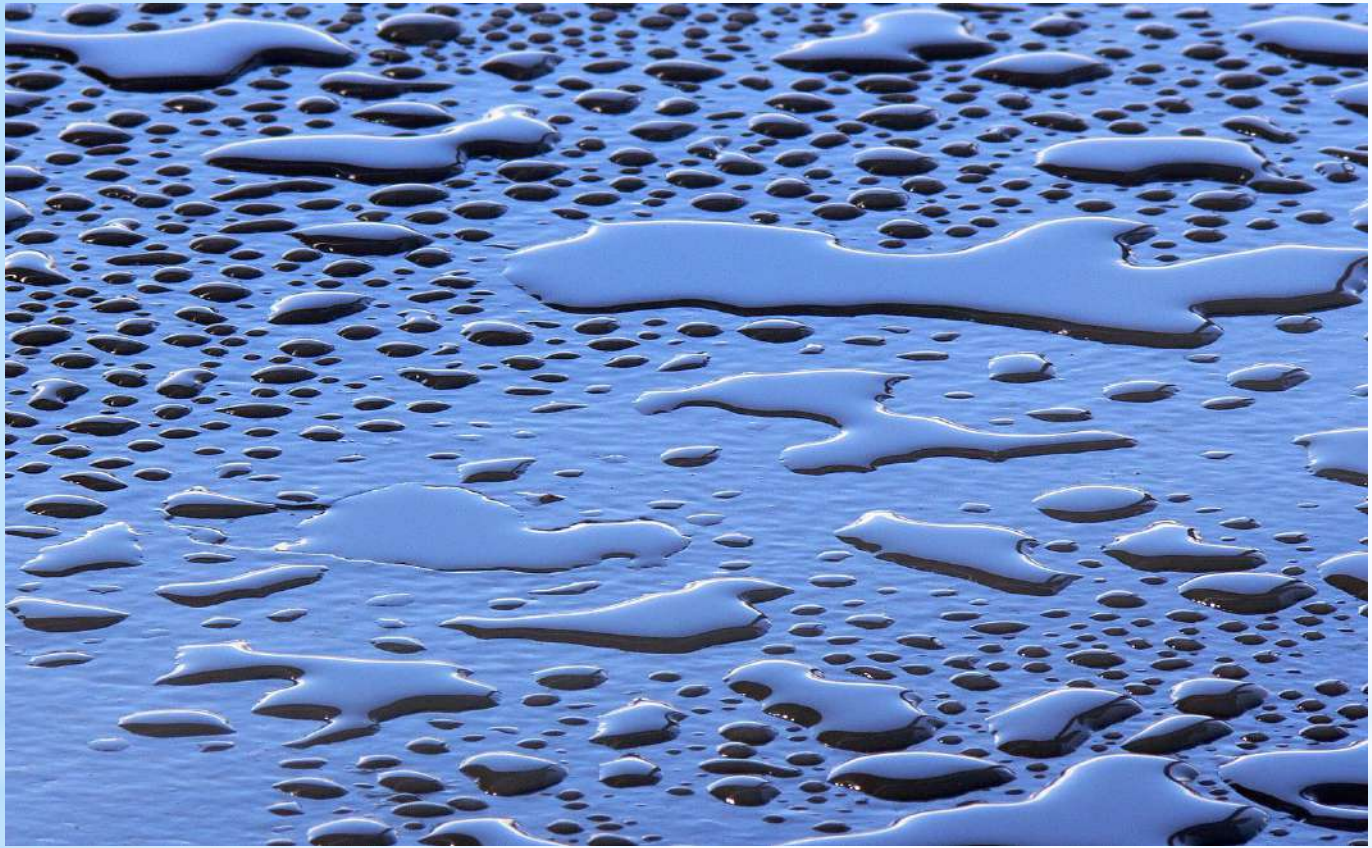
Element


C&H
Pure
CANE
SUGAR
GRANULATED WHITE
15
CALORIES
per teaspoon

Compound

Rocks

Mixture



pure
water

Compound

Mixture

Mixture

Element

Aluminum

Element

Compound

Mixture

Mixture

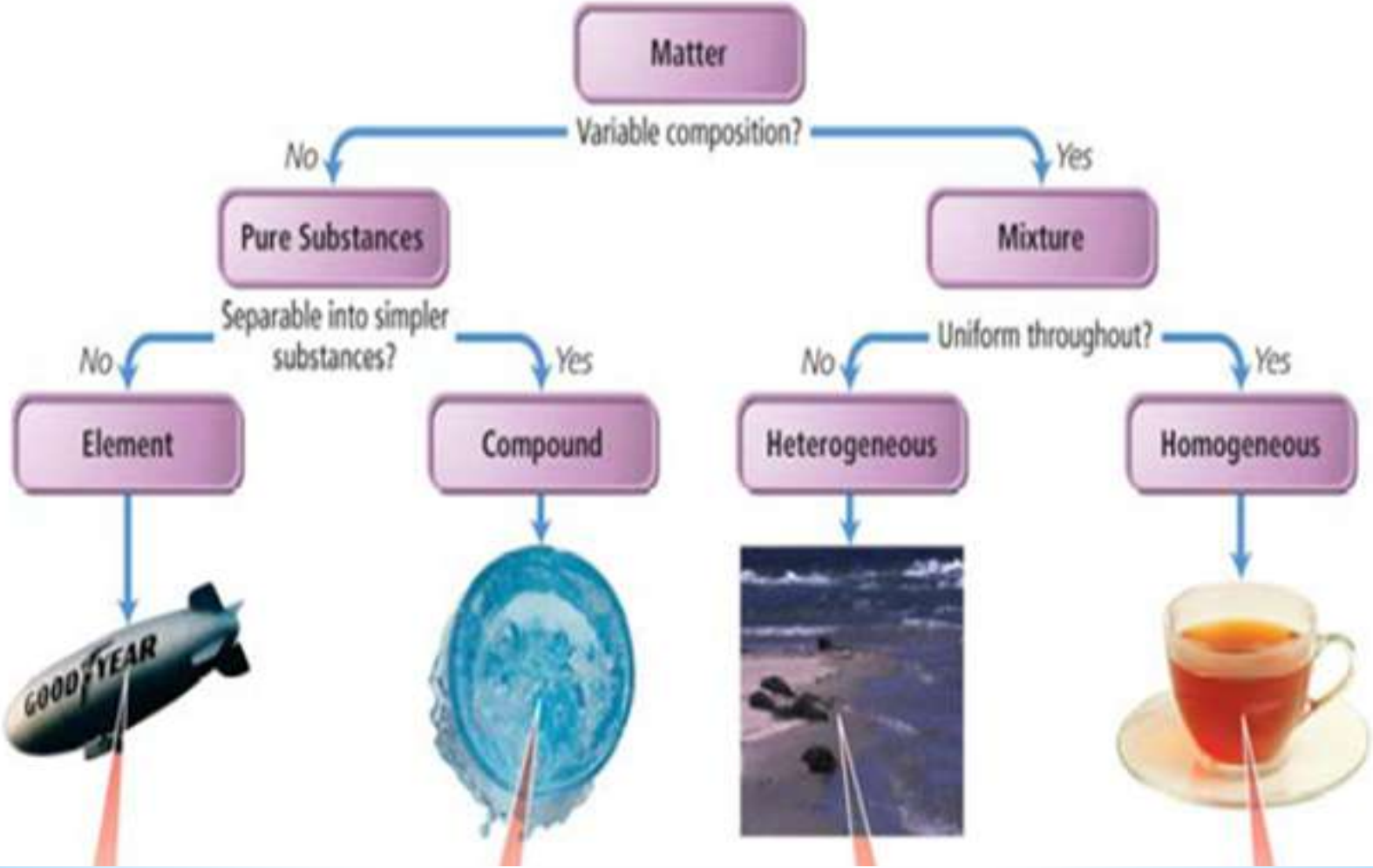

Shake Well
ALL NATURAL
Simply Lemonade
NOT FROM CONCENTRATE

neon gas

Element

Mixture

Element


Matter
Variable composition?
No
Yes
Pure Substances
Mixture
Separable into simpler substances?
No
Yes
Uniform throughout?
No
Yes
Element
Compound
Heterogeneous
Homogeneous
GOODYEAR