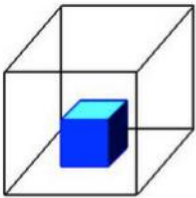


## States of Matter & Separation Techniques

There are 3 states of matter that we focus on:

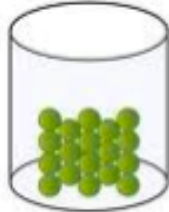
### **SOLID:**

- 
- 
- 
- 

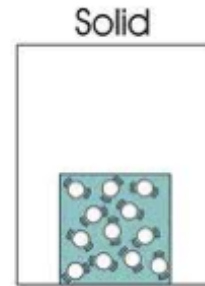


**Solid**

Holds Shape  
Fixed Volume

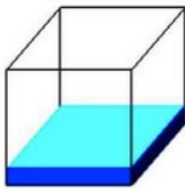


Solid



### **LIQUID:**

- 
- 
- 
- 

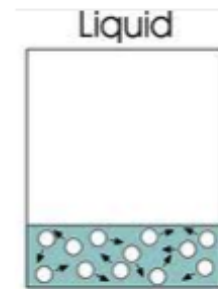


**Liquid**

Shape of Container  
Free Surface  
Fixed Volume

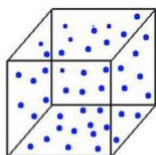


Liquid



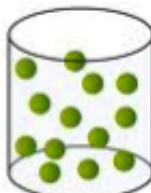
### **GAS:**

- 
- 
- 
- 

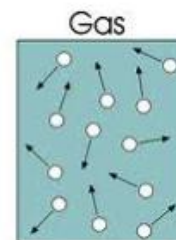


**Gas**

Shape of Container  
Volume of Container



Gas



## Matter on the atomic level:

Pure Substances:

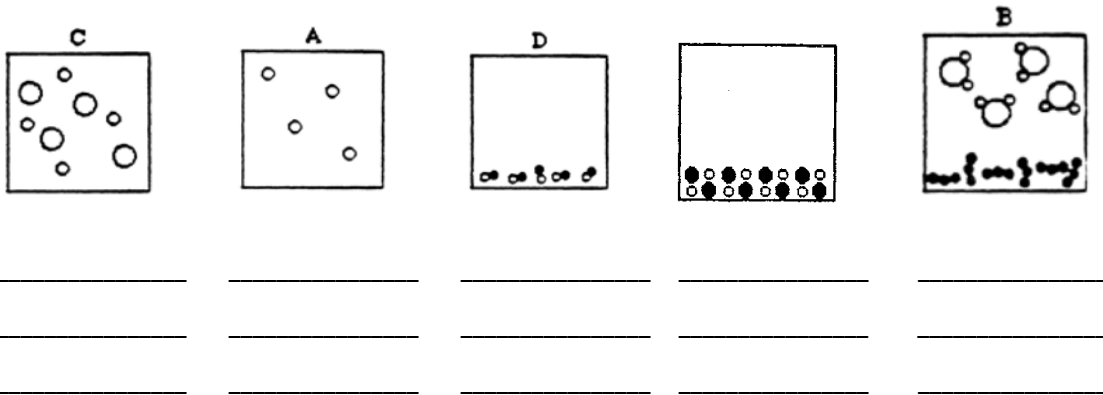
Elements are made of ONE type of atom.

Compounds are made of TWO or MORE different elements.

Draw some examples below of ELEMENTS.

Draw some examples below of COMPOUNDS.

Lets put it all together!



## Separation Techniques

Different methods of separation

- Remember, \_\_\_\_\_ can only be separated physically.
- Magnetic Attraction: Used to separate particles based on magnetic properties.
  - Ex: A magnet can separate iron from sand.
- Sieving: Used to separate particles by different sizes by passing through a mesh or net.
  - Ex: alluvial gold is separated from smaller soil particles.
- Filtration: Used to separate a SOLID from a LIQUID.
  - The liquid passes through the holes in the filter paper, but the solid particles are too big and get stuck.
  - Ex: using a filter to separate dirt from water.
- Evaporation: Used to separate a dissolved solid from a solution.
  - Ex: Salt water is boiled, leaving behind salt crystals when the water evaporates entirely.
- Distillation: Used for separating mixtures based on differences in conditions required to change the phase of components of the mixture.
  - Ex: ethanol can be separated from water via distillation because ethanol has a lower boiling point than water.
- Centrifugation: Separating solids from liquids or liquids of different densities by the application of centrifugal force.
  - Ex: Separating blood into plasma and blood cells.
- Decanting: The separation of mixtures, leaving sediments in the bottom of the container.
  - The liquid is poured into a new container without disturbing the sediments or lower liquid layers.
- Chromatography: Used to separate a mixture on the basis of differences in their affinity for a stationary and a mobile phase.
  - Ex: separating components of ink using paper and water.
- Crystallization: A solid-liquid separation technique through the formation of crystals from a homogeneous mixture.

Separation of Compounds (pure substance):

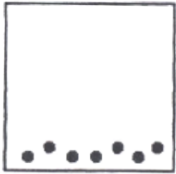
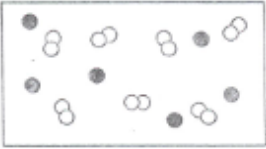
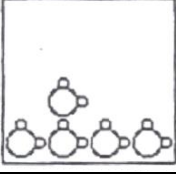
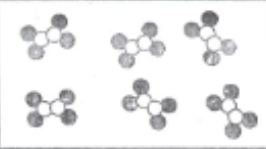
Molecules can be divided into atoms of the elements that make them up, but

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Ex: heating to break bonds, electrolysis- using electricity to break bonds

**HOMEWORK: States of Matter & Separation Techniques**

I. Complete the chart using all the information you learned during this activity. Your answer for column 3 will determine if you answer column 4 or 5 & 6. In other words you will NOT fill in every column for every substance.

| 1   | 2                  | 3                         | 4  | 5  | 6  |
|---|--------------------|---------------------------|--|--|--|
| Substance   | State(s) of Matter | Pure Substance or Mixture | If it was a pure substance – Element or Compound | If it was a mixture – Homogeneous or Heterogeneous | If it was a mixture – Is it composed of only elements, only compounds, or elements and compounds |
|    |                    |                           |  |  |  |
|    |                    |                           |  |  |  |
|   |                    |                           |  |  |  |
|  |                    |                           |  |  |  |

II. Using the following word banks below, match each word that BEST describes each statement.

Solid   Liquid   Gas   Evaporation   Distillation   filtering   Centrifuging   Decanting   Heating/ Electrolysis

\_\_\_\_\_ 1. This technique is the only way to separate compounds into elements.

\_\_\_\_\_ 2. This separation method can be used to separate mixtures of alcohol and water. Based on boiling points of each component.

\_\_\_\_\_ 3. Particles in this state of matter are very organized and tightly packed together.

\_\_\_\_\_ 4. What is the best/ easiest method to extract salt crystals from salt water?

\_\_\_\_\_ 5. When water and oil are mixed, 2 distinct layers of water and oil will form. How can we separate oil from the water?

\_\_\_\_\_ 6. Molecules are moving VERY fast at this phase.

\_\_\_\_\_ 7. The fastest way to separate muddy water into dirt and water instead of letting it sit out is \_\_\_\_.

\_\_\_\_\_ 8. In order to separate sandy water, the easiest method would be \_\_\_\_.

\_\_\_\_\_ 9. This state of matter has a definite volume, but not definite shape.