AP Chemistry
Ms. Ye

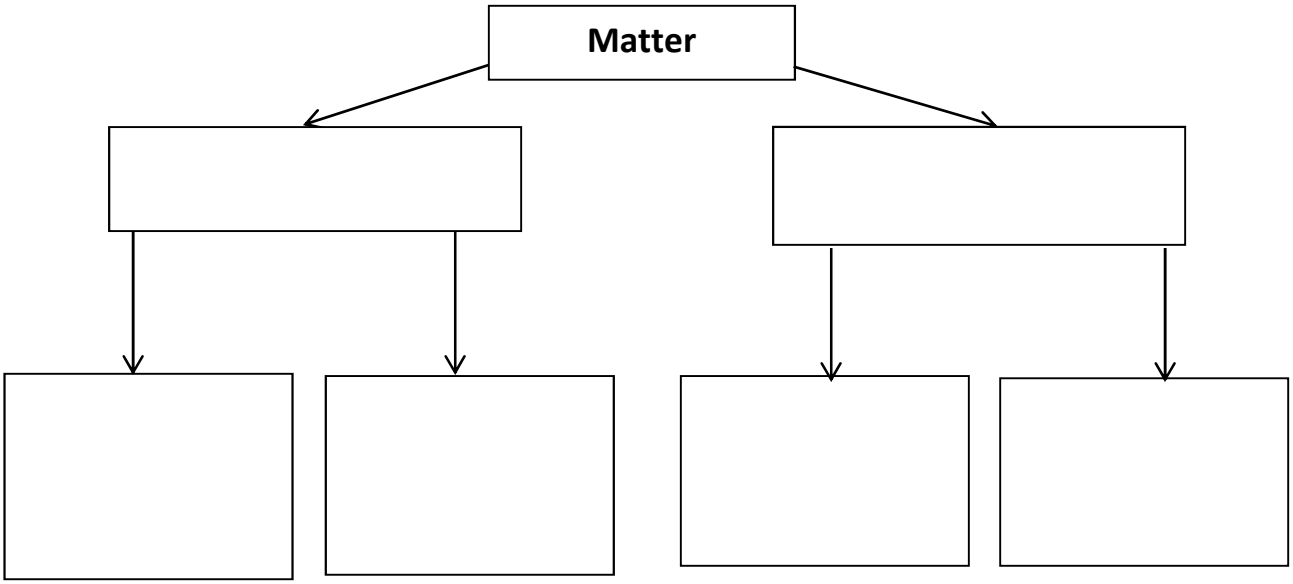
Name _____
Date _____ Block _____

Properties of Matter Review

Chemistry is the study of the properties and interactions of matter

- **Matter**=_____
- **Atom**=_____

Atoms can combine or join together to form other substances:



<u>Pure Substances</u>=a substance that _____ be _____

_____. They can be separated by a chemical process ONLY

There are 2 types of pure substances: elements and compounds.

- **Element**=a substance that is made up of _____

Elements _____ be broken down into _____

All the elements that we know of are organized in the _____

  - **Diatomic Elements=** _____

(H_2, N_2, O_2, F_2, Cl_2, Br_2, I_2…"7-UP")

- **Compound**= a substance that is made up of _____. Therefore, a compound is made up of _____ in a specific ratio.

  Compounds can be _____ into the elements that make it up.

- **Mixtures**=a combination of _____ that can be _____

Mixtures can be made up of elements, compounds, or both.

Mixture




Can be physically separated into its individual parts without changing what they are

Mixtures can be classified as either homogeneous or heterogeneous

- **homogeneous mixture**=a mixture in which the particles are _____

  the individual substances making up the mixture _____

  (Ex: sugar dissolved in water; atmospheric air);

  ***most common type is a _____!**

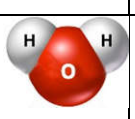
- **heterogeneous mixture**=a mixture in which the particles are _____

  the individual substances making up the mixture _____

  (Ex: chocolate chip cookie, sand in water)

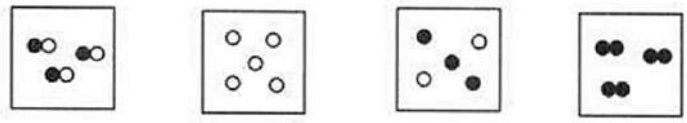
Practice: Pure Substance or Mixture?

-If it is a pure substance, indicate whether it is an element or compound
-If it is a mixture, indicate whether it is a homogeneous or heterogeneous mixture

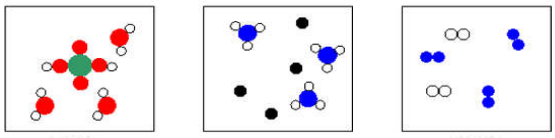
M&M's 	
sucrose ($C_{12}H_{22}O_{11}$)	
Lemonade 	
Iron nails 	
Air (nitrogen + oxygen + other gases)	
Limestone ($CaCO_3$) 	
Magnesium	
Pure Water 	
Tap Water	

Particle Diagrams Practice Questions

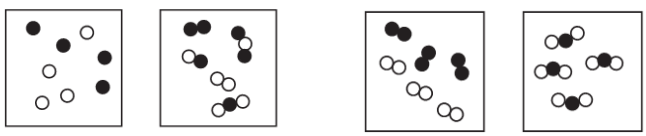
1. Label each particle diagram as an element, compound, or mixture.



2. Which of the following particle diagrams represents a mixture of one compound and one element?



3. Which particle model represents only one compound composed of elements X and z?



Properties of Matter

*__Physical Property__= _____

Ex: _____

*__Chemical Property__= _____

Ex: _____

*__Intensive Property__= _____

Ex: _____

*__Extensive Property__= _____

Ex: _____

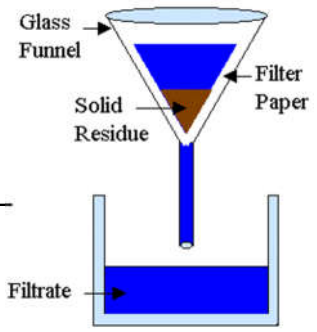
Practice*:* Identify the following properties as either chemical or physical. In addition, identify it as intensive or extensive.

Trait/characteristic	**Chemical (C) or Physical (P)**	**Intensive (I) or Extensive (E)**
Boiling point		
Density		
Color		
Flammability		
Solubility in water		
Texture		
reacts with water to form a gas		
Malleability		
Melting point		
Combustibility		
Volume		
reacts with acid		
Blue appearance		

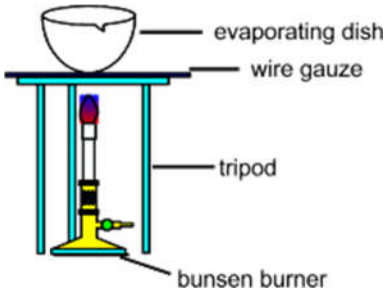
Separation Techniques

Recall, a **mixture** is a combination of _____ that you can _____ into their individual parts _____ what they are. Mixtures can be separated based on their _____ **properties**

1. **Filtration**
   - separation based on different_____ or _____
     allows you to separate a _____
     by catching the _____ on the _____

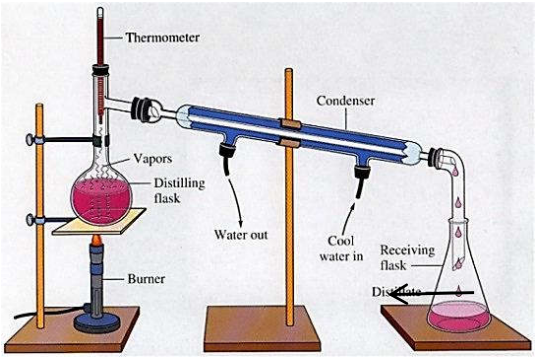


2. **Evaporation**
   - takes advantage of differences in _____
   - can be used to separate _____ mixtures
   - Downside: liquid components of mixture are lost to air through evaporation



3. **Distillation**
   - takes advantage of differences in _____
   - can be used to separate _____ mixtures
- Superior method to evaporation because all components can be isolated and retained.

Mixture of 2 liquids is placed in a flask over a heat source. The liquid with the _____ boiling point stays in this flask →



The liquid with the _____ boiling point collects in this flask

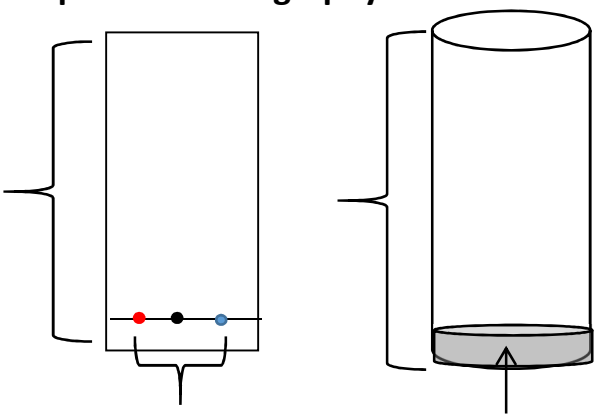
4. **<u>Chromatography</u>**=a technique that allows you to separate a

_____ based on _____ and/or _____

***polarity=**_____

Types of Chromatography:

i. Paper Chromatography

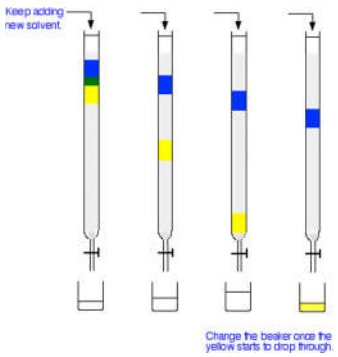


- How the components separate depend on how attracted the individual components are to the _____ versus the _____
- If the components are more attracted to the solvent, _____

  _____
  - "Like dissolves like"

ii. Column Chromatography

- Separates the components of a mixture based on the differences in _____
  - The _____ molecules exit the column first
  - The _____ molecules exit the column last
- Separation can also be based on <u>polarity (attraction)</u> to the material in the column



5. Others include **sifting, magnetism, etc.**

Separation Techniques Practice

Mixture	**Type of Mixture**	**Differing Physical Properties**	**Possible Separation Techniques**
Ex: Sugar dissolved in water	Homogeneous	*boiling point	*evaporation *distillation
Coffee grounds and water			
Crude Oil (mixture of different hydrocarbons)	Homogeneous	*boiling point	
Water + Barium Sulfate (Barium Sulfate is insoluble in water)			
Mixture of pigments found in a plant leaf: (chlorophyll a/b, xanthophylls, carotene)	Homogeneous	*size *polarity	

Paper Chromatography Basics Pre-Lab/Review

Introduction: Chromatography is a means of separating mixtures of substances that are in the same phase. All types of chromatography involve a stationary phase and a mobile phase. If each component has a different attraction for the mobile and stationary phase, they can be separated. In paper chromatography, the stationary phase is paper and the mobile phase is the solvent. Capillary action draws the mobile phase up the paper. If the component has a strong attraction for the mobile phase, it tends to move with it. If the component has a strong affinity for the paper, it stays behind. An important value calculated in chromatography experiments is R_f. It is a ratio of how far the substance in the mixture traveled versus how far the solvent traveled. It is easily calculated as:

$$R_f = D_{dye}/D_{sol}$$

Questions:

1. Figure 1 is a sample paper chromatogram for three samples A, B, and C. Label the drawing with the following items: stationary phase, mobile phase, and solvent front.

2. Calculate the R_f value for the spot in sample B using sample A as an example.

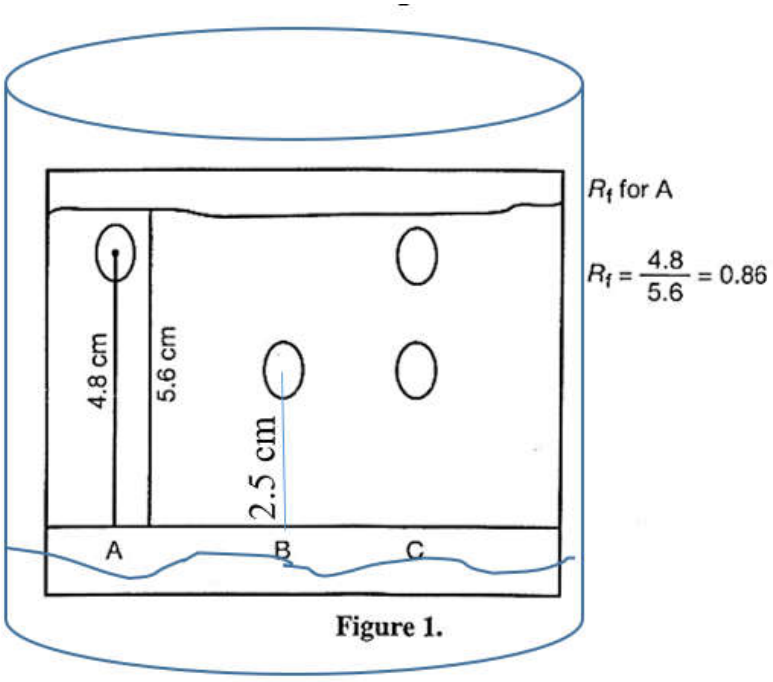


Figure 1.

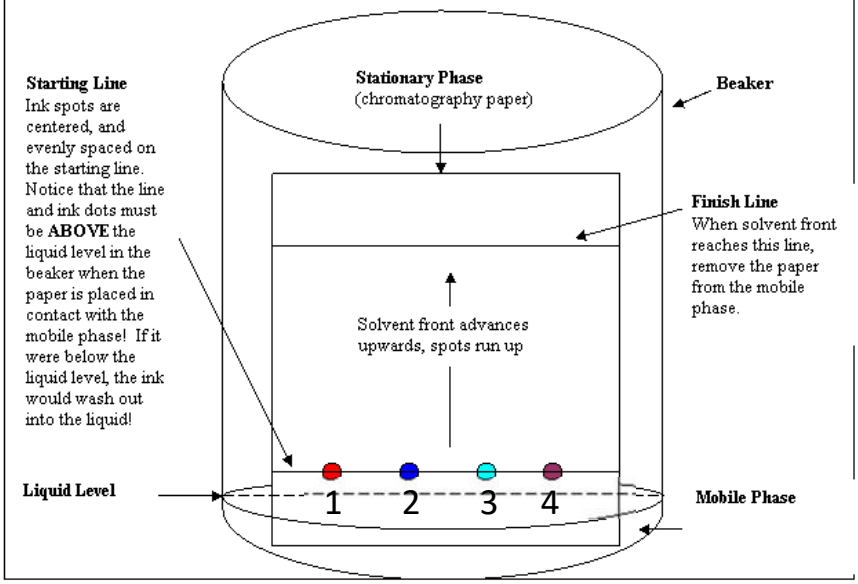
3. Sample C gave two spots on the paper chromatogram. What does this tell you about the composition of the sample?

4. Based on the R_f values of samples A and B, what can you conclude about the intermolecular attractions both samples have for the solvent and the paper?

Procedure for Paper Chromatography

1. Draw a light pencil line (***NOT PEN***) across the strip 2 cm from the bottom. Mark in pencil which marker will be used on the strip in order (see figure 1).

Figure 1: Beaker with stationary and mobile phases.



**Why is it important to mark your starting line in pencil?

2. Place a dot of each marker on the pencil line about 1-2 cm apart from each other (**see figure 1)**. Try to make sure each dot starts at the same place on the pencil line and that they are about the same size.

3. Obtain 2 beakers. Put a small amount of polar solvent into the bottom of one beaker and nonpolar solvent into another beaker. The depth should only be about 1 cm. It must be less than 2 cm.

4. Carefully put the piece of paper upright in the beaker. **Make sure the dye spot remains *above the solvent level*** *(see **figure 1**)*. To keep the paper from falling in the solvent, place a golf pencil across the top of the beaker and secure the paper by taping it to the pencil.

***Why is it important your ink dots remain ABOVE the solvent level when you place it in the beaker?

5. Allow the paper to develop until the solvent front nears the top of the paper. (about 20 minutes)

6. When the solvent front has nearly reached the top, remove the paper from the beaker and immediately mark the solvent front with a pencil before the solvent dries.

7. Place the chromatography paper on a paper towel and allow it to dry.

8. Using a ruler, measure the distance that the solvent traveled from the line at the bottom of the strip to the highest point reached by the solvent front, also marked in pencil near the top of the strip. This distance will be labeled as D_{sol}.