Name _____ Honors Chem:

Distinguish between the gas, liquid and solid phase by listing the unique properties of each that are not shared by the others.

Gas: Gases are fluids with no definite shape, and no definite volume. Gases can expand to fill a container and are easily compressible. Gases have verylow densities.
Liquid:**Liquids are fluids which have a definite volume. Like gases, liquidshave no definite shape. However, liquids will take on the shape of thecontainer and fill the the lowest portion of a container equal to the volume ofthe liquid sample. Liquids are only slightly compressible.**
Solid: **Solids have a definite shape and a definite volume. Solids are not compressible. Solids are not fluids and generally will not flow with thecharacteristics of a liquid or dense gas.**

2.Distinguish between pure substances, homogeneous mixtures and heterogeneous mixtures by listing the unique properties of each that are not shared by the others.

A pure substance consists of homogeneous matter which has invariablecomposition. A mixture is a combination of two or more substances (pure) inwhich each substance retains its identity. Mixtures can be homogeneous orheterogeneous. A homogeneous mixture has the same compositionthroughout the mixture and appears uniform. A heterogeneous mixture isnonuniform because the composition changes throughout the mixture.

3.Define the terms *atom*, *element* and *compound* (You may use drawings to support and clarify your definitions.)

atom - the smallest unit of an element which retains the properties of an element

element - a substance made of only one kind of atom, it can not be broken down into simpler substances by chemical or physical means

compound - a substance formed from a combination of atoms of differentelements. A compound has constant composition and can be broken downonly by chemical means.

4.State the principle postulates of Dalton's atomic theory.

1 **Each element is made up of tiny, indivisible particles called atoms.**
2 **The atoms of a given element possess identical properties.**
3 **Atoms of different elements have different properties.**
4 **When atoms combine they do so in fixed ratios of whole numbers formingparticles called molecules.**

5.Chemical reactions involve reorganization of the atoms - changes in the way they are bound together. The atoms themselves are not changed in a chemical reaction.

5.For each of the separation techniques listed below, give an example of how the technique is used to separate the components of a mixture.

a) Decantation
Decanting is often used to separate the components of a mixture containing a liquidand a solid. Decanting is the process of pouring a liquid off of a solid in theheterogeneous mixture.

b) Filtration
Filtering can also be used to separate the components of a mixture containing aliquid and a solid. Filtering uses a piece of filter paper to trap the solidcomponent, allowing the liquid component to pass. The mixture is pouredthrough a piece of porous paper. The solid is trapped in the paper while the liquidpasses through.

c) Evaporation
Evaporating can be used to separate the components of a homogeneousmixture containing a solid dissolved in a liquid. Evaporation involvesheating the mixture to near the boiling point of the liquid component. After the liquid evaporates, the solid remains.

d) Distillation
Distillation can be used to separate solutions such as a mixture of liquids. This method is based on the difference in boiling points of the substances in thesolution. Distillation involves heating the solution to boiling. The vapor travelsthrough a fractionating column which separates the components of the solutioncompletely or to some degree. The separated components are condensed andcollected in the receiving vessel(s). Careful experimental technique is required forcomplete separation.

e) Paper chromatography

Paper chromatography can be used to separate homogeneousmixtures, and is most often used for mixtures containing colored components. This separation technique relies on the degree the components of the mixture areadsorbed on the surface of chromatography paper. The mixture is carried up thepaper by a solvent. The components of the solution which dissolve in the solventhave different tendencies to adsorb on the paper. Those components which do notadsorb on the paper move with the solvent front, while those components whichadsorb on the paper trail behind. Paper chromatography is useful in determining asample's purity. It is not practical for large scale separation.

6/7. Units for which of the following physical quantities are base units in SI and which are SI-derived units? For each provide the name and symbol (abbreviation) of the SI unit used to express physical quantity.

Physical Quantity	Fundamental or derived unit	Name of Unit	Symbol
volume	**Derived**	**----------**	**m^3**
mass	**Fundamental**	**Kilogram**	**kg**
density	**Derived**	**----------**	**$\frac{g}{cm^3}$**
amount of substance	**Fundamental**	**Mole**	**mol**
temperature	**Fundamental**	**Kelvin**	**K**
heat	**Derived**	**Joules**	**J**
length	**Fundamental**	**Meter**	**m**
time	**Fundamental**	**Second**	**s**

8. Give the name of the prefix and its abbreviation for each of these multipliers.

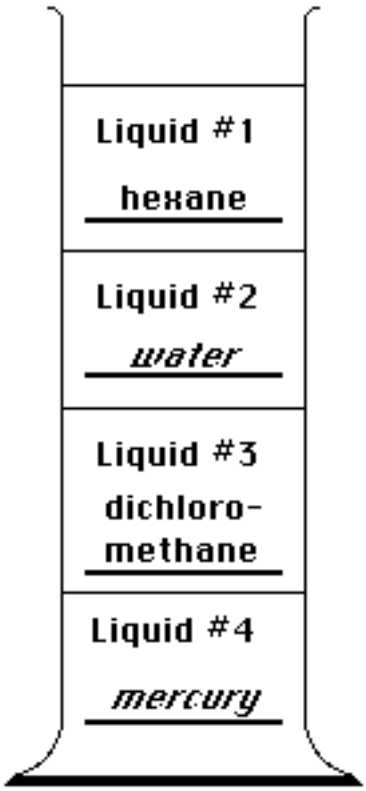
Factor	Prefix	Abbreviation
10^9	**giga**	**G**
10^6	**mega**	**M**
10^3	**kilo**	**k**
10^{-1}	**deci**	**d**
10^{-2}	**centi**	**c**
10^{-3}	**milli**	**m**
10^{-6}	**micro**	**μ**
10^{-9}	**nano**	**n**

9. Distinguish the meaning of the terms mass and weight.

Weight is the measure of the gravitational force exerted on an object. The weight of an object will vary depending on the location of the measurement.
Mass is the measure of amount of material in an object and does not change with position.

10. Figure I shows a glass cylinder containing four liquids each of different density. Two of the liquids have been identified. A table containing a list of substances and their density (at 25 ˚C) has been provided. From the list select a substance for Liquid #1 and Liquid #3. Briefly explain the reason(s) for your selections and for the remaining substances the reason they were not selected. **See Appendix III for recommended demonstration, video, or computer resources.**

Substance	Density ($\frac{g}{mL}$)	Liquid #
Mercury	13.5	Liquid #4
Water	1.0	Liquid #2
Hexane	0.660	**Liquid #1**
Ethyl alcohol	0.789	
Dichloromethane	1.33	**Liquid #3**
Aluminum	2.699	
Bromine	2.928	
Gold	19.3	


Liquid #1
hexane
Liquid #2
water
Liquid #3
dichloro-
methane
Liquid #4
mercury

11. The density of concentrated sulfuric acid is 1.84 g/mL. Concentrated sulfuric acid is 95 % pure sulfuric acid. What volume of concentrated sulfuric acid contains 100 g of pure sulfuric acid?

$$\textbf{100 g pure sulfuric acid} \cdot \left(\frac{\textbf{100 g conc sulfuric acid}}{\textbf{95 g pure sulfuric acid}}\right) \cdot \left(\frac{\textbf{1 mL conc sulfuric acid}}{\textbf{1.84 g conc sulfuric acid}}\right) = \textbf{57 mL}$$

12. During a flood an average of 1.00×10^3 ft^3 of water flowed out of a dam's flood gate each minute. What volume in ft^3 and liters flowed out of the gate in one hour?

$$\textbf{1.00 x } 10^3 \frac{\textbf{ft}^3}{\textbf{min}}\left(\frac{\textbf{60 min}}{\textbf{1 hr}}\right) = \textbf{6.00 x } 10^4 \frac{\textbf{ft}^3}{\textbf{hr}}$$

$$\textbf{6.00 x } 10^4 \frac{\textbf{ft}^3}{\textbf{hr}}\left(\frac{\textbf{12 in}}{\textbf{1 ft}}\right)^3\left(\frac{\textbf{2.54 cm}}{\textbf{1 in}}\right)^3\left(\frac{\textbf{1 L}}{\textbf{1000 cm}^3}\right) = \textbf{1.70 x } 10^6 \frac{\textbf{L}}{\textbf{hr}}$$

b) If the flow was constant for one entire day, what mass of water in kilograms was released from the dam? What weight in pounds?

$$\textbf{6.00 x } 10^4 \frac{\textbf{ft}^3}{\textbf{hr}}\left(\frac{\textbf{24 hr}}{\textbf{1 day}}\right)\left(\frac{\textbf{12 in}}{\textbf{1 ft}}\right)^3\left(\frac{\textbf{2.54 cm}}{\textbf{1 in}}\right)^3\left(\frac{\textbf{1.00 g}}{\textbf{1 cm}^3}\right)\left(\frac{\textbf{1 kg}}{\textbf{1000 g}}\right)$$

$$= \textbf{4.08 x } 10^7 \frac{\textbf{kg}}{\textbf{day}}$$

$$\textbf{4.08 x } 10^7 \frac{\textbf{kg}}{\textbf{day}}\left(\frac{\textbf{2.20 lb}}{\textbf{1 kg}}\right) = \textbf{8.98 x } 10^7 \frac{\textbf{lb}}{\textbf{day}}$$