

# Matter

## I Matter

Chemistry is the study of matter and the changes it undergoes.

Matter: has mass and occupies space.

Law of Conservation of matter: "Matter can not be created nor destroyed. Matter is conserved in chemical reactions."

## II Properties and Changes

Physical property: (appearance) Characteristics that can be observed without the production of new substance.

Ex.'s: color, odor, hardness, taste, density, melting and boiling point, brittle, luster

Ductile: can be drawn into wires

Malleable: can be hammered into sheets

Physical change: change in physical property only. No change in the substance's chemical properties or composition.

Ex.'s: phase changes, melting, condensing, boiling, freezing, bending

Chemical property: (personality) Ability to form new substances.

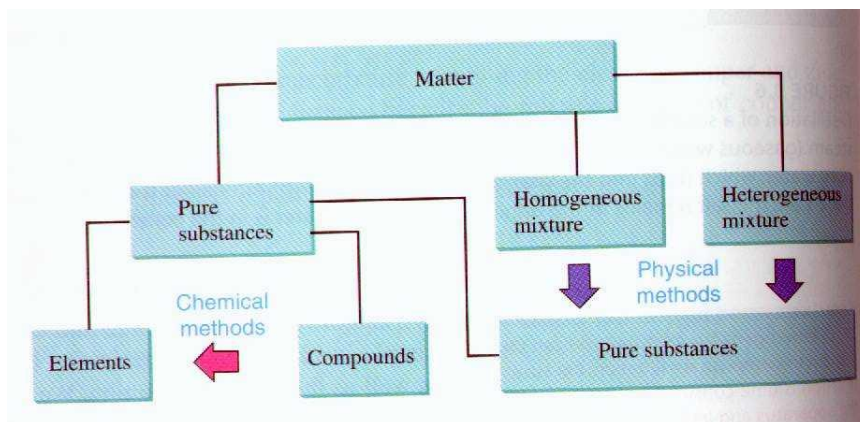
Ex.'s: baked, tarnish,

Inert: does not react. Ex. helium gas will not react with oxygen.

Chemical change: Change that results in a production of one or more substances with a different set of chemical properties.

Ex.'s: burning, oxidation, color change, combustion

## III Classification



Element: (Pure substance)

Can not be broken down into simpler substances by chemical means. Composed of one type of atom.

Clue: all of these are found on the periodic table! Ex. Au, Sn, Na, Ne, W

Free State= uncombined, alone ("single") Combined State= combined with other elements ("married")

Compound: (Pure substance)

Two or more elements that chemically *combine*, not mix, in a definite ratio.

Can write a chemical formula of a compound (unlike a mixture).

NaCl is composed only of only sodium and chlorine. The ratio (by percent) is always 39.3%Na and 60.7% chlorine. Regardless of where it is it only contains sodium and chlorine in these amounts.

Pure Substance: Ask yourself this: "What is in these substances?" Silver? Water? Toothpaste?

Mixture: (Variable composition) Two or more substances that *mix*, not combine, in any ratio. Mixtures can be separated by physical means. The components of a mixture retain their properties.

Types of mixtures:

Homogeneous: Single phase, uniform composition. (If you take a sample from a mixture it will always have the same percent composition). Ex.'s: Air (oxygen and nitrogen), alloys (2 metals), amalgam (alloy containing mercury), tincture (dissolved in alcohol), brass (Cu and Zn), saline (NaCl in water)

Heterogeneous: More than one phase, regions of different properties throughout.

Ex.'s: apple, mud, chunky peanut butter, cotton, pizza

## Chemistry In Class Practice: Matter

1. Identify as either a (P)hysical or (C)hemical property or change.

- |  |   |
|--|---|
| a.) _____ B.P. = 78°C                                  | n.) _____ sugar dissolves in water        |
| b.) _____ diamond is very hard                         | o.) _____ sugar does not dissolve in oil  |
| c.) _____ sugar ferments into alcohol                  | p.) _____ Hg expands in a thermometer     |
| d.) _____ metal wire conducts electricity              | q.) _____ Food is digested in the stomach |
| e.) _____ Ga melts in your hand                        | r.) _____ Sharpening a pencil             |
| f.) _____ Platinum is inert in oxygen                  | s.) _____ Ginger-ale goes flat            |
| g.) _____ The page is white                            | t.) _____ photosynthesis                  |
| h.) _____ Cu on Statue of Liberty is greenish          | u.) _____ water freezes                   |
| i.) _____ Fe rusts                                     | v.) _____ A wound heals                   |
| j.) _____ Wood burns in air                            | w.) _____ H <sub>2</sub> O evaporates     |
| k.) _____ Coal is pulverized in a mortar with a pestle | x.) _____ Coal is converted into nylon    |
| l.) _____ Pb is malleable                              | y.) _____ C is converted into diamond     |
| m.) _____ Milk turns sour                              | z.) _____ C is converted into Au          |

2. Classify as either (E)lement, (C)ompound, Ho(M)ogeneous mixture, or He(T)erogeneous mixture.

- |   |   |
|---|---|
| a.) _____ Antimony                              | k.) _____ milk                          |
| b.) _____ 5% vinegar                            | l.) _____ salt                          |
| c.) _____ limestone gravel                      | m.) _____ saline                        |
| d.) _____ carbon dioxide                        | n.) _____ Air                           |
| e.) _____ Red blood cell                        | o.) _____ Earth                         |
| f.) _____ Mercury                               | p.) _____ C <sub>6</sub> H <sub>6</sub> |
| g.) _____ Na <sub>2</sub> CO <sub>3</sub>       | q.) _____ rust (oxidized Fe)            |
| h.) _____ Soil                                  | r.) _____ Amalgam alloy                 |
| i.) _____ Dilute Hydrochloric acid              | s.) _____ Chemistry textbook            |
| j.) _____ 5 drops food coloring in 1 pint water |   |

3. The compound cinnabar contains only Hg and S. In an analysis of cinnabar 0.69g of S and 4.31g of Hg are found. Answer the questions below pertaining to cinnabar. **Show work with Sig Figs and Units!!!**

a.) How many grams of cinnabar are present?

b.) What is the percentage of Hg and S in cinnabar?

c.) How many grams of Hg could be obtained from a 15.00g sample of cinnabar?

d.) What is the percentage of S in 15.00 gram sample of cinnabar?

e.) Sample A is 10g of cinnabar. Sample B is 100g of cinnabar. Circle all statements which are true:

- Sample B has 10x more Hg than sample A.
- Sample A and B have the same percentage of Hg.
- Sample B has 10x greater percentage of Hg than sample A.