Describing Matter

* All substances possess either \_\_\_\_\_ or \_\_\_\_\_ properties.
* An e\_\_\_\_\_ property depends on the \_\_\_\_\_ of matter in a sample.
* e.g. The \_\_\_\_\_ of an object, a measure of the amount of matter the object contains, is an extensive property.
* The \_\_\_\_\_ of an object, a measure of the \_\_\_\_\_ occupied by the object, is an extensive property.
* The volume of a basketball is greater than the volume of a golf ball.
* \_\_\_\_\_ is also an \_\_\_\_\_ property; (mass x gravity).
* \_\_\_\_\_ can be an extensive property when describing how much wire or rope one needs. E.g. 2 m of rope

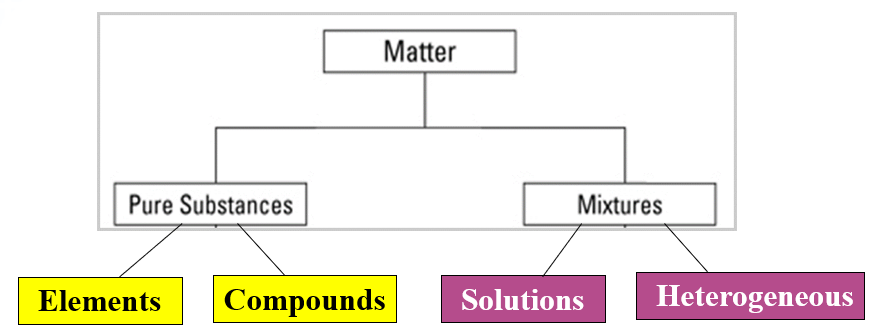
Describing Matter

* I\_\_\_\_\_ Properties - help \_\_\_\_\_ a substance; \_\_\_\_\_ based on the *amount* of matter.
* Complete the chart:

|  |  |  |  |
| --- | --- | --- | --- |
| Extensive (amount) | Intensive (identification) | General  (both or unknown) | Intensive and/or General |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Classifying Matter

All matter consists of \_\_\_\_\_ substances and \_\_\_\_\_.



E\_\_\_\_\_

* \_\_\_\_\_ substances that \_\_\_\_\_ be broken down by ordinary chemical means. Elements have a fixed composition because it contains only \_\_\_ type of atom.

C\_\_\_\_\_

* \_\_\_\_\_ substances made up of \_\_\_\_\_ or more elements and/or compounds that are \_\_\_\_\_ combined in a \_\_\_\_\_ proportion.

M\_\_\_\_\_

* Substances are classified by “Phases”. Pure substances have only 1 Phase, mixtures have more than \_\_\_ phase.
* Mixtures do \_\_\_ have uniform composition or properties.
* Each substance (atom/element/compound) in a mixture \_\_\_\_\_ its own \_\_\_\_\_. E.g. oil & vinegar
* The term phase is used to describe any part of a sample with uniform composition and properties; also called a “\_\_\_\_\_”.
* \_\_\_\_\_ mixture
  + Substances are so \_\_\_\_\_ distributed that it is difficult to distinguish one substance in the mixture from another. Only \_\_\_\_ boundary or phase.
  + Called “\_\_\_\_\_”
  + E.g.
  + Solutions can be any \_\_\_\_\_ of matter (s, l, or g)
  + Substances \_\_\_\_\_ and form homogeneous mixtures.
  + Particles are too \_\_\_\_\_ to settle out.
  + Do NOT \_\_\_\_\_ into layers over time.
  + Cannot be \_\_\_\_\_ out.
  + No \_\_\_\_\_ Effect (light passes through a transparent solution \_\_\_\_\_).
* \_\_\_\_\_ mixture
  + Appears to have more than \_\_\_\_\_ phase
  + Having parts with \_\_\_\_\_ characteristics 🡪 separated by definite \_\_\_\_\_
  + E.g.

Classifying Matter

* \_\_\_\_\_ Substances (\_\_\_\_\_ and \_\_\_\_\_)
* \_\_\_\_\_ (\_\_\_\_\_, \_\_\_\_\_)

Separating Mixtures

* Most of the things around us are \_\_\_\_\_.
* To understand, \_\_\_\_\_, and evaluate substances for the myriads of reasons (medicine, cleanliness, organization, functionality, etc.), we need to \_\_\_\_\_ mixtures into their \_\_\_\_\_ components.

Separating \_\_\_\_\_ Mixtures

* F\_\_\_\_\_ is a process that separates elements of a heterogeneous mixture based on particle \_\_\_\_\_.
  + \_\_\_\_\_ cannot be filtered out.
* M\_\_\_\_\_: separates mixtures based on the presence of magnetic physical properties.
  + A magnetic substance’s molecules take on a specific \_\_\_\_\_ (domains), creating magnetic fields with force.
* C\_\_\_\_\_ separates elements of a mixture based on different \_\_\_\_\_. E.g. hematocrit (Red blood cell separation) & protein analysis

Separating \_\_\_\_\_ Mixtures

* D\_\_\_\_\_, separates \_\_\_\_\_ in \_\_\_\_\_ (solutions) based on varying \_\_\_\_\_ points (intensive physical property).
* E\_\_\_\_\_ \_\_\_\_\_ dissolved \_\_\_\_\_ from the liquid they are dissolved in; also called \_\_\_\_\_.
* C\_\_\_\_\_ separates components of a mixture based on their differential migration due to \_\_\_\_\_. 60% of chemical analysis worldwide is currently done with chromatography.
* E\_\_\_\_\_
  + Separates components of a mixture based on the differential movement of \_\_\_\_\_ particles in a liquid or gel under the influence of an electric field. Used for Protein and DNA analysis and in forensics.

\_\_\_\_\_ Changes

* Separating \_\_\_\_\_ is based on Physical Change
* Any change that occurs without \_\_\_\_\_ the chemical composition of a substance
* \_\_\_\_\_ new substance is formed and the physical & chemical \_\_\_\_\_ of the constituents remains.
* Physical changes involve a change in outward \_\_\_\_\_ and arrangement, but \_\_\_\_\_ in chemical identity.
* Physical changes can be \_\_\_\_\_ (*putting a puzzle together*) or \_\_\_\_\_ (*breaking a glass*).
* Physical changes often involve a reversible change from one \_\_\_\_\_ to another:
  + \_\_\_\_\_ ↔ \_\_\_\_\_ ↔ \_\_\_\_\_

States of Matter

\_\_\_\_\_

a. \_\_\_\_\_ shape

b. \_\_\_\_\_ volume

c. \_\_\_\_\_ packed molecules

d. Greater \_\_\_\_\_ than liquids or gases

e. Usually \_\_\_\_\_ compressible of phases

f. Molecules move slowest of all the phases**Gas** Versus **Vapor**

\_\_\_\_\_

a. \_\_\_\_\_ definite shape

b. \_\_\_\_\_ volume

c. Less tightly packed molecules that take the \_\_\_\_\_ of the container

d. Lesser density than solids, but greater than gases (usually d ∞ 1/T)

e. Relatively \_\_\_\_\_ -compressible except for extreme temperatures and pressures

f. Molecules move slower than gases, faster than solids

\_\_\_\_\_

a. \_\_\_\_\_ definite shape

b. \_\_\_\_\_ definite volume

c. Take the \_\_\_\_\_ and \_\_\_\_\_ of the container

d. \_\_\_\_\_ \_\_\_\_\_ of all phase

e. Compressible

f. Molecules move \_\_\_\_\_ of all the phases

g. Must consider variables of \_\_\_\_\_ and \_\_\_\_\_

Gas Versus Vapor

* A gas is a substance, like oxygen (O2), that exists in the gaseous state at \_\_\_\_\_ temperature.
* \_\_\_\_\_ describes the gaseous state of a substance that is generally a \_\_\_\_\_ or \_\_\_\_\_ at room temperature, as in water vapor.
* \_\_\_\_\_ is a high temperature physical state of matter in which atoms lose most of their electrons. Plasma is found in fluorescent bulbs.

Give examples of physical changes:

\_\_\_\_\_ changes

* \_\_\_\_\_ the chemical composition of a substance
* produce \_\_\_\_\_ substances with physical & chemical properties \_\_\_\_\_ from the constituents. e.g. Sodium (Na) explodes in air, Chlorine gas (Cl2) is lethal; But table salt (NaCl) tastes great!

Give examples of chemical changes:

How can we distinguish chemical change from physical?

Similarities of both physical & chemical changes:

* \_\_\_\_\_ transfer (e.g. absorbed or released)
* Often a \_\_\_\_\_ of matter change
* \_\_\_\_\_ formation\* (bubbles form when you boil water or open a carbonated drink [physical], but bubbles\* also form when an acid reacts with metal [chemical].
* \_\_\_\_\_ \* (a solid forms in a liquid) rain [physical]; solutions chemically react to form to a precipitate\* [chemical]
* \_\_\_\_\_ change or odor

CHEMICAL CHANGES:

* \_\_\_\_\_ chemical substances form
* a chemical “\_\_\_\_\_” occurred
* Combustion

\_\_\_\_\_ of Mass

* Chemical changes are based on chemical reactions that involve “\_\_\_\_\_” ↔ “\_\_\_\_\_”.
* During any chemical reaction [based on a chemical change], the \_\_\_\_\_ of the products is always \_\_\_\_\_ to the \_\_\_\_\_ of the reactants.
* Matter \_\_\_\_\_ be created or destroyed;
* it can only change form (\_\_\_\_\_).
* Mass also remains constant for Physical Changes.
* E.g. \_\_\_\_\_ g or ice melt to form \_\_\_\_\_ g of liquid water
* The Law of \_\_\_\_\_ \_\_\_\_\_ states that in any \_\_\_\_\_ or \_\_\_\_\_ change (reaction), mass is conserved.

\_\_\_\_\_ Proportions

* The mass of any element is given on the Periodic table and never changes in chemistry.
* The mass of a compound, however, is based on a \_\_\_\_\_ \_\_\_\_\_ of the \_\_\_\_\_ that are \_\_\_\_\_ combined in the chemical reaction that formed that compound.
* For any compound, the \_\_\_\_\_ of elements \_\_\_\_\_ in that compound \_\_\_\_\_ changes.
  + E.g. CO2  contains the elements \_\_\_\_\_, C, and \_\_\_\_\_, O, in a fixed proportion of 1:2. [The subscript for Carbon is 1]
* Use the periodic table to find the masses of the elements:

*C🡪* ? O 🡪 ? Total Mass =

* CO2 is always in the ratio of: by\_\_\_\_\_**.**

Suppose you have a 30.1 g sample of a compound of carbon and hydrogen that decomposes to yield 24.0 g C and 6.1 g H.

You have another compound of carbon and hydrogen with a mass of 67.7 g that decomposes to yield 54.0 g C and 13.7 g H. Is this the same substance as the first sample?

* Ratio of C to H in 30.1 g sample: \_\_\_\_\_ g / \_\_\_\_\_ g = \_\_\_\_\_
* Ratio of C to H in 67.7 g sample: \_\_\_\_\_ g / \_\_\_\_\_ g = \_\_\_\_\_
* The ratios for both samples are almost \_\_\_\_\_, so one could say they both are the \_\_\_\_\_ \_\_\_\_\_.

What if a third compound of carbon and hydrogen has a mass of 80.0 g and decomposes to yield 60.0 g C and 20.0 g H. Is this the same substance as the first sample?

* Ratio of C to H in 80.0 g sample: \_\_\_\_\_ g / \_\_\_\_\_ = \_\_\_\_\_
* Based on the ratio, this compound is a \_\_\_\_\_ substance from the first two.