Matter

Pure substances
Anything with a formula

Elements
See Periodic Table

- Metals: Fe, Cu, Ca, Na, U, etc.
- Non-metals: C, N, O, He, etc.

Hydrogen is neither. (At times both.)

Metalloids or semi-metals: B, Si, As, Te, At, Ge, Sb, Po

Elements can only be separated by nuclear means, i.e., <u>fission</u>. And it's usually only very large nuclei.

Compounds
2 or more elements in fixed ratios

- Ionic: begins with a metal (often metal + nonmetal)
  - NaCl, Fe_2O_3, UF_6, etc.
  - (Acids--begin with H: HCl, H_2SO_4)
- Molecular: 2 or more nonmetals
  - $C_6H_{12}O_6$, CO_2, N_2O, etc.

Compounds can only be separated by chemical means: When atoms in a compound are rearranged to make a <u>new</u> compound(s). Reactions alter the identity of reactants: Ex. $H_2O(\ell) \rightarrow H_2(g) + O_2(g)$, called <u>electrolysis</u>, or $H_2(g) + O_2(g) \rightarrow H_2O(\ell)$, a <u>combustion</u> reaction. All combustion reactions require oxygen (O_2). Any burning, combusting, oxidation (like rusting), corrosion, etc. are chemical changes.

Mixtures
Separable by physical means

Heterogeneous
Can see component parts

sand, concrete, blood, milk, etc.

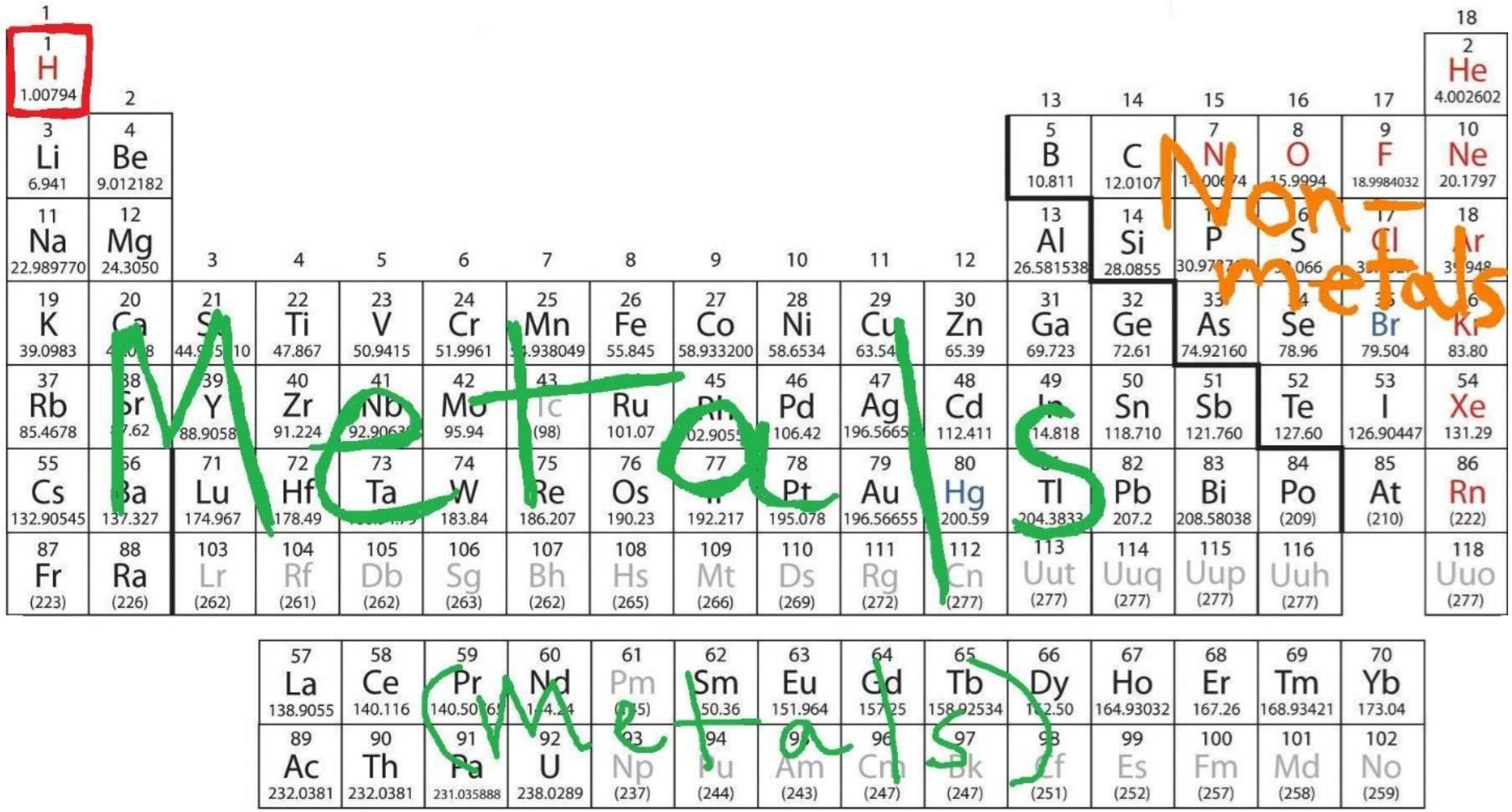
Homogeneous
AKA solutions

salt water, KoolAid, alloys like brass, steel, bronze

Melting, vaporizing, freezing, filtering, crushing, ripping, magnetism, etc. are all physical changes or properties.

Ex. $H_2O(\ell) \rightarrow H_2O(g)$.

Physical changes do <u>not</u> alter the identity of the original substance. ALL phase changes are physical changes.


Metals
Non metals
(metals)