Physical Science Chapter 5 Notes

5.1 Notes

* Atoms are the smallest form of elements
  + All matter is made of atoms
  + Greek philosophers proposed everything on Earth was made of 4 basic substances – air, water, fire, and earth
  + Now we know there are about 100 basic substances or elements
* Each element is made of a different atom
  + Atoms are composed of three types of particles
    - **Proton** – positively charged in nucleus
    - **Neutron** – neutral charge in nucleus
    - **Electron** – negatively charged, orbits nucleus
  + **Atomic** **number**: the identify of an atom is determined by the number of protons in its nucleus
  + **Atomic mass number**: total number of protons and neutrons in an atom’s nucleus
  + **Isotopes**: atoms of the same element that have a different number of neutrons.
* Atoms form ions
  + **Ion**: formed when an atom loses or gains one or more electrons
  + **Positive ions**: lose an electron (-) so the overall charge of the atom is positive
  + **Negative ions:** gain an electron (-) so the overall charge of the atom is negative

5.2 Notes

* Elements make up the periodic table
  + Elements can be organized by similarities
    - **Atomic mass**: average mass of all the element’s isotopes
    - **Periodic table**: shows a periodic, or repeating pattern of properties of the elements
  + The periodic table organizes the atoms of the elements by properties and atomic number
* Reading the Periodic Table
  + Number at the top of the square is the atomic number, which is the number of protons in the nucleus of an atom of that element
  + The chemical symbol is an abbreviation for the element’s name. It contains one or two letters. Some elements have not yet been named are designated by temporary three-letter symbols
  + The name of the element is written below the symbol
  + The number below the name indicates the average atomic mass of all the isotopes of the element
  + **Group**: elements in a column are labeled by a number at the top of the column
  + **Period**: horizontal row
* Trends in the Periodic Table
  + Sizes of atoms
  + Densities of atoms

5.3 Notes

* The periodic table is a map of the elements
  + The periodic table has distinct regions
    - **Reactive**: indicates how likely an element is to undergo a chemical change
  + Most elements are metals
    - **Metals**: elements that conduct electricity and heat well and have a shiny appearance. Can be easily shaped, solid at room temperature besides Mercury
    - **Reactive Metals**: group 1 and group 2
    - **Transition Metals**: groups 3-12
    - **Rare Earth Elements**: top row of the two rows of metals that are usually shown outside the main body of the periodic table
  + Nonmetals and metalloids have a wide range of properties
    - **Nonmetals**: elements to the right side of the periodic table
    - **Halogens**: Group 17, form salts
    - **Noble Gases**: Group 18 elements, almost never react with other elements
    - **Metalloids**: elements that have properties of both metals and nonmetals
  + Some atoms can change their identity
    - Identity of an element is determined by the number of protons in its nucleus
    - **Radioactivity**: the process by which atoms produce energy and particles
      * An isotope is radioactive if the nucleus has too many or too few neutrons
    - **Radioactive decay**: radioactive atoms produce energy and particles from their nuclei, occurs at a steady rate that is characteristic of the particular isotope
      * **Half-life**: the amount of time that it takes for one-half of the atoms in a particular sample to decay