**Chapter 4 – Atomic Structure (Sec 4.2 pages 108-112)**

**Chapter 5 – The Periodic Table (Sec 5.2 pages 130-138 and Sec 5.3 pages 139-145)**

Prentice Hall – Physical Science: Concepts in Action, Copyright 2004

***Section 4.2 The Structure of the Atom – pages 108-112***

*Key Concepts:*

* *What are three subatomic particles?*
* *What properties can be used to compare protons, electrons, and neutrons?*
* *How are atoms of one element different from atoms of other elements?*
* *What is the difference between two isotopes of the same element?*

*Vocabulary:*

* Proton
* Electron
* Neutron
* Atomic number
* Mass number
* Isotopes
* Atoms
* Nucleus

*Evidence for atoms (page 101)*

* John Dalton was born in England in 1766.
  + He was a teacher who spent his spare time doing science experiment.
  + Dalton developed a theory to explain why elements in a compound always join in the same way.
    - He proposed the theory that all matter is made up of individual particles called atoms – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Properties of Subatomic Particles*

* The mass of an atom is concentrated in a dense, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ core located in the \_\_\_\_\_\_\_\_\_\_\_of an atom.
* Atoms are made up of three subatomic particles:
  + **Protons**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Each nucleus must contain at least one proton.
    - Each proton is assigned a charge of \_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Discovered by Ernest Rutherford
    - Mass = 1.674 x 10-24 grams
    - Symbol = p+
  + **Electrons:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Each electron has a charge of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Discovered by J.J. Thomson
    - Mass = 9.11 x 10-28 grams
    - Symbol = e-
  + **Neutrons:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Neutral = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Discovered by James Chadwick
    - Mass = 1.675 x 10-24 grams
    - Symbol = n0

*Comparing Subatomic Particles*

* Protons, electrons, and neutrons can be distinguished by mass, charge, and location in an atom.
  + Protons and neutrons have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - It would take nearly 2000 electrons to equal the mass of one proton
  + Electrons have a charge that is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to, but opposite of, the charge of a \_\_\_\_\_\_\_\_\_\_\_.
    - Neutrons have no charge
  + Protons and neutrons are located \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Electrons are found in the space (electron cloud) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Everything scientists know about the nucleus and subatomic particles is based on how the particles behave.
  + Scientists do not have an instrument that can show the inside of an atom.

*Atomic Number and Mass Number*

* Dalton predicted that the atoms of any element are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_from the atoms of all other elements.
* The subatomic particles allow scientists to describe those differences.
  + **Atomic Number** of an element equals \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - The atoms of any given element always have the same number of protons – thus, their atomic numbers are always the same
      * If you change the number of protons, you change the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, thus you are changing the element you are describing.
      * Atoms of different elements have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * You can use atomic numbers to refer to elements, like names and symbols, because each element has a unique atomic number
    - Each positive charge is balanced by a negative charge because atoms are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      * So the atomic number of an element also equals the number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + **Mass Number:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - To calculate the number of neutrons in an atom = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Isotopes*

* Every atom of a given element does have the same number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + But every atom of a given element does NOT have the same number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* **Isotopes** are atoms of the same element that have different numbers of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and different \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Isotopes of an element have the same \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ but different \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because they have different numbers of neutrons.
  + For example: Oxygen-16, Oxygen-17 and Oxygen-18
    - Every atom of oxygen has 8 protons
    - Some oxygen atoms have 8 neutrons with a mass number of 16 (8p + 8n = 16)
    - Some oxygen atoms have 9 neutrons with a mass number of 17 (8p + 9n = 17)
    - Some oxygen atoms have 10 neutrons with a mass number of 18 (8p + 10n = 18)
  + With most elements it is hard to notice any differences in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ properties of their isotopes.

***Section 5.2 The Modern Periodic Table - pages 130-138***

*Key Concepts:*

* *How is the modern periodic table organized?*
* *What does the atomic mass of an element depend on?*
* *What categories are used to classify elements on the periodic table?*
* *How do properties vary across a period in the periodic table?*

*Vocabulary:*

* Period
* Group
* Periodic law
* Atomic mass unit (amu)
* Metals
* Transition metals
* Nonmetals
* Metalloids

*The Periodic Law*

* In the modern periodic table, elements are arranged by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (number of protons)
* **Period:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Period 1 has 2 elements
  + Period 2 and 3 have 8 elements
  + Period 4 and 5 have 18 elements
  + Period 6 has 32 elements
  + Period 7 can have up to 32 elements
* **Group:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + The elements within a group have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Properties of elements repeat in a predictable way when atomic numbers are used to arrange elements into groups.
  + An element’s electron configuration determines its chemical properties – each element in a group has similar electron configurations.
  + This \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the **periodic law.**
  + Periodic Table (not up-to-date) page 132-133

*Atomic Mass*

* There are 4 pieces of information for each element typically represented on the periodic table
  + Name of the element
  + Element symbol
  + Atomic Number
  + **Atomic Mass**: a value that depends on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in nature and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **Atomic Mass Unit (amu)**:defined as one twelfth the mass of the carbon-12 atom.
  + The mass of an atom in grams is extremely small and difficult to measure
  + Scientists chose one isotope to serve as a standard, C-12.
* Isotopes of Chlorine
  + In nature, most elements exist as a mixture of two or more isotopes.
  + Chlorine has the symbol Cl, atomic number of 17, and an atomic mass of 35.453 – where does that atomic mass come from?
    - There are two natural isotopes of chlorine: Chlorine-35 and Chlorine-37
    - Chlorine-35 has 17 protons and 18 neutrons
    - Chlorine-37 has 17 protons and 20 neutrons – greater mass
* Weighted Averages
  + The value of the atomic mass of chlorine (35.453 amu) is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + The isotope that occurs in nature about 75% of the time (Chlorine-35) contributes three times as much as the average as the isotope that occurs in nature about 25% of the time (chlorine-37)
  + Example: How to calculate weighted averages

*Classes of Elements*

* The periodic table of elements presents three different ways to classify elements.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ based on their states at room temperature
    - Typically represented by different colors on the periodic table
  + Naturally occurring vs synthetic
    - All but two elements with atomic numbers 1-92 occur on Earth
    - Elements with atomic numbers of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ do not occur naturally – symbols are typically represented by outline letters
  + Metals, nonmetals, or metalloids
    - Metals are located on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Nonmetals are located on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Metalloids are in between
* **Metals**
  + Metals make up a majority of the elements on the periodic table
  + Metals are elements that are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Except for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, metals are solids at room temperature
    - Most are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (can be hammered into a thin sheet)
    - Many are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (can be drawn into thin wires)
  + Some metals are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and some do not react easily.
    - Gold vs Magnesium reactivity when exposed to oxygen in the air
      * Gold remains shiny – no reaction
      * Magnesium quickly dulls – reaction
  + The metals in groups 3-12 are called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:** elements that form a bridge between the elements in the left and right sides of the table.
    - One property is their ability to form compounds with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * Iron or Chromium is added for green colored glass
      * Copper or gold for red colored glass
      * Cobalt is added for blue glass
    - Some transition elements have more properties in common than elements in other groups.
      * Elements in the lanthanide and actinide series
        + These elements are so similar that chemists in the 1800s had difficulty separating them when they were found mixed together in nature.
* **Nonmetals**
  + Nonmetals have properties opposite to those of metals
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of heat and electric current
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – many nonmetals are gases at room temperature
    - All the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on the periodic table are nonmetals
      * Nonmetals that are solids tend to be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (can shatter or crumble easily)
  + Nonmetals vary as much in their chemical properties as they do in their physical properties.
    - Some nonmetals are extremely reactive, some hardly react at all, and some fall somewhere in between.
* **Metalloids**
  + Metalloids are elements with properties that fall between those of metals and nonmetals.
    - A metalloid’s ability to conduct electric current varies \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * Pure silicon (Si) and germanium (Ge) are good insulators at low temperatures and good conductors at high temperatures.

*Variation Across a Period*

* The properties within a period change in a similar way from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, except for Period 1.
* Across a period from left to right, the elements become \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in their properties.
  + Most \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are on the left side of the table (group 1)
  + Most \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are on the right side (group 17)
  + Group 3 provides an excellent example of this trend
    - There are three metals, a metalloid, and four nonmetals.
      * Na: reacts quickly and violently with water
      * Mg: does not react with water unless the water is hot
      * Al: does not react with water, but it does react with oxygen
      * Si: least reactive element (except for argon)
      * P and S: do not react with water, but they do react with oxygen
      * Cl: highly reactive nonmetal
      * Ar: hardly reacts at all

***Section 5.3 Representative Groups – pages 139-145***

*Key Concepts:*

* *Why do the elements in a group have similar properties?*
* *What are some properties of the A groups in the periodic table?*

*Vocabulary:*

* Valence electron
* Alkali metal
* Alkaline earth metals
* Halogens
* Noble gases

*Valence Electrons*

* **Valence Electron:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + These electrons play a key role in chemical reaction and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ vary across a period because the number of valence electrons \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from left to right.
  + Periodic Table group numbering system – notice the A groups are numbered 1-8.
    - This group number corresponds to the number of valence electrons that each atom in that group contains.
  + Elements in a group have similar properties because they have the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of valence electrons.
    - The properties are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because the valence electrons are in different energy levels.

*The Alkali Metals*

* Elements in group 1A
  + These elements have a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and are extremely reactive.
    - Never found in nature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (example table salt)
  + Not all the elements in a group are equally reactive
    - Na is more reactive than lithium, potassium is more reactive than lithium, etc
    - The reactivity \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from the top of group 1A to the bottom

*The Alkaline Earth Metals*

* Elements in group 2A
  + These elements all have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Harder than the metals in group 1A
  + Differences in reactivity among the alkaline earth metals are shown by the ways they react with \_\_\_\_\_\_.
    - Ca, Sr, and Ba all react easily with cold water
    - Mg will react with hot water
    - Be no reaction with water

*The Boron Family*

* Elements in group 3A
  + Contains the metalloid B, metals Al, Ga, In, and Tl
  + Each of these elements has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Aluminum is the most abundant metal in the earth’s crust.
    - Typically found mixed with oxygen in a mineral called bauxite
    - It is less reactive than Na and Mg
    - It is strong, lightweight, malleable, and a good conductor of electric current.

*The Carbon Family*

* Elements in group 4A
* Contains a nonmetal (C), two metalloids (Si and Ge) and two metals (Sn and Pb)
* Each of these elements has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Metallic nature of these elements \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from top to bottom of the group
* Except for water, most of the compounds in the human body contain carbon
* Silicon is the second most abundant element in the earth’s crust

*The Nitrogen Family*

* Elements in group 5A
* Each of these elements has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Contains two nonmetals (N and P), two metalloids (As and Sb) and one metal (Bi)
* Elements in this group have a wide range of physical properties

*The Oxygen Family*

* Elements in group 6A
* Each of these elements has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Contains three nonmetals (O, S, and Se) and two metalloids (Te and Po)
* Oxygen is the most abundant element in the earth’s crust
  + Complex forms of life also need oxygen to survive (helps release energy stored in food)
  + Ozone is another form of the element oxygen

*The Halogens*

* Elements in group 7A
* Each of these elements has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Despite their physical differences, the halogens have very similar chemical properties
  + F and Cl are gases, Br is a liquid that evaporates quickly, and I is a solid that sublimes
  + Highly reactive nonmetals (F is most reactive)
  + React easily with most metals

*The Noble Gases*

* Elements in group 8A
* Each of these elements has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (except for He, it only has 2)
* The noble gases are colorless and odorless and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* An element that does not react easily with other elements can be very useful
  + Allows for other elements to not react
  + Storing documents
  + Prevents the reaction with oxygen
* All of the noble gases except for radon are used in “neon” lights
  + When electric current passes through noble gases, they emit different colors
    - Helium – pink
    - Neon – orange/red
    - Argon – lavender
    - Krypton – white
    - Xenon – blue