The Periodic Table of Elements

History

- In 1869 Dimitri Mendeleev (Russia) and Lothar Meyer (Germany) published nearly identical classification schemes for elements known to date.
- The periodic table is base on the similarity of properties and reactivities exhibited by certain elements.
- Later, Henri Moseley (England,1887-1915) established that each element has a unique atomic number, which is how the current periodic table is organized.

Mendeleev

- Mendeleev left blank spaces in his table when the properties of the elements above and below did not seem to match.
- The existence of unknown elements was predicted by Mendeleev on the basis of the blank spaces.
- When the unknown elements were discovered, it was found that Mendeleev had closely predicted the properties of the elements as well as their discovery.

The Periodic Law

- Similar physical and chemical properties recur periodically when the elements are listed in order of increasing atomic number.

Organization

- The periodic table is made up of rows of and columns.
  - A row is called a <u>period</u>
  - A column is called a <u>group or family</u>
- An element is identified by its chemical symbol.
- The number above the symbol is the atomic number
- The number below the symbol is the average atomic weight of the element. (based on isotopes)

Periodic Patterns

- <u>Periods:</u> Arranged horizontally across the periodic table (rows 1-7)
- These elements have the same number of e- energy levels.
- Each period ends with a completely filled outer shell that has the maximum number of electrons for that shell.
- <u>Family (Group) :</u> Arranged vertically down the periodic table (columns1- 18 or 1-8 A,B)
- These elements have the same number electrons in the outer most shells, the valence shell.

Chemical Families

- Group 1: alkali metals
  - react with water to form an alkaline solution
  - Very reactive

- Group 2: alkali earth metals
  - reactive, but not as reactive as Group 1.

- Group 17: halogens
  - need only one electron to fill their outer shell
  - are very reactive.

- Group 18: noble gases
  - have completely filled outer shells
  - are almost non reactive.

Reading the Periodic Table: Classification

- Metal: Elements that are usually solids at room temperature.
  - Most elements are metals.

- Non-Metal: Elements in the upper right corner of the periodic Table.
  - Their physical and chemical properties are different from metals.

- Metalloid: Elements that lie on a diagonal line between the Metals and non-metals.
  - Their chemical and physical properties are intermediate between the two.

Periodic Table: The three broad classes –

- Main
- Transition
- Rare Earth