6.1 Developments of the Periodic Table

Who developed the Periodic Table and how did they do it?

- Dimitri Mendeleev, a Russian scientist, is the father of the Periodic Table
- Mendeleev's work occurred the same time another scientist, a German physicist named Julius Lothar Mayer, was working on creating a Periodic Table as well
- the two worked independently but produced similar tables in 1869
- he grouped known elements together based on similar properties
- this left some gaps in the table that Mendeleev first produced
- below is a portion of Mendeleev's first Periodic Table

Reihen	Gruppe I R^2O	Gruppe II RO	Gruppe III R^2O^3	Gruppe IV RH^4 RO^2
1	H = 1			
2	Li = 7	Be = 9,4	B = 11	C = 12
3	Na = 23	Mg = 24	Al = 27,3	Si = 28
4	K = 39	Ca = 40	-- = 44	Ti = 48
5	(Cu = 63)	Zn = 65	-- = 68	-- = 72
6	Rb = 85	Sr = 87	?Yt = 88	Zr = 90
7	(Ag = 108)	Cd = 112	In = 113	Sn = 118

- Mendeleev based this table on the atomic weights of the elements and found that some elements had similar properties that occur periodically → hence the name Periodic Table

- the table lead to Mendeleev's Periodic Law, which states:
  The properties of the elements recur periodically when the elements are arranged in increasing order by their atomic weight.

- the modern Periodic Law states the same thing only the elements are arranged by *atomic number*

- in the modern Periodic Table, the elements within a group or *family* share properties that allow us to predict the behaviour of elements in that group

Group #	Group Name	Properties
1	Alkali Metals	➢ form hydroxides → very basic ➢ high metallic behaviour ➢ good reducing agents ➢ high electrical and heat conductivity ➢ contain one outer shell electron ➢ forms ions with a charge of +1
2	Alkaline Earth Metals	➢ good metallic properties including conductivity and reduction ability → not as good as alkali metals (some have low solubility in water) ➢ contain two outer shell electrons ➢ forms ions with a charge of +2
17	Halogens	➢ reactive, nonmetals ➢ relatively high electronegativities ➢ are short 1 electron for a full outer shell ➢ forms ions with a charge of –1

		➢ can form gases or liquids ➢ at room temp: F, Cl gases, Br liquid, & I, As solids ➢ 7 valence e^- ($3s^2$ $3p^5$)
Group #	**Group Name**	**Properties**
18	Noble Gases	➢ the least reactive of all families → inert ➢ are all gases at STP ➢ inertness due to a full outer shell ➢ low reactivity does not mean lack of reactivity

- Transitional elements: all metals and most are hard solids with high melting & boiling pts.
- Chemical behavior complex due to similarities within a period and a group
- Some have distinct colour due to addition of last electrons in inner d orbital. Electrons in d orbitals closer to nucleus.