PERIODIC CLASSIFICATION OF ELEMENTS

CLASS 10TH CHEMISTRY

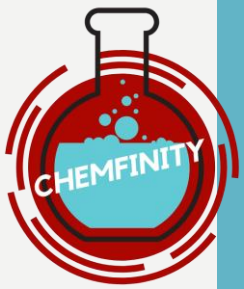
GLOSSARY

- Dobereiner's Triads
- Newlands' Law of Octaves
- Mendeleev's Periodic Law
- Moseley's Periodic Law
- Bohr's Periodic Table
- Trends in Periodic Table
- Metals, Metalloids and Non-Metals

DOBEREINER'S TRIADS

- Dobereiner observed that certain elements had similar properties and could be put into groups.
- "When elements are arranged in order of increasing atomic masses in groups of 3, called triads, groups of elements having similar chemical properties are obtained.
- "The atomic mass of middle/central element in these triads is roughly equal the average of the other two elements.
- 3 such triads were formed.

Lithium (7)	Calcium (40)	Chlorine (35.3)
Sodium (23)	Barium (88)	Bromine (80)
Potassium (39)	Strontium (137)	Iodine (127)



Alkali Metal Group (Dobereiner's Triad)

Elements of the triad	Symbols	Atomic masses
1. Lithium	Li	7
2. Sodium	Na	23
3. Potassium	K	39

Alkaline Earth Metal Group (Dobereiner's Triad)

Elements of the triad	Symbols	Atomic masses
1. Calcium	Ca	40
2. Strontium	Sr	88
3. Barium	Ba	137

Halogen Group (Dobereiner's Triad)

Elements of the triad	Symbols	Atomic masses
1. Chlorine	Cl	35.5
2. Bromine	Br	80
3. Iodine	I	127

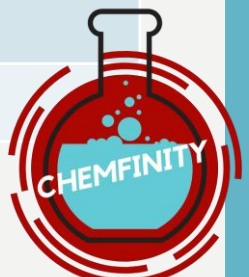
LIMITATION OF DT

- Failed to arrange all the then known elements in the form of triads of elements.
- Only three triads were identified.
- Not much successful.

NEWLANDS' OCTAVES

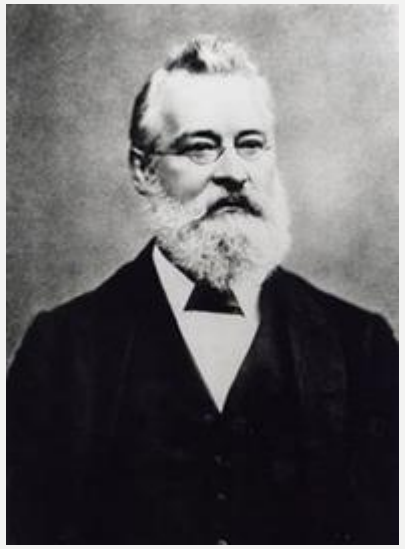
- When Newland arranged then known elements in the order of increasing atomic masses, he found that properties of every 8th element were similar to the corresponding first. From there he concluded his law of octaves.
- " When elements are arranged in the order of increasing atomic masses the properties of every eight element are a repetition of that of the first.

H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co, Ni	Cu	Zn	Y	In	As	Se
Br	Rb	Sr	Ce, La	Zr		



	GROUP I	GROUP II	GROUP III	GROUP IV	GROUP V	GROUP VI	GROUP VII	GROUP VIII
Oxides →	R_2O	RO	R_2O_3	RO_2	R_2O_5	RO_3	R_2O_7	RO_4
Hydrides →	RH	RH_2	RH_3	RH_4	RH_3	RH_2	RH	—
PERIODS ↓ 1	H 1.0							
2	Li 7.0	Be 9.1	B 11.0	C 12.0	N 14.0	O 16.0	F 19.0	
3	Na 23.0	Mg 24.3	Al 27.0	Si 28.4	P 31.0	S 32.0	Cl 35.5	
1st series : 4	K 39.1	Ca 40.1	... 44	Ti 48.1	V 51.4	Cr 52.1	Mn 55.0	Fe 55.8 Co 58.9 Ni 58.7
2nd series :	Cu 63.5	Zn 65.4	... 68	... 72	As 75	Se 79	Br 79.9	
1st series : 5	Rb 85.4	Sr 87.6	Y 89.0	Zr 90.6	Nb 94.0	Mo 96.0	Tc 99	Ru 101.0 Rh 102.9 Pd 106.4
2nd series :	Ag 107.9	Cd 112.4	In 114.0	Sn 119.0	Sb 120.0	Te 127.6	I 126.9	
1st series : 6	Cs 132.9	Ba 137.3						
2nd series :	Au 197.2	Hg 200.0						

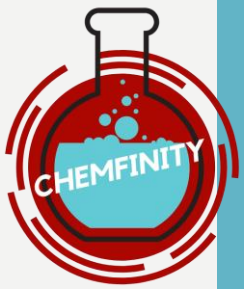
LIMITATIONS OF NLO



- Could classify elements until Calcium only.
- More and more elements were discovered but could not be fitted into octave structure.
- Assumed that only 56 elements existed in nature and no more would be discovered.
- In order to fit elements into octave structure, some elements, even having stark difference in properties were put into the same slot.
- Fe which resembled Co, Ni was placed in a column far far away…

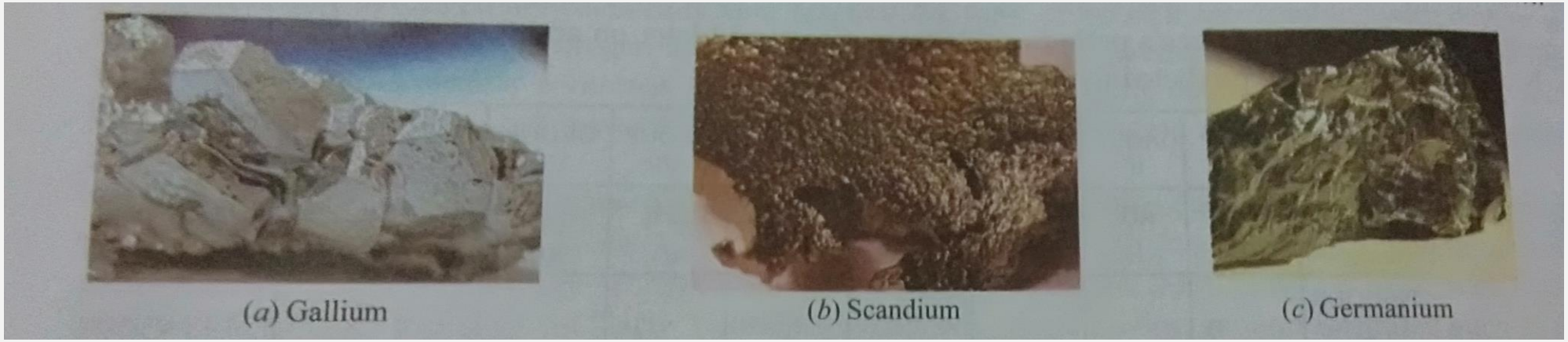
MENDELEEV'S CLASSIFICATION

- Dmitri Ivanovich Mendeleev
- When he started his work only 63 elements were known.
- When he arranged elements in order of increasing atomic masses, he discovered that the properties of elements repeated after certain intervals.
- "The properties of elements are a function of atomic masses.
- Called vertical columns "groups" and horizontal rows "periods".
- 6 periods and 8 groups.

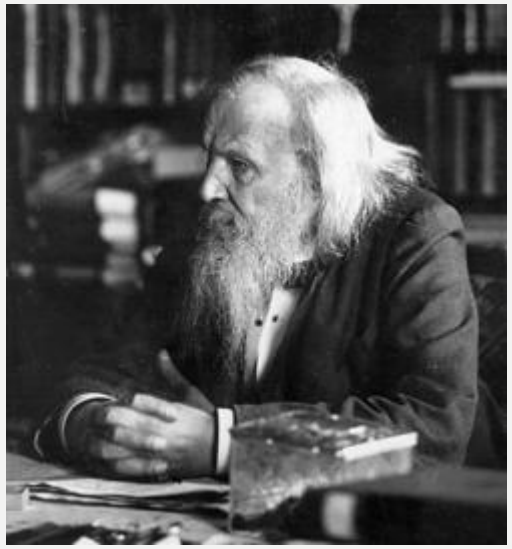


ADVANTAGES

- Some gaps were left deliberately by him in his periodic table. This was done to accommodate the elements that were not discovered at that time. So he predicted the existence of new elements that were yet to be discovered.
- Separated a group for noble gases; not discovered till that time.
- Scandium → Eka-Boron; Gallium → Eka-Aluminium; Germanium → Eka-Silicon



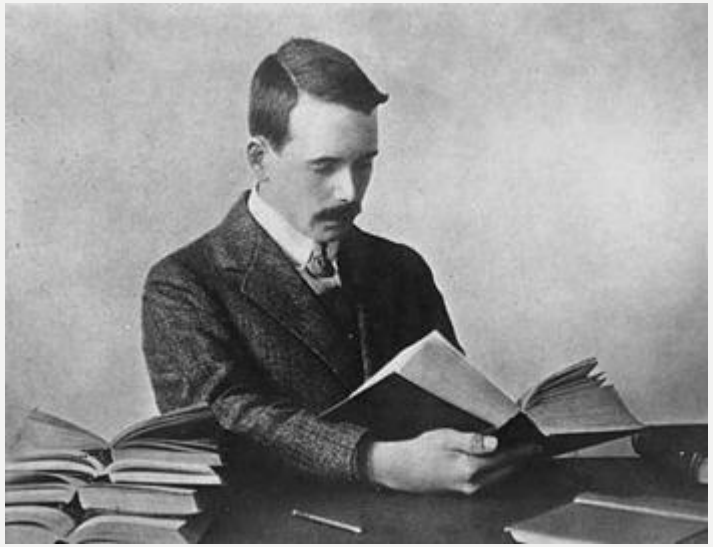
LIMITATIONS OF MPL



- Could not assign a unique position to Hydrogen.
- The position of ISOTOPES could not be explained.
- Some elements were wrongly arranged to accommodate for the periodic nature of properties of elements. E.g. **Co and Ni / V and Cr**.

HENRY MOSELEY

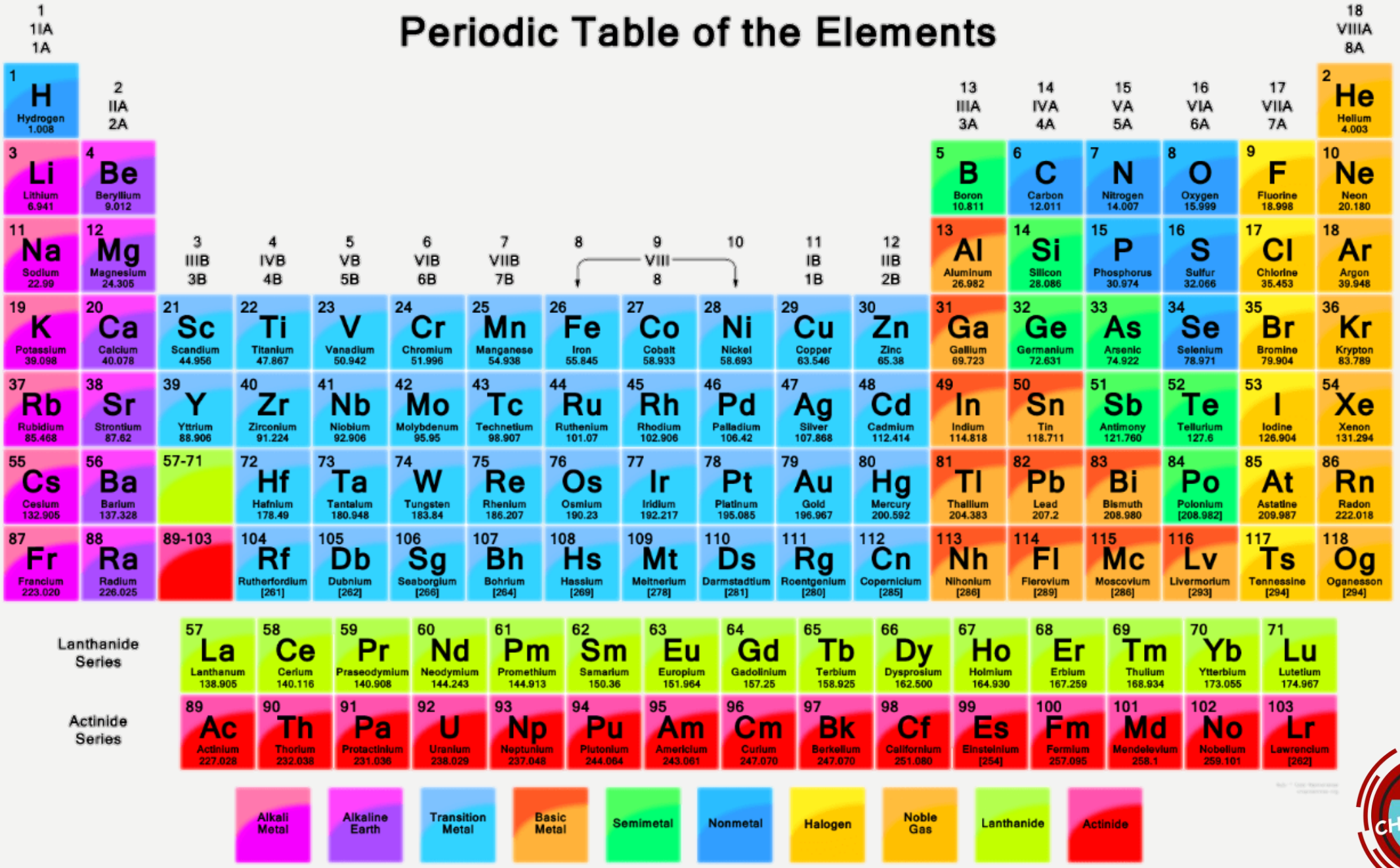
- In 1913, he showed that:
- “ Properties of elements are a periodic function of their atomic numbers. → The Modern Periodic Law.
- But the modern form of periodic table was designed by Niels Bohr.



PERIODIC TABLE

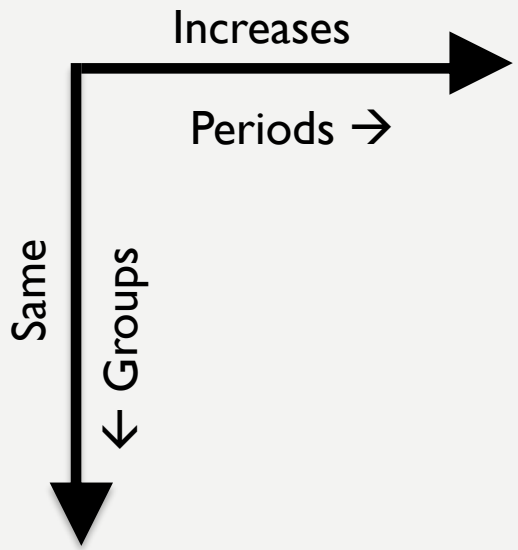
- Arrangement of elements in a manner such that elements having similar properties are repeated in a repeated fashion.
- Horizontal rows → Periods
- Vertical columns → Groups
- Modern Periodic Table: 118 elements: 18 groups, 7 periods.

Periodic Table of the Elements

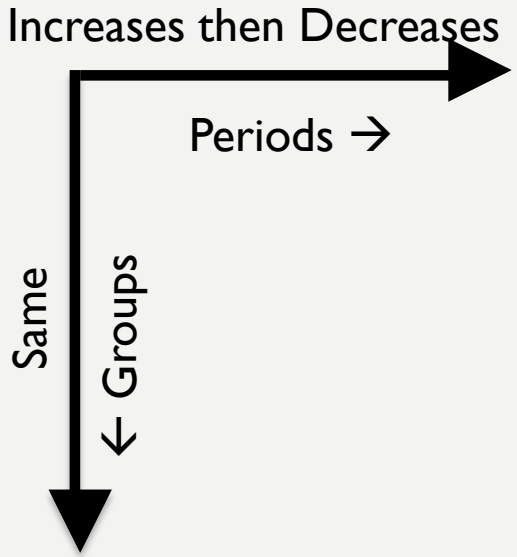


TRENDS IN MODERN PERIODIC TABLE

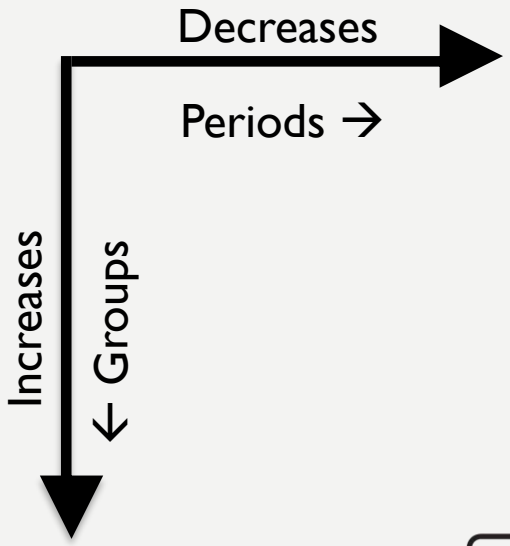
Valence Electrons



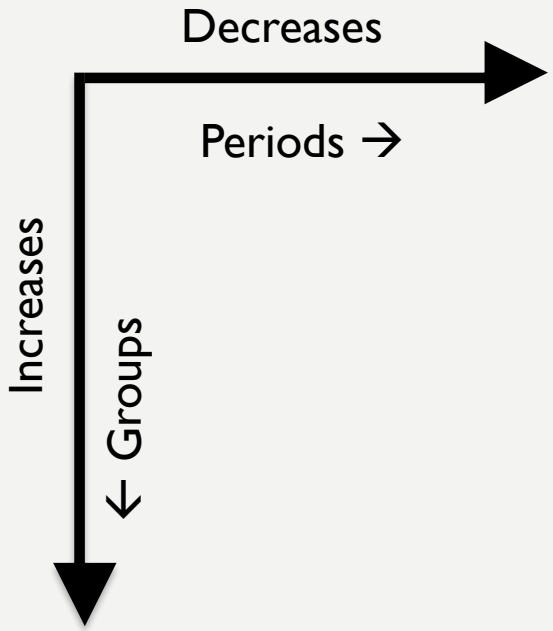
Valency



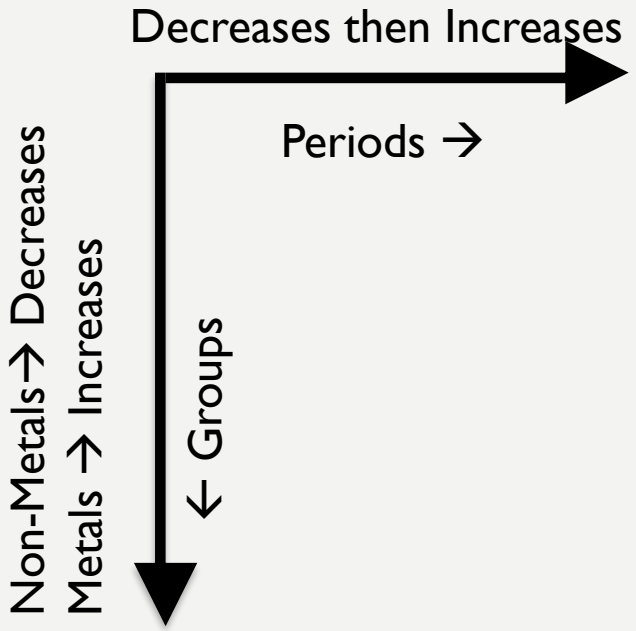
Atomic Size



Metallic Character

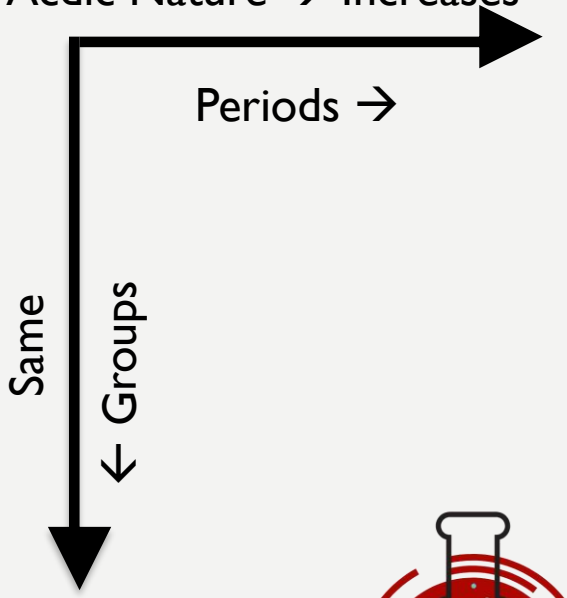


Chemical Reactivity



Nature of Oxides

Basic Nature → Decreases
Acdic Nature → Increases



METALS, NON-METALS, METALLOIDS