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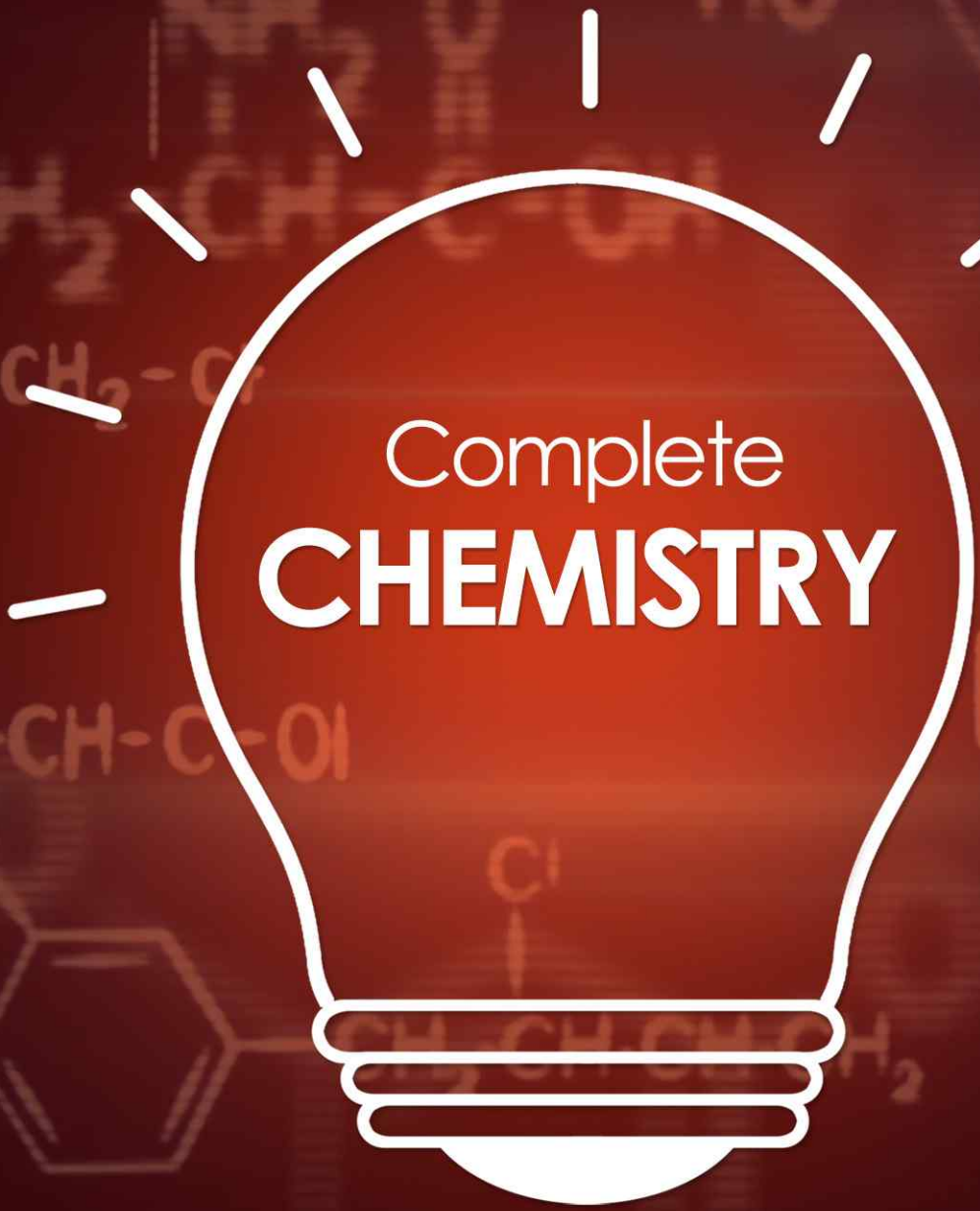


Complete CHEMISTRY

IIT-JEE · NEET · CBSE eBOOKS

CLASS 11&12th

CLASS 11th

Classification of Elements & Periodicity in Properties

01. Need for Classification:

It is very difficult to study individually the chemistry of all the elements and millions of their compounds, hence to simplify and systematize the study of chemistry of the elements and their compounds, they are classified into groups and periods. Early attempt to classify the elements:

02. Dobereiner's Law of Traids:

It was first attempt towards classification. He arranged similar elements in a group of three elements called triad and the atomic mass of the middle elements of the traid is approximately the arithmetic mean of the other two.

e.g. Ca^{40} $Sr^{87.5}$ Ba^{137}

$$\text{At. wt. of Sr} = \frac{137+40}{2} = 88.5$$

88.5 is nearly similar to 87.5 of atomic wt. of Sr.

Such a group of elements is called **Dobereiner's triad.**

Triad of atoms			Means of first and last element
Li	Na	K	$\frac{7+39}{2}$ =23
7	23	39	
Be	Mg	Ca	$\frac{8+40}{2}$ =24
8	24	40	

Dobereiner could arrange only a few elements as triads and there are some such elements present in a triad, whose atomic weights are approximately equal, e.g.

Fe	Co	Ni
Ru	Rh	Pd

Therefore, this hypothesis was not acceptable for all elements.

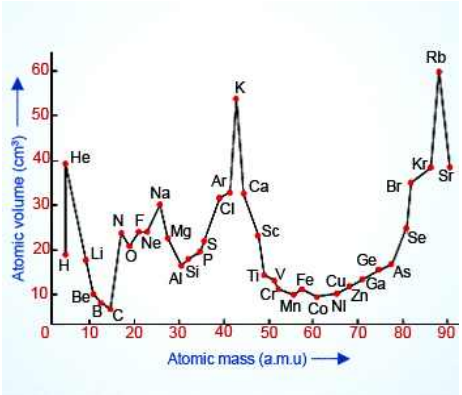
03. Newland's Law of Octaves:

When the lighter elements are arranged in order of their increasing atomic weights, then every eighth element is similar to the first element in its properties, similarly as the eighth node of a musical scale is similar to 1st one. e.g. Na 8th element resembles in their properties with Li. Similarly K the 8th element with Na and so on.

Name of element	Li	Be	B	C	N	O	F
	7	9	11	12	14	16	19
Name of element	Na	Mg	Al	Si	P	S	Cl
	23	24	27	28	31	32	35.5

- It is clear from the above table that sodium is the eighth element from lithium, whose properties resemble that of lithium.
- This type of classification was limited up to only 20 elements.
- Inert gas element were not discovered till then.

04. Lother Mayer Arrangement:



- The graphs plotting the atomic volumes against atomic weights are known as Lother Mayer volume curves.
- The alkali metals have highest atomic volumes.
- Alkaline earth metals (Be, Mg, Ca, Sr, Ba, etc.) which are relatively a little less electropositive. Occupy positions on the descending part of the curve.
- Halogens and the noble gases (except helium) occupy positions on the ascending part of the curve.
- Transition elements have very small volumes and therefore these are present at the bottoms of the curve.

05. Mendeleev's Periodic Law

Mendeleev's Periodic Law

The physical and chemical properties of elements are the periodic function of their atomic weight.