PERIODIC CLASSIFICATION OF ELEMENTS

CLASS :: 10TH
CHAPTER :: 2
SCIENCE AND TECHNOLOGY
Part : II

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MATH-SCIENCE DEARS

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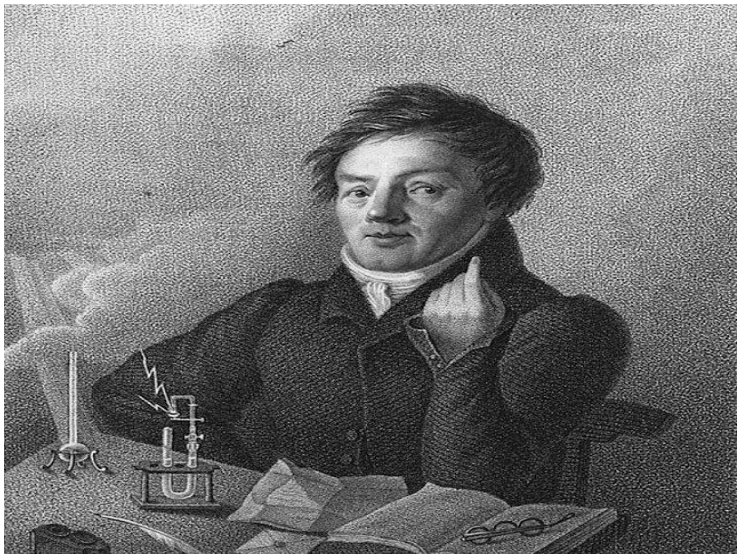
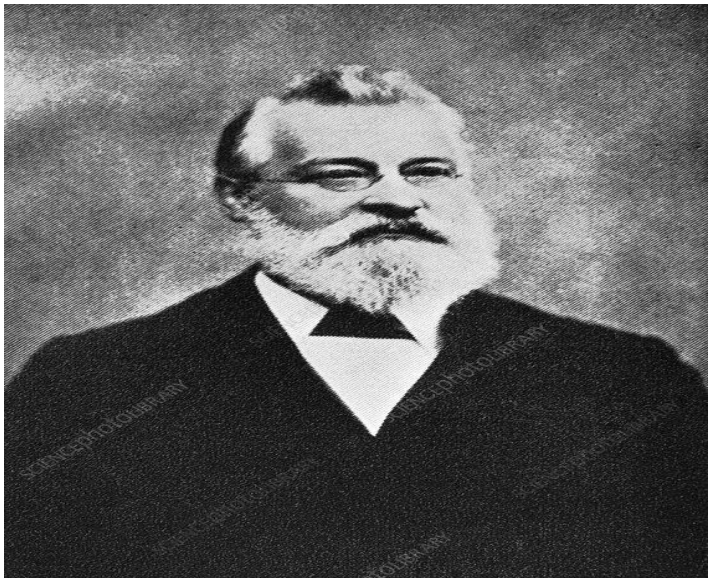
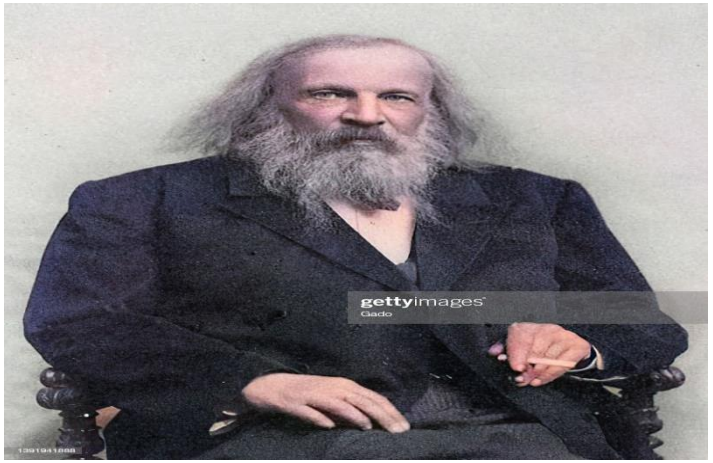


Johann Wolfgang Döbereiner



John Newlands



Dimitri Mendeleev

Henry Moseley

Various Dobereiner's Triads

Triad 1:

This triad was constituted by the alkali metals lithium, sodium and potassium.

Element	Lithium Li	Sodium Na	Potassium K
Atomic Mass	7	23	39

The law of triads can be verified for this triad as follows:

The atomic mass of Sodium =

(Atomic Mass of Lithium + Atomic mass of Potassium) / 2

= (7 + 39)/2

= 46/2

= 23

Thus the law of triads is verified for this triad.

Triad 2:

This triad is comprised of **alkaline earth metals**
i.e. calcium, strontium and barium.

Element	Calcium Ca	Strontium Sr	Barium Ba
Atomic Mass	40	87.6	137

Let us verify the law of triads for this triad too.

(Atomic Mass of Calcium + Atomic mass of Barium) / 2
= (40 + 137) / 2

= 177/2

= 87.5

87.5 is very close to the atomic mass of Strontium.
Thus the law of triads is verified.

Dobereiner's triads

In the year 1817 a German scientist ***Johann Wolfgang Dobereiner***

Dobereiners suggested that properties of elements are related to their atomic masses.

He made groups of three elements each, having similar chemical Properties and called them triads.

Law of Triads:

According to Dobereiner,

when elements are arranged in increasing order of their atomic masses, the arithmetic mean of the atomic masses of the first and third element in a triad is approximately equal to the atomic mass of the second element in that triad.

Newland’s Law of Octaves

Newland's law of octaves Based on increasing atomic mass of elements.

It started with the lightest element hydrogen and ended up with thorium.

He found that every eighth element had properties similar to those of first.

.For example,

sodium is the eighth element from lithium and both have similar properties.

The law of octaves states that when the elements are arranged in ascending order of atomic mass, every eighth element has comparable properties.

sa (do)	re (re)	ga (mi)	ma (fa)	pa (so)	da (la)	ni (ti)
H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co and Ni	Cu	Zn	Y	In	As	Se
Br	Rb	Sr	Ce and La	Zr	—	—

Limitations of Newland's Law of Octaves

1) This law is applicable only the first few elements.

2) Newlands place the two elements each in some boxes.
Ex . Co & Ni

3) This law found to be applicable only up to calcium.

4) Newlands place some elements with different properties under the same note in the octave.
Ex. Cobalt and Nickel

5) Newlands octaves did not have provision to accommodate the newly discovered elements.

Mendeleevs Periodic Table –

Dmitri Ivanovich Mendeléev,

Dmitry Mendeleev a Russian chemist in 1869 gave Mendeleev's Periodic Table.

Till then 63 elements were known.

Elements were arranged on the basis of the fundamental property of elements, atomic mass, and chemical properties.

Mendeleev found that the elements are arranged in an increasing order of their atomic masses, the elements with similar physical and chemical properties repeat after a definite interval.

" Properties of elements are periodic function of their atomic masses".

In Mendeleev periodic table, vertical columns in the periodic table are called groups and horizontal rows are called periods.

MERITS OF MENDELEEV'S PERIODIC TABLE

1) Atomic masses of some elements were revised so as to give them proper place in periodic table.

2) Mendeleev had kept some vacant places in the periodic table for elements that were yet to be discovered.

3) Later on these elements were discovered the properties of these elements matched well with those predicted by Mendeleev.

Demerits of Mendeleev's periodic table

1) **The whole number atomic mass of the element of Co & Ni is same. Therefore there was an ambiguity regarding their sequence.**

2) **When elements are arranged in an increasing order of atomic masses, the rise in atomic mass does not appear to be uniform.**

3) **In Mendeleev Periodic table it is difficult to decide the correct position of Hydrogen whether it is in the alkali metal group or halogen group.**

Modern Periodic Table

In 1913, Henry Moseley, from his studies on X-ray, found that

The atomic number is the fundamental property of an element but not atomic mass.

The atomic number is equal to the number of electrons or protons in a neutral atom.

Modern Periodic Law

Henry Moseley states that the

properties of elements are the periodic functions of their atomic number. i.e.,

if the elements are arranged in tabular form in the increasing order of their atomic numbers, then the properties of the elements are repeated after definite regular intervals or periods.

The structure of modern periodic table

1) The modern periodic table contains seven horizontal rows called periods and eighteen vertical columns called groups

2) Apart from these seven rows, two rows are shown separately at the bottom of the periodic table. These are called lanthanide seies and actinide series respectively.

3) The modern periodic table is now completely filled with 118 elements are now discovered.

4) The entire periodic table is divided into four blocks s-block, p-block, d-block and f-block.

5) The S block contains the groups 1 and 2, alkaly metals

the D block contents the groups 3 to 12, transition elements.

the P block contains the groups 13 to 18 ,

While the F Block contains Lanthanide and actinide

series at the bottom.

6) The D block elements are called transition elements.

7) A zigzag line can be drawn in the P block of the periodic table.

The metalloids element lie along the border of the zigzag line,

all the metals lie on the left side of the zigzag line while all the

nonmetals lie on the right side

Importance of electronic configuration in modern periodic table

In modern periodic table the electronic configuration is most importance Because characteristic of the groups and periods are depend on its electronic configuration. Its decide the group and the period in which it is to be placed.

Groups and Electronic Configuration

In modern periodic table the elements from any group, you will find the number of their valence electrons to be the same.

H,	Li,	Na,	K,	Rb,	Cs,	Fr.
Hydrogen,	Lithium ,	Sodium ,	Potassium,	Rubidium,	Cesium,	Francium

1) H1:- 1 **2) Li3 :- 2, 1** **3) Na11 :- 2, 8, 1** **4) K 19:- 2, 8, 8, 1**

Periods :

The number of elements in each period is given below:

Period	Valency	Type of period	Number of elements	Atomic number of the elements
1st period	n=1	Shortest period	2	Atomic number 1 to 2
2nd period	n=2	Short period	8	Atomic number 3 to 10
3rd period	n=3	Short period	8	Atomic number 11 to 18
4th period	n=4	Long period	18	Atomic number 19 to 36
5th period	n=5	Long period	18	Atomic number 37 to 54
6th period	n=6	Longest period	32	Atomic number 55 to 86
7th period	n=7	Incomplete	32	Atomic number 87 to 118

Groups:

The elements present in a group have the same valency and identical chemical properties.

The physical properties of the elements in the group very gradually.

Group	Name of the Group	Property
Group 1	Alkali metals	These are highly reactive elements; hence they form strongly alkaline solutions with water.
Group 2	Alkaline earth metals	These form basic hydroxides, which are less soluble in water than the hydroxide of alkali metals.
Group 13	Boron family	Each element of the boron family has three valence electrons.
Group 14	Carbon family	Carbon is the first member of this family. Each element of the carbon family has four valence electrons.
Group 15	Nitrogen family	Each element of the nitrogen family has five valence electrons, also known as pnicogens.
Group 16	Oxygen family	Each element of the oxygen family has six valence electrons. These elements are also known as Chalcogens.
Group 17	Halogen family	These elements form salts with group 11 elements.
Group 18	Noble gas (Zero group)	These elements have completely filled outermost orbits. Therefore, they do not react with other elements or each other.

Periods and electronic configuration

You will find that the number of Valence Electrons is different in these elements. The number of shells is the same i.e. 2.

while going from left to right within the period the **atomic number increases by 1** at a time and the **number of Valence Electrons also increase by 1 at a time.**

we can say that the elements with the **same number of shells** occupied by electrons belong to the same period.

Li, Be, B C N O F Ne
Lithium Beryllium, Boron, Carbon, Nitrigen, Oxygen, Flurine, Neon

1) Li3:- 2, 1 2) Be4 :- 2, 2 3) B5 :- 2, 3 4) C6:- 2, 4 5) N7 :- 2, 5

6) O8 :- 2, 6 7) F9 :- 2, 7 8) Ne10 :- 2, 8

Periodic Trends In The Modern Periodic Table

When the properties of elements in a period or a group of the modern periodic table are compared , certain regularity is observed in their variations is called the periodic trends in the modern periodic table.

Valency :

No. of valence electrons present in the outermost shells. Valency remains the same down a group but changes across a period.

Atomic size :

Atomic size refers to radius of an atom. Atomic size decreases in moving from left to right along a period due to increase in nuclear charge. Atomic size increases down the group because new shells are being added as we go down the group.

Metallic Character -

Ability of atom to lose the electron is known as Metallic Character AND An atom of a non metal Has a tendency to form an anion by accepting electrons from outside into its valence shell.

Metallic character decreases from **left to right** in a period. This is due to increase in nuclear charge. But non-metallic character increases left to right in a period. And metallic character increases **down the group** as the size increases it can easily lose electron AND decreasing non-metalic character.

Gradation in Halogen Family -:

The group 17 contains the members of the halogen family. All of them have the general formula X2. A gradation is observed in their physical state down the group. Thus, fluorine (F2) and chlorine (Cl2) are gases, bromine (Br2) is a liquid while iodine (I2) is a solid.

ह	H		
ली	Li	Be	बेटा
ना	Na	Mg	माँगे
की	K	Ca	कार
रब	Rb	Sr	स्कूटर
से	Cs	Ba	बाप
फरयाद	Fr	Ra	राजी

P -- BLOCK											
BORON	CARBON			PNICOG ENS		CHALCO GENS		HALO GENS		NOBAL 18th GAS	
13th		14th		15th		16th		17th		He	हिना
B	बैंगन	C	कहे	N	नाना	O	ओ	F	फिर	Ne	नीना
Al	आलू	Si	शिव	P	पापा	S	स्टाइल	Cl	कल	Ar	और
Ga	गाजर	GL	जी	As	आशु	Sl	से	Br	बाहर	Kr	करीना
In	In	Sn	सुने	Sb	सब	Tl	टी	I	आई	Xe	झेरॉक्स
Tl	थैली	Pb	पार्वती	Sn	बिंदास	Po	पो	At	आन्टी	Rn	रंगीन

Hydrogen ko hello HELLO HELLO hydrogen ko hello

Lithium Bareillywala Bore Kare nitrogen Oxygen ko on floor 9

na na na na na

soda Mange AaluSingh phasGaya selfish chlorine arey

soda Mange AaluSingh phasGaya selfish chlorine arey

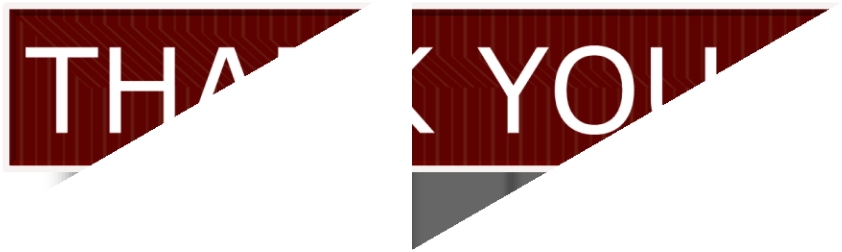
Pa pa pa pa

Potash ka science teacher very crazy man Potash ka science teacher very crazy man

Iron ko Nickel Bole copper jink galat Bole Iron ko Nickel Bole copper jink galat Bole

German asteric Bor kare Ruby Suri ne poochha kya poochha bhai kya poochha Ruby Suri

naye mols ki technic Sare Rote Rote Roj padhe ag cd ag cd Indian student Sab Ko Tel Karenge i exceed



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