CLASS 10- SCIENCE

CHAPTER 5- PERIODIC CLASSIFICATION OF ELEMENTS

PART 2- MENDELEEV'S PERIODIC TABLE

MENDELEEV'S PERIODIC TABLE

- Dmitri Ivanovich Mendeleev, a Russian chemist, classified elements and contributed the most in the early development of the periodic table.
- He started his work with 63 elements known at that time.
- He classified elements in the increasing order of their atomic masses and similarities in their physical and chemical properties.
- Among chemical properties, he focused on the compounds formed by the elements with oxygen and hydrogen.
- The formulae of the hydrides and oxides formed by an element were also the basis for classification of elements.

MENDELEEV'S PERIODIC TABLE (cont.)

- On the basis of his study and the patterns observed, he formulated a Periodic Law which states that, 'The properties of elements are the periodic function of their atomic masses'. This means that, when the elements are arranged in order of increasing atomic masses then those elements with similar properties are repeated at regular intervals.
- Mendeleev's Periodic Table contains eight vertical columns called 'groups' and six horizontal rows called 'periods'.
- Elements having similar properties were placed in the same groups.

MENDELEEV'S PERIODIC TABLE (cont.)

Group →	I	II	III	IV	V	VI	VII	VIII
Oxide Hydride:	R_2O RH	RO RH_2	R_2O_3 RH_3	RO_2 RH_4	R_2O_5 RH_3	RO_3 RH_2	R_2O_7 RH	RO_4
Periods ↓	A B	A B	A B	A B	A B	A B	A B	Transition series
1.	H 1.008							
2	Li 6.939	Be 9.012	B 10.81	C 12.011	N 14.007	O 15.999	F 18.998	
3	Na 22.99	Mg 24.31	Al 29.98	Si 28.09	P 30.974	S 32.06	Cl 35.453	
4. First series : Second series	K 39.102 Cu 63.54	Ca 40.08 Zn 65.37	Sc 44.96 Ga 69.72	Ti 47.90 Ge 72.59	V 50.94 As 74.92	Cr 50.20 Se 78.96	Mn 54.94 Br 79.909	Fe Co Ni 55.85 58.93 58.71
5 First series : Second series	Rb 85.47 Ag 107.87	Sr 87.62 Cd 112.40	Y 88.91 In 114.82	Zr 91.22 Sn 118.69	Nb 92.91 Sb 121.75	Mo 95.94 Te 127.60	Tc 99 I 126.90	Ru Rh Pd 101.07 102.91 106.4
6. First series : Second series :	Cs 132.90 Au 196.97	Ba 137.34 Hg 200.59	La 138.91 Tl 204.37	Hf 178.49 Pb 207.19	Ta 180.95 Bi 208.98	W 183.85		Os Ir Pt 190.2 192.2 195.0

MERITS OF MENDELEEV'S PERIODIC TABLE-

- Mendeleev's Periodic Law predicted the existence of some elements and accordingly left proper gaps in the Mendeleev's Periodic Table for those undiscovered elements like gallium (Ga), scandium (Sc) and germanium (Ge). Later on, these elements were discovered and were placed in those gaps without disturbing the existing elements.
- Atomic masses of certain elements were corrected by placing them in this periodic table. E.g.- Atomic mass of beryllium was corrected from 13.5 to 9.
- This periodic table could predict the properties of several undiscovered elements on the basis of their position in the table.
- The noble gases were discovered very late, but were placed easily in the Mendeleev's Periodic Table in the form of a separate group and thus did not disturb the existing order of elements.

LIMITATIONS/ DEMERITS/ DEFECTS/ DISCREPANCIES OF MENDELEEV'S PERIODIC TABLE-

- Position of hydrogen could not be justified as it resembles both, the alkali metals as well as the halogens, in its properties.
- Isotopes of an element have different atomic masses, but were not allotted different positions in the table.
- In placing some elements, the trend of increasing atomic masses was not followed e.g. Cobalt with higher atomic mass was placed before Nickel.
- The atomic masses were not increasing in a regular manner, so it was not possible to predict how many elements could be discovered between any two elements.

CONCLUSION-

- From the above known merits and demerits of Mendeleev's Periodic Law, it was concluded that atomic mass could not be the basis for the classification of elements.
- A more fundamental property of elements should have been considered for better explanation of periodicity in the properties of elements.
- It was found that the atomic number of an element could be a more fundamental property than atomic mass, and hence was considered to be a better basis for the classification of elements.

THANK YOU