MENDELEEV'S PERIODIC TABLE

(a) Mendeleev's periodic law

The physical and chemical characteristics of elements vary periodically with their atomic weight.

Group	I	II	III	IV	V	VI	VII	VIII
Oxide: Hydride:	R_2O RH	RO RH_4	R_2O_3 RH_4	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 22.99	Al 24.31	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 65.54	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 55.85 Co 58.93 Ni 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 121.60	Mo 95.94 Te 127.60	Tc 99 I 126.90	Ru 101.07 Rh 102.91 Pd 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 178.40 Pb 207.19	Ta 180.95 Bi 208.98	W 183.85		Ru 190.2 Rh 192.2 Pd 195.09

(b) Characteristic of Mendeleef's periodic table

(I) It is based on atomic weight.

(II) At that time, 63 elements were known, and noble gases had not been discovered.

(III) He was the first scientist to systematically classify elements, organizing them in both horizontal rows and vertical columns.

(IV) The horizontal rows are termed periods, and Mendeleev's Periodic Table comprised 7 periods.

(V) The vertical columns are referred to as groups, and there were 8 groups in Mendeleev's Periodic Table.

(VI) Each group up to the VIIth is further divided into A and B subgroups. Elements in the 'A' subgroups are known as normal elements, while those in the 'B' subgroups are referred to as transition elements.

(VII) The VIIIth group consisted of 9 elements arranged in three rows (Transitional Metals group).

(VIII) Elements within the same group display similar properties.

Main Features of Mendeleev's Periodic Table

(c) Merits or advantages of Mendeleef's periodic table

(I) Examination of elements

For the first time, all known elements were systematically grouped based on their similar properties, facilitating the study of their characteristics.

(II) Anticipation of new elements

This classification provided motivation for the exploration of new elements, as it left certain gaps yet to be filled.

Sc (Scandium) Ga (Gallium) Ge (Germanium) Tc (Technetium)

These elements had well-defined positions and properties according to Mendeleev even before their actual discoveries, and he allocated blank spaces for them in his table.

Ex. Blank space at atomic weight 72 in silicon group was called Eka silicon (means properties like silicon) and element discovered later was named Germanium.

Similarly other elements discovered after Mendeleef's periodic table were.

E ka aluminium – Galium (Ga) Eka B oron – Scandium (Sc)

E ka Silicon – Germanium (Ge) Eka Mangense – Technetium (Tc)

(III) Correction of doubtful atomic weights

Correction were done in atomic weight of some elements.

$$\text{Atomic weight} = \text{Valency} \times \text{Equivalent weight}$$

Initially, it was determined that the equivalent weight of Be is 4.5, indicating tri valence ($V = 3$). Consequently, the calculated weight of He was 13.5, but there was no designated space for this element in Mendeleev's table. Upon correction, it was established that Be is actually divalent ($V = 2$), resulting in a corrected weight of $2 \times 4.5 = 9$. This adjustment created a space between Li and B for Be in Mendeleev's table.

Corrections were done in atomic weight of elements are – U, Be, In, Au, Pt.

(d) Defects of Mendeleev's Periodic Table

(I) Hydrogen's position is uncertain, and it has been assigned to both IA and VII A groups due to its similarities with both groups.

(II) Isotopes were not provided with distinct positions.

(III) The relationship of lanthanides and actinides to either IIA or IIB groups is not clearly defined.

(IV) Despite the absence of significant similarities except for the valency of subgroups A and B, they have been grouped together.

(V) The arrangement of elements in the periodic table does not strictly adhere to the order of increasing atomic weights.

For instance, Co (Atomic weight: 58.9) precedes I (127), and Ar (39.9) comes before K (39).