Modern Periodic Law and Modern Mandeleeff's Periodic Table.

The recent work has established that the fundamental property of an atom is atomic number and not atomic weight. Therefore, atomic number is taken as the basis of the classification of the elements. The modern periodic law may be stated as:**''The properties of elements are periodic functions of their atomic number**.'' (**Moseley**).

When atomic number is taken as the basis for classification of elements, many anomalies of Mendeleef's table disappear, such as the,

(1) **Position of hydrogen:** Dual behaviour of hydrogen is explained on the fact that it has one electron in its outermost orbit. When it loses its electron it gives H^+ and behaves like alkali metals and when it gains an electron it gives H^- and behaves like halogens. Thus, it resembles with both the alkali metals and the halogens.

(2) **Dissimilar elements placed together:** The lengths of periods are determined by the arrangement of electrons in different orbits. The period ends on the completion of last orbits (last members always being the inert gas). Different periods contain 2, 8, 18 or 32 elements. Now out of the two elements which every long period adds to the group, one resembles the typical elements while the other does not. This gives rise to formation of subgroups. This explains the inclusion of dissimilar elements in the same group but different subgroups.

(3) **Position of rare earth elements**:The electronic arrangement of rare earths can be written as 2, 8, 18, (18 + x), 9, 2 where x varies from 0 to 13, i.e., from Lanthanum to Lutecium. The number of electrons in valency shell, in case of all the elements remains the same although the atomic number increases. Since they possess the same number of valency electrons, the chemical behaviour is also similar. This justifies their positions in the same group and in the same place of the periodic table.

(4) **Anomalous pairs of elements:** Now the basis of classification is atomic number, therefore, this anomaly disappears as the elements occupy their normal position in the new periodic table.

(5) **Position of isotopes:** Since the isotopes of same element possess same atomic number they should occupy one and the same position in the periodic table.

(6) **Position of VIII group elements**: In long periods 18 elements are to be distributed among 8 groups; 1 to 7 groups get 2 elements each and zero group accommodates inert elements, the rest three elements are placed at one place in a new group, known as VIII group. This lack of space justifies the induction of VIII group in the periodic table.

(7) **Transuranic elements:** These elements form a series known as actinide series, it begins from actinium and ends at lawrencium (89–103). Discovery of elements 104, 105 and 112 has recently been reported. This series has been placed outside the periodic table. The electronic configuration of these elements can be written as 2, 8, 18, 32, (18 + x), 9, 2, where x varies from zero (for actinium) to 14 (for lawrencium). The number of valency electrons remains the same for all these elements although atomic number increases. Therefore, their chemical behaviour is similar. This justifies their position outside the periodic table at one place.