# CLASS 10- SCIENCE

# CHAPTER 5- PERIODIC CLASSIFICATION OF ELEMENTS

## PART 1- EARLY ATTEMPTS AT CLASSIFICATION OF ELEMENTS

# CLASSIFICATION OF ELEMENTS-

- There are about 119 different elements known to us.
- Classification of elements actually made the study of elements more easy and understandable.
- Many scientists made several attempts and contributed their efforts in arranging the elements systematically in a table, which is now in use as Modern Periodic Table.
- Definition- The grouping/ arranging of elements into different groups on the basis of the similarities in their properties is known as classification of elements.

# NEED FOR CLASSIFICATION OF ELEMENTS-

- It helps in understanding the properties of elements and their compounds.
- It helps to study, compare and distinguish the properties of elements and their compounds from different groups.
- It enables to predict the properties of elements and their compounds based on their position in the periodic table.

# LAVOISIER'S CLASSIFICATION-

- Lavoisier classified elements into two main types known as metals and non-metals, which was based on few distinctive physical properties like hardness, malleability and luster.
- Limitations-

1) There was no place for elements whose properties resemble to those of metals as well as non-metals.

2) Hardness, malleability and luster were the only common properties of sodium and lead, otherwise they were entirely different elements.

# DOBEREINER'S CLASSIFICATION-

- In 1817, Johann Wolfgang Dobereiner, a German chemist arranged the elements with similar properties into groups.
- Few groups having three elements each were identified and were named 'triads'.
- He found that when the three elements in a triad were written in the increasing order of their atomic masses, then the atomic mass of the middle element is approximately the average/ mean of the atomic masses of the other two elements.

# DOBEREINER'S CLASSIFICATION (cont.)-

| Elements | Atomic Mass | Average |
|---|---|---|
| Lithium (Li)<br>Sodium (Na)<br>Potassium (K) | 6.9<br>23.0<br>39.0 | $\frac{6.9+39}{2}$ = 22.95 |
| Calcium (Ca)<br>Strontium (Sr)<br>Barium (Ba) | 40.1<br>87.6<br>137.3 | $\frac{40.1+137.3}{2}$ = 88.65 |
| Chlorine (Cl)<br>Bromine (Br)<br>Iodine (I) | 35.5<br>79.9<br>126.9 | $\frac{35.5+126.9}{2}$ = 81.2 |

- Limitations-

1) Only three triads were identified from the elements known at that time.

2) Could not arrange all the known elements in the form of triads, even having similar properties.

# NEWLAND'S LAW OF OCTAVES-

- In 1866, John Newlands, an English scientist arranged the then known elements in the increasing order of their atomic masses.
- He found that the physical and chemical properties of every eighth element is similar to the first element.
- He compared these octaves to the eight notes of music and hence called it the 'Law of Octaves'.
- Examples-

1) Lithium, sodium and potassium shows similar properties.

2) Beryllium, magnesium and calcium resemble each other.

# NEWLAND'S LAW OF OCTAVES (cont.)-

- Newland's Octave Table

| 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 | ------- | ------ |

# NEWLAND'S LAW OF OCTAVES (cont.) -

- Limitations-

1) This law was applicable only upto calcium, as after calcium every eighth element did not show similar properties to that of the first element.

2) According to Newland only 56 elements existed in nature and no more elements would be discovered in the future. So the properties of the elements which were discovered later did not fit into the Law of Octaves.

3) In few cases, Newland placed two elements in the same slot to fit the elements in the table.

# NEWLAND'S LAW OF OCTAVES (cont.) -

- Limitations-

4) He also placed some unlike elements in the same column like cobalt and nickel are placed in the same column as fluorine, chlorine and bromine which have different properties than these elements. Also, iron having properties similar to cobalt and nickel is placed in different row.

5) Newland's Law of Octaves worked well only with lighter elements.

6) The law became irrelevant with the discovery of noble gases.

# THANK YOU