

# CHEMISTRY STUDY MATERIALS FOR CLASS 10

(Based on: Periodic Classification of Elements)

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## MODERN PERIODIC TABLE

### Alkali Metals

Elements of group I A of the periodic table constitute a family of very reactive metals called alkali metals. They are lithium, sodium, potassium, rubidium, caesium and francium. All of them have one electron in the valence shell. They are called alkali metals because their hydroxides are strong alkalis. These metals are soft, light and easily fusible. In fact, sodium and potassium are lighter than water. At room temperature they readily get oxidised in air and so are preserved under kerosene in the laboratory.

|           |    |                        |    |                   |      |
|-----------|----|------------------------|----|-------------------|------|
| Lithium   | 3  | 2, 1                   | +1 | Li <sub>2</sub> O | LiOH |
| Sodium    | 11 | 1, 8, 1                | +1 | Na <sub>2</sub> O | NaOH |
| Potassium | 19 | 2, 8, 8, 1             | +1 | K <sub>2</sub> O  | KOH  |
| Rubidium  | 37 | 2, 8, 18, 8, 1         | +1 | Rb <sub>2</sub> O | RbOH |
| Caesium   | 55 | 2, 8, 18, 18, 8, 1     | +1 | Cs <sub>2</sub> O | CsOH |
| Francium  | 87 | 2, 8, 18, 32, 18, 8, 1 | +1 | -                 | -    |

### Halogens

The elements placed in group 7 (VIIA) of the periodic table are called halogens or salt producers. All these elements form salts called halides, e.g. NaCl, NaI, KCl, KI etc. Halogen is an ancient Greek word meaning 'salt producer'. Halogens have seven electrons in their valence shell and so are monovalent.

**Bromine is the only Liquid non-metal. Iodine when heated undergoes sublimation.**

|          |    |                     |    |                          |             |
|----------|----|---------------------|----|--------------------------|-------------|
| Fluorine | 9  | 2, 7                | -1 | Greenish but more yellow |             |
| Chlorine | 17 | 2, 8, 7             | -1 | Greenish yellow Liquid   |             |
| Bromine  | 35 | 2, 8, 18, 7         | -1 | Dark red liquid          |             |
| Iodine   | 53 | 2, 8, 18, 18, 7     | -1 | Solid                    | Dark purple |
| Astatine | 85 | 2, 8, 18, 32, 18, 7 | -1 | -                        | -           |

## Transition Elements

All the elements belonging to 3 to 12 groups are called transition elements. They resemble each other in several physical and chemical properties. They are all metals. They are called transition elements because they are placed between the most reactive metals on the left and non-metals on the right. Their compounds are coloured. They exhibit variable valency.

## Inner-transition Elements

The 6<sup>th</sup> period consists of elements that have atomic numbers 58 to 71. They are called Lanthanides. The 7<sup>th</sup> period consists of elements that have atomic numbers 90 to 105. They are called Actinides. Both of them are called inner transition elements. Lanthanides and actinides are not accommodated in the main body of the periodic table but are placed in separate rows in form of two series at the bottom of the modern periodic table. The 7<sup>th</sup> period is an incomplete period as it has only 23 elements.

## TRENDS IN THE MODERN PERIODIC TABLE

**Valency:- The combining capacity of an atom or ion is called valency.**

- The valency of an element is determined by the number of valence electrons present in its outermost shell.
- In a group, all the elements have the same number of valence electrons.
- On moving from left to right in each short period, the valency increases from 1 to 4 and then decreases to zero.

**Atomic Size:- The distance between center of the nucleus and electron cloud present in outermost orbit of an atom or ion is called atomic size (atomic radius or ionic radius)**

Atomic size refers to the radius of the atom.

It is the distance between the centre of the nucleus and the outermost shell of an isolated atom.

In a period, the atomic radius decreases from left to right. This is because electrons are added to the same shell and so they experience a greater pull from the nucleus.

Moving in a group from top to bottom, the atomic radius increases as new shells are added, resulting in the outermost electrons being farther away from the nucleus.

## **Metallic & Non-metallic Properties**

Metals show a tendency to lose electrons and are said to be electropositive.

Non-metals show a tendency to accept or share electrons and are said to be electronegative.

Moving from left to right in a period, the metallic character decreases and the non-metallic character increases. The atomic size decreases and so electrons are not released easily.

In a group, the metallic character increases from top to bottom and the non-metallic character decreases. This is because, as the atomic size increases the valence electrons can be easily removed.

Elements on the left of the periodic table are all metals and on the right of the periodic table are all non-metals.

A zigzag line in the periodic table separates the metals from non-metals. The borderline elements show intermediate properties and are called metalloids.

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