



### Chemistry of Main Group Elements

Aerospace Engineering

**Instructor Name:** Prof. Maravanji Shivaramiah Balakrishna

**Institute:** IIT Bombay

**Department:** Chemistry and Biochemistry

**About Instructor:** Joined the department of chemistry in 1996. Taught inorganic chemistry, molecular spectroscopy, organometallic chemistry of main group elements to UG, PG and Ph.D. scholars. Research interests: Main group and transition metal chemistry, Organophosphorus chemistry, homogeneous catalysis and biological applications of copper(I) complexes. Published 170 research papers and supervised 18 Ph.D. and at present 10 doctoral students and 2 PDFs are working in the group.

**Pre Requisites:** : 12th Grade Chemistry Knowledge

**Core/Elective:** : Core

**UG/PG:** : UG

**Industry Support** : This course is very useful for those working in pharmaceutical industries

**Course Intro:** : This course on "Chemistry of Main Group Elements" focuses on the chemistry of s- and p-block elements, structure and bonding concepts and systematic understanding of their chemical reactivity. Organometallic chemistry of main group elements with special emphasis on their applications in organic synthesis is also included in the discussion. Various applications of main group elements and their compounds is also added into the lectures.

#### COURSE PLAN

SL.NO	Week	Module Name
1	1	Basic concepts of chemistry, Ionization energy, electron affinity and electronegativity, Periodic trends among main group elements, Classification of compounds of main group elements.
2	2	Introductions to s- and p-block element-Hydrides, Oxides, (also sulphides, selenides) and Halides. Introduction to structure and bonding concepts starting from Lewis dot structures.
3	3	Valence shell electron pair repulsion theory (VSEPR), Basic concepts of VSEPR, Molecules with non-bonding pairs of electrons, Molecules with multiple bonds, Molecules and ions with more than six electron pairs, Dative bonds and resonances, Bent's rule and problems, worked examples
4	4	Molecular Orbital Theory, Examples of diatomic, triatomic and polyatomic molecules, Chemistry of hydrogen



5	5	Chemistry of s-block elements: Chemistry of alkali metals, Chemistry of alkaline earth metals
6	6	Chemistry of p-block elements: Group 13 elements, Wade's rules and Group 14 elements
7	7	Group 15 elements and Group 16 elements
8	8	Group 17 elements and Group 18 elements
9	9	Chemistry of group 12 elements. Main group rings, cages and clusters
10	10	Organometallic chemistry of main group elements: s-Block elements
11	11	Organometallic chemistry of main group elements: p-Block elements
12	12	Applications of main group elements and their compounds and summary