

**Subject Code: 02CY0201**
**Subject Name: Chemistry-III**
**B.Sc. Sem - III**
**Objectives:**

- To study the properties of the 's' and 'p' block elements.
- To study the nomenclature, methods of preparation, physical properties, chemical properties, stability of cycloalkanes.
- To study the acid and base chemistry and Ionic equilibrium.
- To details study about hydrolysis and Ionic solids.

**Credits Earned:** 6 Credits

**Course Outcomes:** After completion of this course, student will be able to

- Understand the behaviour and the involvement of the elements from periodic table while knowing the general chemistry.
- Be aware of the basics of cycloalkanes; their methods of preparation, properties and stability.
- Obtain the information regarding 's' and 'p' block elements and their applications.
- Understand the basic of hydrolysis, Ionic solids and their various studies.

**Pre-requisite of course:** Before studying fundamental chemistry part III, all students must have knowledge of periodic table studied in 12<sup>th</sup> standard level. This unit also requires slight knowledge of term "Hydrolysis". Prior knowledge of organic chemistry is important (mainly 12<sup>th</sup> standard level).

**Teaching and Examination Scheme**

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA	CSE	Viva (V)	Term Work (TW)	
5	-	2	6	50	30	20	25	25	150

**Contents**

Unit	Topics	Contact Hours
1	<b>Chemistry of s &amp; p block elements:</b> Introduction, Characteristics of s and p block elements, metal character, Polarizing power, Hydration energy, inert pair effect, Relative stability of different oxidation state, Anomalous behavior, Formation of complex, biological importance of some s-block elements.	15
2	<b>Cycloalkanes</b> Nomenclature, methods of preparation, physical properties, chemical properties, stability of cycloalkanes, Baeyer Strain Theory, Sachtmayer theory.	12
3	<b>Acids, Bases and Ionic equilibrium</b> Introduction, Degree of ionization and factors affecting degree of ionization. Ionization constants of weak acids and bases. Solubility, Solubility products of sparingly soluble salts, Ionic product, Applications of solubility product. Hydrolysis of salts, Relation among $K_b$ , $K_a$ , or $K_b$ and $K_w$ . Degree of hydrolysis and pH of the solution of salts of weak acids and strong bases, salts of weak bases and strong acids and salts of weak bases and weak acids. Buffer solutions, Definition and types of buffer solutions, Buffer action, Derivation of Henderson-Hasselbalch equation. Numericals.	15
4	<b>Ionic Solids</b> Introduction, Characteristics of ionic solids, Lattice energy, Born-Haber cycle, Max-Born equation for the calculation of lattice energy, Radius ratio effect and coordination number, Derivation of radius ratio, Bravais lattice, Close packed structures, Classification of ionic structures, Lattice defects, Stoichiometric defects, Non stoichiometric defects, Semiconductor.	18
<b>Total Hours</b>		<b>60</b>

**References:**

1. A Textbook of Physical Chemistry; K. L. Kapoor
2. An Introduction to Chemical Thermodynamics; R. P. Rastogi, R. R. Misra, 6<sup>th</sup> Edition, Vikas Pub. Pvt. Ltd.
3. Physical Chemistry; G. W. Castellan, 3<sup>rd</sup> Edition, Narosa Publishing House, New Delhi.
4. Physical Chemistry; Arun Bahl & J. D. Tuli, S. Chand Publishing.
5. Organic Reactions and their Mechanisms; P. S. Kalsi, New Age International Publishers.
6. Organic Chemistry; R. T. Morrison and R. N. Boyd, 6<sup>th</sup> Edition, Prentice Hall of India.

**Chemistry**

7. Concise Inorganic Chemistry; J. D. Lee, 5<sup>th</sup> Edition, Blackwell Science, London.
8. Basic Inorganic Chemistry; F. A. Cotton, G. Wilkinson
9. Principles of Inorganic Chemistry; B. R. Puri, L. R. Sharma, K. C. Kalia, Vallabh Publications, Delhi
10. Organic Chemistry; Morrison and Boyd
11. Organic Chemistry (Volume I, II & III); S. M. Mukherji, S. P. Singh, R. P. Kapoor.
12. Principles of physical chemistry; B.R. Puri, L.R. Sharma, M.S. Pathania.

**Suggested Theory distribution:**

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	30%	25%	15%	10%	-

**Qualitative Analysis:**

1. Qualitative analysis of given unknown organic compound. [Monofunctional, compound 1]
2. Qualitative analysis of given unknown organic compound. [Monofunctional, compound 2]
3. Qualitative analysis of given unknown organic compound. [Monofunctional, compound 3]
4. Qualitative analysis of given unknown organic compound. [Monofunctional, compound 4]
5. Qualitative analysis of given unknown inorganic salt. [ Two radicals, 1]
6. Qualitative analysis of given unknown inorganic salt. [ Two radicals, 2]
7. Qualitative analysis of given unknown inorganic salt. [ Two radicals, 3]
8. Qualitative analysis of given unknown inorganic salt. [ Two radicals, 4]

**Reference Books**

1. An Advanced Course in Practical Chemistry, A. K. Nad, B. Mahapatra and A. Ghoshal, New Central Book Agency (P) Ltd.
2. Practicals in Physical Chemistry, P S Sindhu, Macmillan.
3. Experimental Physical Chemistry: A Laboratory Textbook, Arthur Halpern, George McBane, W. H. Freeman.

**Instructional Method:**

1. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
2. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
3. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
4. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory
5. Use of hazardous/toxic chemicals should be avoided as far as possible in laboratory.
6. All students in the laboratory must wear safety goggles and lab coats during lab session.

**Supplementary Resources:**

1. <http://nptel.ac.in/course.php?disciplineId=104>
2. <http://ocw.mit.edu/courses/chemistry/>
3. <http://vlab.amrita.edu/index.php?sub=2>
4. [http://www.vlab.co.in/ba\\_labs\\_all.php?id=9](http://www.vlab.co.in/ba_labs_all.php?id=9)
5. <https://www.youtube.com/user/TMPChem>
6. <https://www.youtube.com/playlist?list=PL166048DD75B05C0D>
7. <https://www.youtube.com/channel/UCqk-dmk3AOFtikaFDpsZorg>
8. <https://www.youtube.com/user/PradeepKshetrapal>