

**Subject Code: 02CY0301**
**Subject Name: Inorganic and Industrial Chemistry**
**B.Sc. Sem - V**
**Objectives:**

- To study the introduction of coordination chemistry.
- To make students capable of understanding the basics of wave mechanics.
- To study the introduction, properties, manufacture of cement.
- To study the introduction of ceramics, glass and refractory's.
- To study pesticides and Insecticides.

**Credits Earned: 6 Credits**
**Course Outcomes:** After completion of this course, student will be able to

- Understand the concepts of coordination chemistry.
- Be aware of the basics of wave mechanics
- Obtain the information regarding cement.
- Understand the basic of ceramic, glass and refractory's.
- Will know more about pesticides and insecticides.

**Pre-requisite of course:** To understand this course general knowledge and basics of chemistry needed .

**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**

<b>Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Coordination Chemistry:</b> Introduction, Double salts, coordination compounds, coordination complexes and complexes ions, coordination number, classification of ligands, valence bond theory, crystal field theory, crystal field splitting of energy levels, magnetic properties of metal complexes and crystal field theory, ligand field theory, Jahn Teller effect, multi electron system.	15
2	<b>Wave mechanics:</b> Introduction, operators, Algebra of operators, multiplication of operators, commutative property, linear operator, commutator of operator, operator $\nabla$ and $\nabla^2$ , momentum operator, Hamiltonian operator, particle in a one-dimensional box, Wave function and energy of a particle in one dimensional box.	15
3	<b>Cement</b> Introduction, types of cement, raw materials, cement rock beneficiation, Manufacturing process of cement, Setting and hardening of Portland cement, Properties of cement, Indian standards institute (ISI) specification of cement, Mortars and concrete, Curing and decay of concrete, Uses of cement.	15
4	<b>Ceramic, Glass and Refractories</b> Introduction to ceramics, raw materials, classification based on reduction in porosity, manufacturing, body preparation using clay slip. Introduction to glass, physical and chemical properties of glass, raw materials, methods of manufacturing, special types of glasses. Introduction to refractories, classification of refractories, properties of refractories, manufacturing, fire clay bricks manufacture, properties and uses.	15
<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.
8. Concise Inorganic Chemistry; J. D. Lee, 5<sup>th</sup> Edition, Blackwell Science, London.

9. Basic Inorganic Chemistry; F. A. Cotton, G. Wilkinson
10. Principles of Inorganic Chemistry; B. R. Puri, L. R. Sharma, K. C. Kalia, Vallabh Publications, Delhi
11. Organic Chemistry; Morrison and Boyd
12. Organic Chemistry (Volume I, II & III); S. M. Mukherji, S. P. Singh, R. P. Kapoor.
13. 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%	-

**Inorganic Qualitative Analysis:**

1. Aim: Qualitative analysis of given unknown inorganic salt.[Six radicals, mixture 1]
2. Aim: Qualitative analysis of given unknown inorganic salt.[Six radicals, mixture 2]
3. Aim: Qualitative analysis of given unknown inorganic salt.[Six radicals, mixture 3]
4. Aim: Qualitative analysis of given unknown inorganic salt.[Six radicals, mixture 4]
5. Aim: Qualitative analysis of given unknown inorganic salt.[Six radicals, mixture 5]
6. Aim: Qualitative analysis of given unknown inorganic salt.[Six radicals, mixture 6]

**Inorganic Volumetric Analysis:**

7. To determine the amount of  $\text{Ni}^{+2}$  in the given  $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$  solution using 0.01 M EDTA solution. (Direct and Back titration method)
8. To determine the amount of  $\text{Mg}^{+2}$  and  $\text{Pb}^{+2}$  in the given solution containing a mixture of  $\text{Mg}^{+2}$  and  $\text{Pb}^{+2}$  using 0.01 M EDTA solution.

**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-dmk3AOfrikaFDpsZorg>
8. <https://www.youtube.com/user/PradeepKshetrapal>