Syllabus for Bachelor of Science

Chemistry

Subject Code: 02CY0152

Subject Name: Fundamental Chemistry-II

B.Sc. Sem - II

Objectives:

- To study physical aspects of photochemical reaction.
- To make students capable of understanding the basics of electrochemistry.
- To study the introduction, properties, preparation and reactions of aldehyde and ketones.
- To study the properties of the first transition series elements i.e. 3d block elements.

Credits Earned: 5 Credits

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

- Understand the concepts of photochemical processes.
- Be aware of the basics of reaction mechanism and structure & stability of reacting constituents.
- Obtain the informationregardingfirst transition series and their applications.
- Understand the basic of electrochemical reactions and their construction.
- Gain the detail knowledge of'd' block elements and their variable oxidation states, which is of great interest for the formation of catalyst.

Pre-requisite of course: Before studying fundamental chemistry part II, all students must have superficial knowledge of periodic table studied in 12^{th} standard level. This unit also require basic knowledge of photochemistry and photochemical effect for the better understanding of the subject.

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)	
4	-	2	5	50	30	20	25	25	150

Contents

Unit	Topics	Contact Hours
1	**Photochemistry** Introduction. Law of Photochemistry: Grothus-Drapper law, Lambert-Beers law, Stark-Einstein's law. Quantum efficiency and factors affecting quantum efficiency, Quantum yield. Reasons for low and high quantum yield. Photo sensitization, Photosensitized reactions. Kinetics of HI decomposition, H_2-Br_2reaction, dimerisation of anthracene. Decay of excited states by radiative and non-radiative paths. Fluorescence and phosphorescence, Jablonsky diagram, Chemiluminescence.	15
2	**Electromotive Force** Introduction, Types of electrochemical cells and examples, Half-cell, Reversible and irreversible cell, Convention sign, Types of electrodes, cell reactions, Representation of cell, emf of cell, emf series. Thermodynamic derivation of Nernst equation. Standard cells. Half-cells/electrodes, different types of electrodes (with examples). Standard electrode potential (IUPAC convention) and principles of its determination. Types of cells: electrolytic, galvanic and concentration cells. Liquid junction potential andits minimization.	15
3	**Aldehyde and Ketone** Introduction, Structure, Nomenclature, Nature of carbonyl group, methods of synthesis, Preparation of ketones by use of organocopper compounds, physical properties, relative reactivities and distinction of aldehydes and ketones. Nucleophilic addition, Oxidation, Reduction, Addition of cyanide, Addition of derivatives of ammonia, Addition of alcohols. Acetal formation, Iodoform test, Acidity of α–hydrogens, Reactions involving carbanions, Base-promoted halogenation of ketones, Acid-catalized halogenation of ketones: Enolization, Aldol condensation, Dehydration of aldol products, Use of aldol condensation in synthesis, Crossed aldol condensation, claisen condensation, Cannizzaro reaction, Perkin reaction, Benzoin condensation reactions.	15
4	**Elements of the First Transition Series** Introduction and definition, Electronic configuration, General comparison of 3d, 4d and 5d elements in term of electronic configuration, Reversal of Energies of 3d and 4s orbitals. Physical properties: elemental forms, metallic nature, crystal structure, conductivity, density, catalytic properties, tendency of formation of alloys. Effective nuclear charges, screening effects, Slater's rules. Atomic properties: atomic and ionic radii, atomization energy, oxidation states, redox properties and their stability. Magnetic properties: spectral character, coordination chemistry, magnetic behavior, interstitial compounds.	15
Total Hours		**60**

References:

1. A Textbook of Physical Chemistry;K. L. Kapoor
2. An Introduction to Chemical Thermodynamics; R. P. Rastogi, R. R. Misra, 6thEdition, Vikas Pub. Pvt. Ltd.
3. Physical Chemistry; G. W. Castellan, 3rdEdition,Narosa Publishing House, NewDelhi.
4. Physical Chemistry; ArunBahl& 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, 6thEdition, PrenticeHall of India.
8. Concise Inorganic Chemistry; J. D. Lee, 5thEdition, 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%	-

Suggested List of Experiments:

Qualitative Analysis:

1. To perform qualitative test for given known inorganic compound.
2. To perform qualitative test for given known inorganic compound.
3. To perform qualitative test for given known inorganic compound.
4. To perform qualitative test for given known organic compound.
5. To perform qualitative test for given known organic compound.

Crystallization/Purification:

6. To crystallise the pure compound from an impure sample of Copper sulphate.
7. To crystallise the pure compound from an impure sample of Benzoic acid.

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
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
9. https://www.youtube.com/watch?v=2iqUB_N-uzw