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| INSTITUTE | FACULTY OF SCIENCE |
| PROGRAM | BACHELOR OF SCIENCE (CHEMISTRY) |
| SEMESTER | 2 |
| COURSE TITLE | GENERAL CHEMISTRY-II |
| COURSE CODE | 02CY0153 |
| COURSE CREDITS | 4 |

Objective:

- 1 To understand the scope and principle of adsorption and water analysis.
- 2 To explain the important features of amines with its classification and synthesis.
- 3 To understand the classification of elements and periodicity in properties.
- 4 To acquire knowledge regarding the second law of thermodynamics with Carnot cycle and heat engines.

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

- 1 Understand the basic idea of water analysis and adsorption.
- 2 Be aware with the classification of elements and periodicity in property.
- 3 Capable to explain division of s, p, d and f blocks and their electronic configuration.
- 4 Obtain the basic idea of second law of Thermodynamics.
- 5 Get the idea of various thermochemical processes and their applications.

Pre-requisite of course: Students should have basic conceptual clarity of chemistry at 12th standard level. Student must have known the knowledge of thermodynamics laws and some basics of adsorption and water analysis studies.

Teaching and Examination Scheme

| Theory Hours | Tutorial Hours | Practical Hours | ESE | IA | CSE | Viva | Term Work |
|---------------------|-----------------------|------------------------|------------|-----------|------------|-------------|------------------|
| 4 | 0 | 0 | 50 | 30 | 20 | 0 | 0 |

| Contents : Unit | Topics | Contact Hours |
|------------------------|---|----------------------|
| 1 | Adsorption and water analysis Introduction of adsorption, definition of adsorbent, adsorbate, adsorption, absorption, sorption, desorption, types of adsorptions, physical and chemical adsorption, difference between them, factor affection adsorption, adsorption isotherm, Freundlich and Langmuir adsorption isotherm. Water analysis, total solid and volatile solid, non-filterable solids and non-filterable volatile solids, filterable solids, total dissolved solid (TDS), total suspended solids (TSS), acidity, basicity, turbidity, hardness of water, soap method. | 15 |

| Contents : Unit | Topics | Contact Hours |
|----------------------------|---|--------------------------|
| 2 | Amines Introduction, definition and classification of amines, nomenclature of amines, properties: physical and chemical, preparation of amines: from reduction of nitro compounds, halides, Hoffmann degradation and alcohols, chemical reaction of amines: reaction with alkyl halides, acid chlorides, preparation of diazonium salt and its uses, sulphonation of aromatic amines. | 15 |
| 3 | Classification of elements and periodicity in properties Introduction, Mendeleev's periodic law, modern periodic law, cause of periodicity, Bohr's table, structure features of Bohr's table, nomenclature, division of s, p, d and f blocks and their electronic configuration, periodic properties: atomic radius, ionic radii, ionisation potential and electronegativity. | 15 |
| 4 | Second law of thermodynamics Introduction, process, spontaneous processes, nonspontaneous processes, criteria of spontaneity, statement of the second law, cyclic process, the Carnot cycle, heat engines, efficiency of a heat engine, first operation-isothermal reversible expansion, second operation-adiabatic reversible expansion, third operation-isothermal reversible compression, fourth operation-adiabatic reversible compression, net heat absorbed in one cycle, calculation of thermodynamic efficiency, Carnot theorem, entropy change in an irreversible process, the Clapeyron equation, Clausius–Clapeyron equation, numerical. | 15 |
| Total Hours | | 60 |

Textbook :

- 1 Water pollution, V.P. Kudesia, Pragati Prakashan, 2001
- 2 A Textbook of Organic Chemistry, B.S. Bahl, A. Bahl, S. Chand Publishing, 2017

References:

- 1 Concise Inorganic Chemistry, Concise Inorganic Chemistry, J.D. Lee, Blackwell Science Ltd., London., 2002
- 2 Principles of Inorganic Chemistry, Principles of Inorganic Chemistry, B.R. Puri, L.R. Sharma, Milestone Publishers, New Delhi, 2013
- 3 Inorganic Chemistry, 3rd Edition, Inorganic Chemistry, 3rd Edition, D.F. Shriver, P.W. Atkins, Oxford University Press, 2010
- 4 A Textbook of Physical Chemistry, 3rd Edition, A Textbook of Physical Chemistry, 3rd Edition, K.L. Kapoor, Macmillan India Ltd. , 2013
- 5 An Introduction to Chemical Thermodynamics, 6th Edition, An Introduction to Chemical Thermodynamics, 6th Edition, R. P. Rastogi, R.R. Misra, Vikas Pub. Pvt. Ltd, 2003
- 6 Essentials of Physical Chemistry, Essentials of Physical Chemistry, A. Bahl, J.D Tuli, S. Chand Publishing, 2022

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as 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 / Knowledge | Understand | Apply | Analyze | Evaluate | Higher order Thinking / Creative |
| 20.00 | 30.00 | 25.00 | 15.00 | 10.00 | 0.00 |

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 class-room.
- 3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.
- 4 Measure progress in different ways, through projects, portfolios and participation.
- 5 Use visual cues, instructional videos, promote handwritten notes and allow time to students for questions.

Supplementary Resources:

- 1 <http://www.nptel.ac.in/courses/104103069/#>
- 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.khanacademy.org/science/chemistry>
- 6 <https://www.bozemanscience.com/ap-chemistry>
- 7 <https://chem.libretexts.org/>