

Keywords: s-Block Elements, p-Block Elements, Borazine, Silicones, Silicates, Solutions in Ammonia, Anomalous Behaviour, Inorganic Polymers, Oxides, Oxyacids.

11.2.12. Course Code: CHEMISTRY(DSE-C6)

Course Title: Active Methylene Compounds, Polynuclear hydrocarbon and Heterocyclic compounds

Total Credits: 04 (Credits: Theory-02, Practical-02)
(Total Lectures: Theory- 30, Practical-60)

Objectives: The purpose of this course to introduce the chemistry and applications of polynuclear hydrocarbons, active methylene and heterocyclic compounds. The learners are introduced to spectroscopy, an important analytical tool which allows identification of organic compounds by correlating their spectra to structure.

Learning Outcomes:

By the end of the course, the students will be able to:

- Understand the fundamentals of functional group chemistry, polynuclear hydrocarbons and heterocyclic compounds through the study of methods of preparation, properties and chemical reactions with underlying mechanism.
- Become familiar with their particular properties, chemical reactions, criterion of aromaticity with reference to polynuclear hydrocarbons and heterocyclic compounds, trends in basicity of amines and heterocyclic compounds and their behaviour at different pH.
- Understand the Synthetic applications of these compounds including their medicinal applications through their reaction chemistry.

Unit I: Active methylene compounds

Preparation and reactions, Claisen ester condensation, Keto-enol tautomerism. Reactions: Synthetic uses of ethylacetoacetate and malonic esters (preparation of non-heteromolecules having up to 6 carbons).

(Lectures: 08)

Unit II: Polynuclear Aromatic compounds:

Introduction, Classification, Structure, Nomenclature and uses. Aromaticity of polynuclear hydrocarbons, structure elucidation of Naphthalene and general methods of preparation of naphthalene, phenanthrene and anthracene (including Haworth method, Friedel Craft acylation, Diels Alder reaction and Pschorr Synthesis).

Relative reactivity of naphthalene, phenanthrene and anthracene in comparison to benzene.

Properties: Physical properties, discussion on the following reaction (with mechanism) for Naphthalene, Anthracene and Phenanthrene: Addition reactions, Oxidation, Electrophilic substitution- Friedel Craft reaction, Chloromethylation, Halogenation, Formylation, Nitration and sulphonation. Reduction reaction and Diels Alder reaction.

(Lectures:09)

UNIT-III: Heterocyclic Compounds

Introduction, importance, classification and nomenclature of heterocyclic compounds (containing only one hetero atom). General discussion on the following aspects of heterocyclic compounds: Structure, aromaticity in 5-membered and 6-membered rings containing one heteroatom; Basicity and relative reactivity towards electrophilic substitution reactions (amongst five membered and six membered rings)

General methods of synthesis for: Furan, Pyrrole (Paal-Knorr synthesis, Hantzsch synthesis), Thiophene, Pyridine (Hantzsch synthesis), Properties: Physical properties, discussion on the following reaction (with mechanism) for Furan, Pyrrole, thiophene, Pyridine- Electrophilic substitution- Nitration, sulphonation, halogenation, Formylation, acylation, mercuration and carboxylation. Oxidation, Reduction, Addition, Reactions showing acidic /basic character. Reaction with diazonium salts, Ring opening, Ring expansion and Nucleophilic substitution reaction wherever applicable should be discussed

(Lectures:13)

PRACTICALS (Credits: 02, Laboratory Periods-60)

1. Nitration of simple compounds like Chlorobenzene/Bromobenzene.
2. Benzoylation of p-toluidine (or any other compound).
3. Oxidation of toluene to benzoic acid.
4. Detection of Nitrogen/sulphur/halogens in the given organic compound.
5. Systematic identification of bifunctional compounds (Salicylic Acid, Cinnamic acid and nitro phenols) and preparation of their derivatives.
6. Systematic identification of Aromatic hydrocarbons and aryl halides.
7. Multistep synthesis: (a) Cyclohexanone to caprolactam (b) Aniline to p-bromo aniline

REFERENCES:

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Teaching Learning Process:

- Conventional chalk and board teaching,
- Class interactions and discussions

Assessment Methods:

- Class Tests at Periodic Intervals.
- Written assignment (s) / Presentation by individual students
- End semester University Theory and Practical Examination

Keywords: Polynuclear Aromatic Compounds, Active Methylene Compounds, Heterocyclic Compounds.

11.2.13. Course Code: CHEMISTRY(DSE-RM)

Course Title: RESEARCH METHODOLOGY FOR CHEMISTS

Total Credits: 04 (Credits: Theory-03, Practical-01)
(Total Lectures: Theory- 45, Practical-30)

Objectives: To make the students aware of fundamental but mandatory ethical practices in chemistry. To make the students aware of data analysis. To make the students aware of literature survey in different modes. To make the students aware of safety handling and safe storage of chemicals. This paper will help student to learn to avoid plagiarism. To learn different e-resources.

Learning Outcomes:

By the end of the course, the students will be able to:

- Ethical practices in chemistry
- Data analysis
- Literature survey in different modes
- Three R (recovery, recycling and reuse of laboratory chemicals).
- e-resources.
- Plagiarism, consequences

Unit 1: Literature Survey

Print: Sources of information: Primary, secondary, tertiary sources; Journals: Journal abbreviations, abstracts, current titles, reviews, monographs, dictionaries, text-books, current contents, Introduction to Chemical Abstracts and Beilstein, Subject Index, Substance Index, Author Index, Formula Index, and other Indices with examples.