

UNIVERSITY OF MADRAS
B.Sc. DEGREE COURSE IN CHEMISTRY
SYLLABUS WITH EFFECT FROM 2020-2021

BCY-DSC05

CORE-V: GENERAL CHEMISTRY-IV

Learning Outcomes

1. To understand the chemistry of Redox reactions.
2. To understand the General characteristics of d-Block elements
3. To learn about the preparation and properties of Heterocyclic compounds and dyes.
4. To know about the nomenclature, preparation and properties of alcohols, thiols, ethers and thioethers.
5. To understand the limitation of I law of thermodynamics and the need of II law of thermodynamics.

| SEMESTER | Subject Title | Total Hours | Credit |
|-----------------|------------------------------|--------------------|---------------|
| IV | General Chemistry –IV | 75 | 4 |

UNIT I: CHEMISTRY OF REDOX REACTIONS (10 hrs)

Covalency- oxidation number- oxidation state - difference between oxidation number and valency- rules for calculating oxidation number - definition of oxidation and reduction - redox reactions and half reactions - oxidising agents and reducing agents - equivalent weights of oxidising and reducing agents - auto oxidation and induced oxidation - balancing of redox equations by oxidation number method and ion-electron method

UNIT II: CHEMISTRY OF d-BLOCK ELEMENTS (15 hrs)

Transition Elements - Electronic configuration - General periodic trend –Atomic and ionic radii, metallic character, melting and boiling points, ionisation energy, oxidation state, reactivity, colour and tendency to form complexes- Group study of Titanium, Vanadium, Chromium, Manganese, Iron, Cobalt, Nickel and Zinc groups - galvanization, Evidences for the existence of mercurous ion as Hg_2^{2+} .

UNIT III: HETEROCYCLIC COMPOUNDS AND DYES (15 hrs)

3.1 Heterocyclic compounds

Nomenclature, Preparation, properties and reactions of Furan, Pyrrole, Thiophene and Pyridine. Comparative study of basicity of pyrrole and pyridine with aliphatic amines. Synthesis and reactions of Indole, Quinoline and Isoquinoline

3.2 Dyes

Theory of colour and constitution. Preparation and uses of: Azo dye - Bismark brown, Triphenyl methane dye - malachite green, phthalein dye - fluorescein, anthraquinone dye- alizarin and vat dye- indigo.

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UNIT IV:

4.1 Alcohols and thiols (15 hrs)

Monohydric, dihydric (Ethylene glycol) and trihydric (Glycerol) alcohols: Nomenclature, preparation of alcohols from alkenes, alkyl halides, Grignard reagent and carbonyl compounds. Reactions of alcohols-Dehydration, oxidation, action of Grignard reagent, dehydrogenation using copper and esterification.

Thiols: Nomenclature, structure, preparation and properties

4.2 Ethers and thioethers

Ethers: Nomenclature, structure, preparation, properties and uses of dimethyl ether, diethyl ether, ethyl methyl ether, anisole and phenetole.

Thioethers: Nomenclature, structure, preparation, properties and uses.

UNIT 5: Thermodynamics-II (20 hrs)

Second Law of Thermodynamics - Limitations of first law & Need for the second law - Different statements of the law - Carnot's cycle and efficiency of heat engine-Carnot's theorem- Concept of Entropy - Definition and physical significance of entropy - Entropy as a function of P, V and T- Entropy changes during phase changes - Entropy of mixing- Gibb's free energy (G) and Helmholtz free energy (A) - Variation of A and G with P, V and T - Gibb's Helmholtz equation and its applications - Thermodynamic equation of state - Maxwell's relations.

Text Books

1. Puri B.R., Sharma L.R. and Pathania M.S., Principles of Physical Chemistry, 44th ed., New Delhi, Vishal Publishing Co., 2009.
2. Puri B.R., Sharma L.R. and Kalia K.C., Principles of Inorganic Chemistry, 30th ed., New Delhi, Milestone Publishers and Distributors, 2009.
3. Soni P.L., and Chawla H.M., Textbook of Organic Chemistry, 29th ed., New Delhi, Sultan Chand & Sons, 2007.
4. Jain M.K, Sharma S.C. Modern Organic Chemistry, Vishal Publishing Co., 2018

Books for References

1. Glasstone S. And Lewis D., Elements of Physical Chemistry, 2nd ed., MacMillan & Co. Ltd., London.
2. Morrison R.T. and Boyd R.N., Organic Chemistry, 6th ed. Pearson Education, Asia, 2002
3. Bahl B.S. and ArunBahl, Advanced Organic Chemistry, 12th ed., Sultan Chand & Co., New Delhi, 1997.
4. Madan R.D. SathyaPrakash's Modern Inorganic Chemistry, 2nd ed., S.Chand & Co. Ltd, New Delhi, 1990.