

Syllabus (CBCS) For F.Y.B.Sc. Chemistry

w. e. from June 2022

Name of the Programme	: B.Sc. Chemistry
Programme Code	: USCH
Class	: F.Y.B.Sc.
Semester	: I
Course Name	: Physical and Inorganic Chemistry
Course Code	: USCH111
No. of Lecture	: 36

Course Outcome:

- This course makes understanding of use of mathematical concepts in chemistry, correlation in chemical variables graphically.
 - Student should be able to understand basic concepts of mathematics useful to solve problems related to chemistry.
 - Student would be able to learn basic of chemical energetics.
 - Students will be able to apply thermodynamics principles to physical and chemical processes.
 - Students should be able to know states of matter, properties associated and measurement.
 - Students should be able to learn the concepts like mole, molecular weight, equivalent weight, GMV relationship, standardization of solution and balancing the redox reactions should be understood
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SECTION I: PHYSICAL CHEMISTRY (24 L)

Unit I: Chemical Mathematics (8 L)

Functions and variables, variables used in chemistry

Logarithm- Rules of logarithm, Problems based on pH and pOH calculations.

Derivative: Rules of differentiation, partial differentiation, problems related to chemistry,

Integration: Rules of integration, definite and indefinite, problems related to chemistry.

Graph of linear function: Equation of straight line, equation from data of graph, plotting the graph from the data of chemical properties, problems.

Unit II: Gaseous and Liquid States (8 L)

Introduction: States of matter and their properties.

Gaseous state: Significance of ideal and kinetic gas equation (no derivation), Real gases-

Compressibility factor, van der Waal's equation of state, critical constants, correlation between critical constants and van der Waal's constants.

Liquid state: Properties of liquids, vapor pressure and its measurement by isoteniscope method,

Viscosity and its measurements by Ostwald's viscometers,

Liquid crystals: Introduction, their types and applications in various fields.

Unit III: Chemical Energetics (8 L)

Definitions of thermodynamic terms: System, surroundings etc. Types of systems, intensive and extensive properties, State and path functions, Thermodynamic processes, concept of heat and work, First Law of Thermodynamics: Statement, definition of internal energy and enthalpy, Heat capacity, heat capacities at constant volume and pressure and their relationship, work done in reversible isothermal expansion, work done in reversible adiabatic expansion, Joule-Thomson effect, Joule-Thomson coefficient and inversion temperature. Calculation of w , q , dE & dH
Zeroth law of thermodynamics

SECTION II: INORGANIC CHEMISTRY (12 L)**Unit IV: Chemical Stoichiometry (5 L)**

Mole concept-Determination of molecular weight by gram molecular volume relationship, problems based on mole concept
Methods of expressing concentration-strength, normality, molarity, molality, mole fraction, % w/v, % w/w, % v/v, ppt, ppm, ppb,
Standardization of solutions, primary and secondary standard substances, preparation of standard solutions of acids and bases, problems based on acid-base titrations only

Unit V: Oxidation–Reduction (7 L)

Definitions to related terms like oxidation, reduction, oxidizing agent, reducing agent, oxidation number, valency,
Balancing of redox reactions using oxidation number method and ion electron method, Problems based on equivalent weight of oxidant and reductant.

References:

1. Physical Chemistry, P. W. Atkins, ELBS, 5th Edition.
2. Principles of Physical Chemistry, Maron and Prutton, 4th Edition.
3. Physical Chemistry, G.M. Barrow 4th Edition.
4. Essentials of Physical Chemistry, Bhal and Tuli,
5. Principles of Physical Chemistry, Puri, Sharma and Phathania
6. Mathematical Preparation of Physical Chemistry, F. Daniel, McGraw Hill.
7. Concise Inorganic Chemistry, J. D. Lee, 5th Edition
8. Concept and Models of Inorganic Chemistry, Douglas and Daniel, 3rd Edition
9. Inorganic Chemistry, James Hughey

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Name of the Programme	: B.Sc. Chemistry
Programme Code	: USCH
Class	: F.Y.B.Sc.
Semester	: I
Course Name	: Organic and Inorganic Chemistry
Course Code	: USCH112
No. of Lecture	: 36

Course Outcome:

- This course makes understanding of structure, bonding and reactivity of organic molecules.
 - Students are able to draw of organic molecules, and organic compounds.
 - Students should know structure, preparation and reactions of organic compounds and use of possible reagents.
 - Students are expected to methods of preparation and chemical reactions of alkanes, alkenes, alkynes and homocyclic aromatic hydrocarbons and application of Huckel's rule.
 - To familiarize the recent development in chemistry
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SECTION-I: ORGANIC CHEMISTRY (24L)

Unit I: Chemical Bonding and Reactivity of Organic Molecules (6L)

Covalent bond, Hybridization- sp , sp^2 and sp^3 hybridization, Bond length, Bond angle, Bond energy, Inter and Intra molecular forces. Structural effects –Inductive effect, Resonance effect and hyper conjugation.

Unit II: Chemistry of Hydrocarbons (8L)

Aliphatic Hydrocarbons:

Alkanes-Preparations-Catalytic hydrogenation, Wurtz reaction and from Grignard reagent. Reactions of alkanes- halogenation by free radical and pyrolysis.

Alkenes- Preparations- Dehydration, dehydrohalogenation (Saytzeff's elimination), hydrogenation of alkynes –Cis and trans- alkene. Reactions of alkenes- addition of $KMnO_4$, addition of Br_2 , addition of HX (Markovnikov's and anti- Markovnikov's addition), hydration, ozonolysis and hydroboration-oxidation.

Alkynes-Preparations- Dehalogenation, dehydrohalogenation, from CaC_2 and higher alkynes. Reactions-Formation of metal acetylides, addition of Br_2 and ozonolysis.

Aromatic hydrocarbons:

Benzene-Huckel's rule of aromaticity. Reactions of benzene–Sulphonation, Nitration, Halogenation, Friedel Craft reactions.

Unit III: Chemistry of functional groups (10L)

Alkyl halides, Alcohols, Ethers, Carboxylic acids and Phenols- Physical properties, general methods for preparation and reactions.

SECTION II: INORGANIC CHEMISTRY (12 L)

Unit IV: Chemistry of s-block elements (12 L)

Recapitulation of periodic table, special position of Hydrogen in the long form of periodic table, properties of S -block elements with reference to electronic configuration, extraction, trends and properties.

Introduction to crown ether and cryptans, separation of s- block elements using crown ethers. Compounds of s-block elements: oxides, hydroxides, peroxides, superoxide, and halides.

Applications of s-block elements in industrial, biological and agricultural field.

References

1. Organic Chemistry- Clayden ,Oxford Uni. Press
2. Organic Chemistry- Morrison and Boyd,6thEdn.
3. A guide book to Mechanism in Organic Chemistry-Peter Syke, 6thEdn.
4. Bahl A. and Bahl B.S. Advanced Organic Chemistry (2010)
5. Concise Inorganic Chemistry- J. D. Lee, 2nd Edition- Relevant pages.
6. Concept & model of Inorganic Chemistry- Douglas McDoniels, 3rd Edn.
7. New guide to Modern Valance Theory- G. I. Brown, 3rd Edn.
8. Inorganic Chemistry –James Hughey

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Name of the Programme : B.Sc. Chemistry

Programme Code : USCH

Class : F.Y.B.Sc.

Semester : I

Course Name : Chemistry Practical

Course Code : USCH113

No. of Practical : 12

Course Outcome:

- Student should aware about use of chemicals.
 - Student should aware about laboratory safety and safe working methods.
 - Basic experiments in all discipline of chemistry gives understanding of applications of theory which is learn in theory courses.
 - Students will get advantage of learning theory in laboratory through experiments.
 - To adequate students with graph of various mathematical functions.
 - Students will be able to apply mathematical knowledge in graphical representation of experimental data.
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I: Chemical and Lab Safety (Compulsory)

1. Introduction to laboratory. (Do's and Don'ts in laboratory)
2. Precautions in handling of hazardous substances.
3. Safety symbols on label of pack of chemicals and its meaning.
4. Understanding of MSDS of few hazardous chemicals.

II: Physical chemistry (3 Practical)

1. Plotting of function (linear/logarithm/exponential function).
2. Determine the gas constant R in various units by eudiometer method.
3. Determine the relative viscosity of given organic liquids by viscometer.
4. Determine ΔH for the following chemical reactions
$$\text{Zn (s)} + \text{CuSO}_4 \text{ (aq)} \rightarrow \text{Cu(s)} + \text{ZnSO}_4 \text{ (aq)}$$
$$3\text{Mg (s)} + 2\text{FeCl}_3 \text{ (aq)} \rightarrow 2\text{Fe(s)} + 3\text{MgCl}_2 \text{ (aq)}$$
5. Determination of heat capacity of calorimeter for different volumes.

III: Inorganic chemistry (3 Practical)

1. Standardization of NaOH solution and find the strength of given HCl solution.
2. Standardization of KMnO_4 solution and find the strength of given solution.
3. Determine the hardness of water from a given water sample by EDTA method.
4. Analysis of mixed alkali by volumetric method.
5. Determine the number of water molecules of $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}/\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$.

IV: Organic chemistry

(3 Practical)

1. Determine the amount of acetic acid in commercial vinegar volumetrically.
2. Techniques: (Micro scale)
 - i. Crystallization ii. Sublimation
3. Organic Qualitative analysis of single solid compound: Type, Preliminary tests and Physical constant
4. Organic Qualitative analysis of single liquid compound: Type, Preliminary tests and Physical constant
5. Measure the R_f values by Thin layer chromatographic method.

References:

1. Senior practical Physical chemistry, B.D.Khosla and V.S.Garg.
2. Textbook of practical Inorganic Chemistry, A.I.Vogel.
3. Textbook of practical Organic Chemistry, A.I.Vogel.