



**NSCB Memorial Govt. Degree College
Hamirpur
District Hamirpur (H.P.)**



Tel No.: 01972-222227, FAX: 01972-222227, e-Mail: gchamirpur-hp@nic.in

**Teaching Plan
Session (2022-2023)**

Class: B.Sc IInd

**Name of the Teacher: .i) Dr Ratan Chand Sharma
ii) Mrs. Monika Puri
iii) Dr Hem Suman Jamwal**

Subject: CHEMISTRY

Course:

1. SOLUTIONS, PHASE EQUILIBRIUM, CONDUCTANCE, ELECTROCHEMISTRY & ORGANIC CHEMISTRY (CHEM-201TH)

2. CHEMISTRY OF MAIN GROUP ELEMENTS, CHEMICAL ENERGETICS AND EQUILIBRIA (CHEM-202TH)

Room No: 42. (Physics Major)

S. No	Dates	Topics to be covered
Admissions of B. Sc. 2 nd	10-07-2022 to 30-07-2022	Admissions /Orientation
Week 1	01-08-2022 to 06-08-2022	Unique position of Hydrogen in the periodic table, isotopes, ortho and para hydrogen, Industrial production, Hydrides and their chemistry, Heavy water, Hydrogen bonding, Hydrates.
Week 2	08-08-2022 to 13-08-2022	Periodicity of elements with respect to electronic configuration, atomic and ionic size, ionization enthalpy, electron gain enthalpy, electronegativity(Pauling Scale). General characteristics of s-block elements like density, melting points,
Week 3	16-08-2022 to 20-08-2022	General characteristics of s-block elements ,flame colouration and reducing character, solvation and complexation tendencies and solutions of metals in liquid ammonia.
Week 4	22-08-2022 to 27-08-2022	Comparative studies including diagonal relationship of group 13 and 14 elements. Borohydrides, Hydrides, oxide and oxy-acids and halides of boron, borax, Borazine ,allotropic forms of carbon, fullerenes, carbides of calcium and silicon. Hydrides, oxides, oxoacids and halides of nitrogen..
Week 5	22-08-2022 to 27-08-2022	Allotropic forms of phosphorous. Hydrides, halides, oxides and oxyacids of phosphorous. Basic properties of halogens and inter halogen compounds, pseudohalogens and poly halides.
Week 6	29-08-2022 to 03-09-2022	Occurrence of noble gases, History of discovery of noble gases and isolation of noble gases from air. Preparation properties and structure of important compounds of noble gases-fluorides, oxides, oxyfluorides of xenon (valence bond structure only).
Week 7	05-09-2022 to 10-09-2022	Krypton difluoride and clathrate compounds of noble gases. Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law – non-ideal solutions.
Week 8	12-09-2022 to 17-09-2022	Vapour pressure-composition and temperature composition curves of ideal and non-ideal solutions. Distillation of solutions.
Week 9	19-09-2022 to 24-09-2022	Lever rule. Azeotropes. Partial miscibility of liquids: Critical solution temperature; effect of impurity on partial miscibility of liquids. Nernst distribution law and its applications, solvent extraction.
Week 10	26-09-2022 to 01-10-2022	Phases, components and degrees of freedom of a system, criteria of phase equilibrium. Gibbs Phase Rule and its thermodynamic derivation. Derivation of Clausius – Clapeyron equation and its importance in phase equilibria.
Week 11	03-10-2022	Phase diagrams of one-component systems (water and sulphur) and two

	to 08-10-2022	component systems involving eutectics, congruent and incongruent melting points (lead-silver, NaCl-H ₂ O and Mg-Zn only).
Week 12	10-10-2022 to 15-10-2022	Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of ions. Transference number and its experimental determination using Hittorf and Moving boundary methods
Week 13	17-10-2022 to 21-10-2022	Ionic mobility. Applications of conductance measurements: determination of degree of ionization of weak electrolyte, solubility and solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt. Conductometric titrations (only acid base).
	22-10-2022 to 26-10-2022	Diwali Break
Week 14	27-10-2022 to 29-10-2022	Reversible and irreversible cells. Concept of EMF of a cell. Measurement of EMF of a cell. Nernst equation and its importance. Types of electrodes. Standard electrode potential.
Week 15	31-10-2022 to 5-11-2022	Electrochemical series. Thermodynamics of a reversible cell, calculation of thermodynamic properties: ΔG , ΔH and ΔS from EMF data.
Week 16	7-11-2022 to 12-11-2022	Calculation of equilibrium constant from EMF data. Concentration cells with transference and without transference. Liquid junction potential and salt bridge. pH determination using hydrogen electrode and quinhydrone electrode.
Week 17	14-11-2022 to 19-11-2022	Review of thermodynamics and the Laws of Thermodynamics. Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution.
Week 18	21-11-2022 to 26-11- 2022	Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchhoff's equation. Statement of Third Law of thermodynamics and calculation of absolute entropies of substances.
Week 19	28-11-2022 to 03-12-2022	Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between ΔG and ΔG° , Le Chatelier's principle. Relationships between K_p , K_c and K_x for reactions involving ideal gases
Week 20	5-12-2022 to 10-12-2022	Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect.
Week 21	12-12-2022 to 17-12-2022	Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.
Week 22-23	19-12-2022 to 31-12-2022	House Examination
	01-01-2023 to 04-02-2023	Winter vacations
Week 24	06-02-2023 to 11-02- 2023	Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure. Carboxylic acids (aliphatic and aromatic) - Preparation: Acidic and Alkaline hydrolysis of esters. Reactions: Hell – Vohlard - Zelinsky Reaction. Carboxylic acid derivatives (aliphatic): (Upto 5 carbons) - Preparation: Acid chlorides, Anhydrides, Esters and Amides from acids and their inter conversion.
Week 25	13-02-2023 to 18-02- 2023	Reactions: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation. Amines (Aliphatic and Aromatic): (Upto 5 carbons - Preparation: from alkyl halides, Gabriel's Phthalimide synthesis, Hofmann Bromamide reaction.
Week 26	20-02-2023 to 28-02- 2023	Reactions: Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test, reaction with HNO ₂ , Schotten – Baumann Reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation. Diazonium salts: Preparation: from aromatic amines. Reactions: conversion to benzene, phenol, dyes..
		Term End Practical/Theory Examinations

Teaching Plan
Session (2022-2023)

Class: B.Sc IInd

Name of the Teacher: .i) Dr Ratan Chand Sharma
ii) Mrs.Monika Puri
iii) Dr Hem Suman Jamwal

Subject: Practical's Chemistry

Course:

1. SOLUTIONS, PHASE EQUILIBRIUM, CONDUCTANCE, ELECTROCHEMISTRY & ORGANIC CHEMISTRY, (CHEM-201P)

2. CHEMISTRY OF MAIN GROUP ELEMENTS, CHEMICAL ENERGETICS AND EQUILIBRIA (CHEM-202P)

Room No: Lab-I, II,III

Serial No.	Month	List of Experiments
1	August	Determination of distribution coefficient of i) iodine between CCl ₄ and Water ii) benzoic acid between benzene and water i) Determination of cell constant ii) Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid.
2	September	Conductometric titrations: i) Strong acid vs. strong base ii) Weak acid vs. strong base Preparations of organic compounds – Iodoform and Glucosazone
3	October	Separation of amino acids by paper chromatography ii) Determination of the concentration of glycine solution by formylation method. iii) Titration curve of glycine
4	November	Action of salivary amylase on starch v) Effect of temperature on the action of salivary amylase on starch. vi) Differentiation between a reducing and a non reducing sugar.
5	December	Determination of heat capacity of calorimeter for different volumes. 2. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide. Determination of integral enthalpy of solution of salts (KNO ₃ , NH ₄ Cl). 4. Determination of enthalpy of hydration of copper sulphate.
6	February	Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter. b) Preparation of buffer solutions: (i) Sodium acetate-acetic acid (ii) Ammonium chloride-ammonium hydroxide Measurement of the pH of buffer solutions and comparison of the values with theoretical values.



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Teaching Plan

Session (2022-2023)

Class: B.Sc IInd

Name of the Teacher: Dr Hem Suman Jamwal

Subject: Chemistry

Course: 1. BASIC ANALYTICAL CHEMISTRY

2. FUEL CHEMISTRY & CHEMISTRY OF COSMETICS & PERFUMES

Course Code: 1. CHEM-203

2. CHEM-204

Room No: 43

S. No	Dates	Topics to be covered
Admissions of B. Sc. 2 nd	10-07-2022 to 30-07-2022	Admissions /Orientation
Week 8	12-09-2022 to 17-09-2022	Introduction: Introduction to Analytical Chemistry and its interdisciplinary nature. Concept of sampling. Importance of accuracy, precision and sources of error in analytical measurements.
Week 9	19-09-2022 to 24-09-2022	Presentation of experimental data and results, from the point of view of significant figures. Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelation, Chelating agents, use of indicators.
Week 10	26-09-2022 to 01-10-2022	Determination of pH of soil samples. b. Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration. Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods.
Week 11	03-10-2022 to 08-10-2022	Determination of pH, acidity and alkalinity of a water sample. b. Determination of dissolved oxygen (DO) of a water sample. Analysis of food products: Nutritional value of foods, idea about food processing and food preservations and adulteration.
Week 12	10-10-2022 to 15-10-2022	. Identification of adulterants in some common food items like coffee powder, asafoetida, chilli powder, turmeric powder, coriander powder and pulses, etc. b. Analysis of preservatives and colouring matter.
Week 13	17-10-2022 to 21-10-2022	Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value. Coal: Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas and water gas—composition and uses.
	22-10-2022 to 26-10-2022	Diwali Break
Week 14	27-10-2022 to 29-10-2022	Fractionation of coal tar, uses of coal tar bases chemicals, requisites of a good metallurgical coke, Coal gasification (Hydro gasification and Catalytic gasification), Coal liquefaction and Solvent Refining..
Week 15	31-10-2022 to 5-11-2022	Petroleum and Petrochemical Industry: Composition of crude petroleum, Refining and different types of petroleum products and their applications.
Week 16	7-11-2022 to 12-11-2022	Fractional Distillation (Principle and process), Cracking (Thermal and catalytic cracking), Reforming Petroleum and non-petroleum fuels (LPG, CNG, LNG, bio-gas, fuels derived from biomass), fuel from waste, synthetic fuels (gaseous and liquids), clean fuels. Petrochemicals: Vinyl acetate, Propylene oxide, Isoprene, Butadiene, Toluene and its derivatives Xylene.
Week 17	14-11-2022 to 19-11-2022	Lubricants: Classification of lubricants, lubricating oils (conducting and non-conducting) Solid and semisolid lubricants, synthetic lubricants. Properties of lubricants (viscosity index, cloud point, pore point) and their determination.
Week 18	21-11-2022 to 26-11-2022	Definition, general introduction on principles of chromatography, paper chromatography, TLC etc. a. Paper chromatographic separation of mixture of metal ion (Fe ³⁺ and Al ³⁺). b. To compare paint samples by TLC method.

Week 19	28-11-2022 to 03-12-2022	Ion-exchange: Column, ion-exchange chromatography etc. Determination of ion exchange capacity of anion / cation exchange resin (using batch procedure if use of column is not feasible).
Week 20	5-12-2022 to 10-12-2022	Analysis of cosmetics: Major and minor constituents and their function a. Analysis of deodorants and antiperspirants, Al, Zn, boric acid, chloride, sulphate. b. Determination of constituents of talcum powder: Magnesium oxide, Calcium oxide, Zinc oxide and Calcium carbonate by complexometric titration.
Week 21	12-12-2022 to 17-12-2022	To study the use of phenolphthalein in traps cases. b. To analyze arson accelerants. c. To carry out analysis of gasoline. (15 Hours) Suggested Instrumental demonstrations: a. Estimation of macro nutrients: Potassium, Calcium, Magnesium in soil samples by flame photometry. b.
Week 22-23	19-12-2022 to 31-12-2022	House Examination
	01-01-2023 to 04-02-2023	Winter vacations
Week 24	06-02-2023 to 11-02- 2023	Spectrophotometric determination of Iron in Vitamin / Dietary Tablets. Spectrophotometric Identification and Determination of Caffeine and Benzoic Acid in Soft Drink
Week 25	13-02-2023 to 18-02- 2023	A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, suntan lotions, face powder, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours.
Week 26	20-02-2023 to 28-02- 2023	Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, sandalwood oil, eucalyptus, rose oil, 2-phenyl ethyl alcohol, Jasmone, Civetone, Muscone.
		Term End Practical/Theory Examinations