

MATA GUJRI COLLEGE
FATEHGARH SAHIB
(An Autonomous College)

B.Sc. Non-Medical/Medical
PROGRAMME CODE: BSNM/BSM
(Academic Session: 2022-2023)

PROGRAMME BROCHURE
(As approved by Academic Council)



FACULTY OF SCIENCES
P. G. DEPARTMENT OF CHEMISTRY

B.Sc. Non-Medical/Medical Revised syllabus as per UGC guidelines under CBCS
(Choice Based Credit System)

Prof. (Dr.) Baljit Singh
Prof. (Dr.) Sonal Singhal
Mr. Ravinderjeet Singh
Ms. Rachna Bhardwaj
Dr. Ajay Sharma
Mr. Puneet Bhardwaj
Mrs. Priya Sharma

Dr. Kamalpreet Kaur
Ms. Simrat Kaur
Dr. Kiran
Dr. Kuldeep Kaur
Ms. Seema Maheshwari
Dr. Amritpal Singh
Dr. Manpreet Kaur

Programme Name: B.Sc. (Non-Medical/Medical)

Duration: 3 Years

Programme Specific Objectives (PSOs)

The Under Graduates of the B.Sc. (Non-medical/Medical) program are expected to:

PSO1: Demonstrate a thorough knowledge of basic concepts of chemistry and their applications at undergraduate level, which will enable to impart comprehensive knowledge in chemistry and its societal applications.

PSO2: Understand the inter-disciplinary nature of chemistry and to integrate knowledge of mathematics, physics and other disciplines to a wide variety of chemical problems.

PSO3: Learn the laboratory skills needed to, safely conduct experiments and interpret results.

PSO4: Use scientific method to approach and solve real life problems.

PSO5: Demonstrate moral values and professional ethics in their chosen careers and personal life.

Programme Outcomes (POs)

After the completion of the course students will be able to:

PO1: Demonstrate, solve and an understanding of major concepts in all disciplines of chemistry.

PO2: Develop the problem thinking skills and also think logically, independently and draw a meaningful conclusion.

PO3: Create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community.

PO4: Develop various skills such as team work, time management for effectively doing work in laboratories and other concern fields.

PO5: Employ critical thinking and the scientific knowledge to design, carry out, record and analyse the results of chemical reactions.

PO6: To pursue higher studies i.e. M.Sc. and then do some research work for the welfare of mankind.

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Scheme of the Course

Semester	Core Course (CC)	Ability Enhancement Compulsory Course (AECC)	Skill Enhancement Course (SEC)	Discipline Specific Elective (DSE)
I	CC-I Physics	AECC-I Punjabi*/Basic Punjabi** AECC-II Environmental and Road Safety Awareness		
	CC-II Chemistry/Computer Science			
	CC-III Mathematics			
II	CC-IV Physics	AECC-III Punjabi*/Basic Punjabi** AECC-IV English AECC-V Drug Abuse		
	CC-V Chemistry/Computer Science			
	CC-VI Mathematics			
III	CC-VII Physics	AECC-VI Punjabi*/Basic Punjabi**	SEC I (Choose any one) Physics Chemistry Computer Science Mathematics	
	CC-VIII Chemistry/Computer Science			
	CC-IX Mathematics			
IV	CC-X Physics	AECC-VII Punjabi*/Basic Punjabi**	SEC II (Choose any one) Physics Chemistry Computer Science Mathematics	
	CC-XI Chemistry/Computer Science			
	CC-XII Mathematics			
V		AECC-VIII Punjabi*/Basic Punjabi**	SEC III (Choose any one) Physics Chemistry Computer Science Mathematics	DSE -I Physics
				DSE-II Chemistry/ Computer Science
				DSE-III Mathematics
VI		AECC-IX Punjabi*/Basic Punjabi**	SEC IV (Choose any one) Physics Chemistry Computer Science Mathematics	DSE IV Physics
				DSE-V Chemistry/ Computer Science
				DSE-VI Mathematics

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B.Sc.- I (Non- Medical/Medical)
SEMESTER-I

Course	Course Code	Course Name	L T P(Credits)	No. of Lectures	Max. Marks (External+ Internal)
CC-I	BSNM-101	Mechanics	4 0 0 (4)	60	100 (75+25)
CC-I Practical	BSNM-101(P)	Mechanics Lab	0 0 2 (2)	60	50
CC-II	BSNM/BSM-102/ UGCS1901	BSNM/BSM -102 Chemistry: Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons	4 0 0 (4)	60	100 (75+25)
		UGCS1901 Computer Fundamental			
CC-II Practical	BSNM/BSM 102(P)/UGC S1901(P)	BSNM/BSM-102(P) Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons Lab	0 0 2 (2)	60	50
		UGCS1901(P) Software Lab based on office automation tools			
CC-III		Mathematics: Matrices & Calculus	5 1 0 (6)	90	100 (75+25)
	BSECC-104/BAECC-	Punjabi/ Basic Punjabi	5 0 0 (5)	60	100 (75+25)
BAECC-II	BAECC	Environmental and Road safety Awareness	2 0 0 (2)	30	50 (35+15)
			Total Credits:25		Total Marks:550

L-Lecture, T-Tutorial, P-Practical

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B.Sc.- I (Non- Medical/Medical)**SEMESTER II**

Course	Course Code	Course Name	L T P(Credits)	No. of Lectures	Max. Marks (External+ Internal)
CC-IV	BSNM-201	Electricity, Magnetism and EMT	4 0 0 (4)	60	100 (75+25)
CC-IV Practical	BSNM-201(P)	Electricity and Magnetism Lab	0 0 2 (2)	60	50
	BSNM/BSM 202/UGCS 1902	BSNM/BSM -202 Chemical Energetics, Equilibria & Functional Group Organic Chemistry	4 0 0 (4)	60	100 (75+25)
		UGCS-1902 Computer Programming			
	BSNM/BSM 202(P)/ UGCS1902(P)	BSNM/BSM -202(P) Chemical Energetics, Equilibria & Functional Group Organic Chemistry Lab	0 0 2 (2)	60	50
		UGCS1902(P) Software Lab based on Computer Programming			
CC-VI		Theory of Equations & Ordinary Differential Equations	5 1 0 (6)	90	100 (75+25)
BAECC-III	PBIC102/ PBIC-102A	Punjabi/Basic Punjabi	5 0 0 (5)	60	100 (75+25)
BAECC-IV	ENG 1004	English	5 0 0 (5)	60	100 (75+25)
BAECC-V	DA-4001	Drug abuse: Problem, Management and Prevention	Qualifying	60	50 (35+15)
			Total Credits: 28		Total Marks:650

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**B.Sc.- I (Non- Medical/Medical)
SEMESTER-I**

**PAPER BSNM/BSM-102: ATOMIC STRUCTURE, BONDING, GENERAL
ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS**

(Common for B.Sc. Medical and Non-Medical)

Maximum Marks: 100 External Examination:75

Internal Assessment:25

No. of Lectures:60 Time: 3hours

Pass marks:35%

Course Objectives

- This course is intended to learn the basic concepts of inorganic chemistry.
- To emphasize on atomic structure, bonding and periodicity of elements.
- To understand the general concepts of stereochemistry of organic compounds.
- The course will enable the students to learn the basic concepts of chemical

Course Learning Outcomes

On completion of the course students will be able to:

CO1: Define and explain the behaviour and interactions between matter and energy at the atomic level. Quantum mechanics explain the many observed phenomenon like SWE, quantum mechanics etc.

CO2: Explain the theoretical treatment of chemical bonding via valence bond theory and molecular orbital theory.

CO3: Illustrate the fundamental concepts of organic chemistry and know about the nature of bonding in organic molecules.

CO4: Understand and distinguish between geometrical and optical isomerism and analyse the stereochemistry of various organic moieties.

CO5: Explain the various methods of preparation and properties of aliphatic & aromatic hydrocarbons like alkanes, alkenes and alkynes which is the important part of organic synthesis.

INSTRUCTIONS FOR PAPER –SETTER

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The question paper will consist of three units: I, II and III. Unit I and II will have four questions from respective units of the syllabus and will carry 12 marks each. Unit III will consist of 9 questions from the whole syllabus and will carry 3 marks each.

INSTRUCTIONS FOR THE CANDIDATES

The candidate has to attempt 2 questions each from Unit I and II. Unit III is compulsory.

NOTE: Internal assessment will be given on the basis of assignments, mid semester tests and attendance.

UNIT-I

Inorganic Chemistry-1

Atomic Structure:

(30 Hrs.)

Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra.

What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2 , Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wave functions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation). Radial and angular nodes and their significance. Significance of quantum numbers, orbital angular momentum and quantum numbers m_l and m_s . Shapes of s, p and d atomic orbitals, nodal planes, spin quantum number (s) and magnetic spin quantum number (m_s). Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half- filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, anomalous electronic configurations.

(14 Hrs.)

Chemical Bonding and Molecular Structure

Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

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Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangement.

Concept of resonance and resonating structures in various inorganic and organic compounds. MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of heteronuclear diatomic molecules such as CO, NO and NO⁺. Comparison of VB and MO approaches. **(16 Hrs.)**

Unit-II

Organic Chemistry-1(30Hrs.)

Fundamentals of Organic Chemistry

Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals. Aromaticity: Benzenoids and Hückel's rule.

(8 Hrs.)

Stereochemistry

Conformations with respect to ethane, butane and cyclohexane. Concept of chirality. Meso-Configuration: Geometrical and Optical isomerism, Enantiomerism, Diastereomerism and compounds. Threo and erythro; D and L, CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems). Newman projection and Sawhorse formulae, Fischer and flying wedge formulae. **(10 Hrs.)**

Aliphatic Hydrocarbons

Alkanes: Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent.

Reactions: Free radical Substitution: Halogenation.

Alkenes: Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction).

Reactions: cis-addition (alk.KMnO₄) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymercuration-demercuration, Hydroboration-oxidation.

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Alkynes: (Upto 5 Carbons) Preparation: Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides. Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO_4 , ozonolysis and oxidation with hot alk. KMnO_4 . (12 Hrs.)

Books recommended:

- Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.
- Cotton, F.A., Wilkinson, G. & Gaus, P.L. Basic Inorganic Chemistry, 3rded., Wiley.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. Concepts and Models in Inorganic Chemistry, John Wiley & Sons.
- Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
- Graham Solomon, T.W., Fryhle, C.B. & Snyder, S.A. Organic Chemistry, John Wiley & Sons, 2014.
- McMurry, J.E. Fundamentals of Organic Chemistry, 7thEd. Cengage Learning India, Edition 2013.
- Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi, 1988.
- Eliel, E.L. Stereochemistry of Carbon Compounds, Tata McGraw Hill education, 2000.
- Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
- Bahl, A. & Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.

Teaching-learning Activities

Assignments

Quizzes

Visual demonstration using online resources.

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B.Sc.- I (Non- Medical/Medical)
SEMESTER-I
**PAPER-BSNM/BSM-102(P): CHEMISTRY LAB: ATOMIC STRUCTURE,
BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC
HYDROCARBONS**

Maximum Marks: 50

Time allowed: 4 hrs.

Instructions: Practical examination will be conducted in one single day and marks distribution will be as follows:

Notebook: 5 marks Viva: 10 marks

Write-up and Performance: 35 marks

Course Objectives

- To impart skill to students in the mode of quantitative chemical analysis that is used to determine the concentration of an identified analyte.
- Students will learn how to make solutions of different normality, molarity and calibration of apparatus.
- To impart skills to the students to determine the concentration of an analyte of unknown concentrations.

Course Learning Outcomes

On completion of the course students will be able to:

CO1: Perform Various estimations of oxalic acid, sodium carbonate and sodium hydrogen carbonate, Fe (II) ions, Cu (II) ion and understand the concept and able to find the strength and concentration of salt in given solution by volumetric analysis.

CO2: learn and examine the detection of extra elements (N, S, Cl, Br, I) in organic compounds

CO3: learn about applications of the chromatography by Paper and thin Layer chromatography.

UNIT I

Inorganic Chemistry - Volumetric Analysis

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Estimation of oxalic acid by titrating it with KMnO_4 .
3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4 .
4. Estimation of Fe (II) ions by titrating it with $\text{K}_2\text{Cr}_2\text{O}_7$ using internal indicator.

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5. Estimation of Cu (II) ions iodometrically using $\text{Na}_2\text{S}_2\text{O}_3$.

UNIT II

Organic Chemistry

1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing up to two extra elements).
2. Separation of mixtures by Chromatography: Measure the R_f value in each case (combination of two compounds to be given)
 - (a) Identify and separate the components of a given mixture of two amino acids (glycine, aspartic acid, tyrosine or any other amino acid) by paper chromatography or Thin Layer chromatography.
 - (b) Identify and separate the sugars present in the given mixture by paper chromatography or Thin Layer chromatography.

Books recommended:

- Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012
- Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G.,
- Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960

Teaching-learning Activities

Viva voce interviews.

Laboratory-based practical components and experiments.

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(Common for B.Sc. Medical and Non-Medical)

B.Sc.-I (Non-Medical/ Medical)

SEMESTER-II

Paper: BSNM/BSM-202 Chemical Energetics, Equilibria & Functional Group Organic Chemistry

Maximum Marks:100
External Examination: 75
Internal Assesment: 25

No. of lecture:60
Time: 3hours
Pass Marks: 35%

Course Objectives

- Students will learn the basic theories of the electronic structure of materials.
- Students will learn how solid-state theory is applied to describe physical behaviour of solids and electronic devices.
- To understand the significance of the kinetic molecular theory of gases.
- To calculate the solubility of an ionic compound from its solubility product.
- To acquaint the students with aromatic hydrocarbons & halogenated hydrocarbons along with their comparative studies. It is also adequate to have the basic knowledge of alcohol, phenol, ether and carbonyl compounds.

Course Learning Outcomes

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

CO1: Define and explain the concept of thermodynamics and thermochemistry. Formulate the law of thermodynamics for open and closed systems.

CO2: Illustrate the concept of thermodynamic aspects of chemical equilibrium, Le Chatelier's principle. Explain theoretical relationships between K_p , K_c and K_x for reactions involving ideal gases.

CO3: Classify and explain the types of electrolytes, degree of ionization, factors affecting and ionic product of water. Analyse and differentiate between the strength of the acids and bases.

CO4: Explain the various methods of reaction and preparation of aromatic hydrocarbons, alkyl and aryl Halides like nitrile & isonitrile formation, Williamson's ether synthesis, Benzyne Mechanism which play an important role in organic synthesis.

CO5: Explain the various methods of preparation and reaction of alcohol, phenol. The mechanism of various reaction is the major part of organic synthesis.

CO6: Illustrates the various methods of reaction and preparation of aldehyde and ketones. The various reactions with mechanism like Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Meerwein-Ponndorf Verley reduction and many more have biological and pharmaceutical applications which is used as industry purpose.

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UNIT I

Physical Chemistry-1

(30Hrs.)

Chemical Energetics:

Thermodynamics, importance and limitation of thermodynamics, some basic terms used in thermodynamics (system, surroundings, open, closed system, isolated system, state of system, state variables and homogeneous and heterogeneous system).

Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential, enthalpies of solution and dilution. 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.

(10Hrs.)

Chemical Equilibrium:

Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between G and G° , Le Chatelier's principle. Relationships between K_p , K_c and K_x for reactions involving ideal gases.

(8 Hrs.)

Ionic Equilibria:

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. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Applications of solubility product principle: determination of solubilities of sparingly soluble reaction. Salts, predicting precipitation.

(12 Hrs.)

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UNIT II

Organic Chemistry-2

(30Hrs.)

Aromatic Hydrocarbons

Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid.

Reactions:(Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation). (8 Hrs.)

Alkyl and Aryl Halides

Alkyl Halides Types of Nucleophilic Substitution (SN^1 , SN^2) reactions. Preparation: from alkenes and alcohols.

Reactions: hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs substitution.

Aryl Halides Preparation: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions. Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by $-OH$ group) and effect of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 (or $NaNH_2/NH_3$).

(8Hrs.)

Alcohols, Phenols and Ethers

Alcohols: Preparation of 1° , 2° and 3° alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.

Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. $KMnO_4$, acidic dichromate, conc. HNO_3). oxidation of diols. Pinacol-Pinacolone rearrangement.

Phenols: Preparation: Cumene hydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Gattermann-Koch Reaction, Houben-Hoesch Condensation, Schotten-Baumann Reaction.

Ethers (aliphatic and aromatic): Cleavage of ethers with HI

Aldehydes and ketones (aliphatic and aromatic): (Formaldehyde, acetaldehyde, acetone and benzaldehyde)

Preparation: from acid chlorides and from nitriles.

Reactions – Reaction with HCN, ROH, $NaHSO_3$, NH_2-G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-Ponndorf Verley reduction.

(14 Hrs.)

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Books recommended:

- Graham Solomon, T.W., Fryhle, C.B. & Snyder, S.A. Organic Chemistry, John Wiley & Sons, 2014.
- McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.
- Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi, 1988.
- Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
- Bahl, A. & Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.
- Barrow, G.M. Physical Chemistry Tata McGraw-Hill, 2007.
- Castellan, G.W. Physical Chemistry 4th Ed. Narosa, 2004.
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry Cengage Learning India Pvt. Ltd., New Delhi, 2009.
- Mahan, B.H. University Chemistry 3rd Ed. Narosa, 1998.
- Petrucci, R.H. General Chemistry 5th Ed. Macmillan Publishing Co.: New York, 1985.

Teaching-learning Activities:

Assignments

Seminar presentation

Group tutorial work

Use of e-learning resources and self-study materials

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Dr. Manpreet Kaur

B.Sc.- I (Non-Medical/ Medical)
SEMESTER-II
PAPER-BSNM/BSM -202(P)
CHEMISTRY LAB: CHEMICAL ENERGETICS, EQUILIBRIA &
FUNCTIONAL GROUP ORGANIC CHEMISTRY
(Common for B.Sc. Medical and Non-Medical)

Maximum Marks: 50

Time allowed: 4 hrs.

No. of Lectures: 60

Instructions: Practical examination will be conducted in one single day and marks distribution will be as follows:

Notebook: 5 marks Viva: 10 marks

Write-up and Performance: 35 marks

Course Objectives

- To provide the knowledge of thermochemistry including the determination of heat capacity, enthalpy of hydration, enthalpy of ionization, enthalpy of neutralization.
- To provide knowledge in application of organic compounds and also includes pharmaceuticals, peterochemicals and biological importance.

Course Learning Outcomes

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

CO1: learn the enthalpy of neutralization of different acid and bases and enthalpy of hydration of different salts like copper sulphate. This help in differentiate and analyse the exothermic and endothermic reactions.

CO2: Find out the adulteration of different drinks by using pH-meter.

CO3: Record and analyse the result of recrystallization, purification via melting and boiling points, quantitative yield of different organic compounds. This also help in characterization of the compounds and monitor the progress of the reactions.

UNIT I

Physical Chemistry

Thermochemistry

1. Determination of heat capacity of a calorimeter for different volumes using change of enthalpy data of a known system (method of back calculation of heat capacity of calorimeter from known enthalpy of solution or enthalpy of neutralization).

Prof. (Dr.) Baljit Singh
Prof. (Dr.) Sonal Singhal
Mr. Ravinderjeet Singh
Ms. Rachna Bhardwaj
Dr. Ajay Sharma
Mr. Puneet Bhardwaj
Mrs. Priya Sharma

Dr. Kamalpreet Kaur
Ms. Simrat Kaur
Dr. Kiran
Dr. Kuldeep Kaur
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2. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
3. Determination of enthalpy of ionization of acetic acid.
4. Determination of integral enthalpy of solution of salts (KNO_3 , NH_4Cl).
5. Determination of enthalpy of hydration of copper sulphate.
6. Study of the solubility of benzoic acid in water and determination of ΔH .

Ionic Equilibria pH measurements

- a) 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.

UNIT-II

Organic Chemistry

1. Purification of organic compounds by crystallization (from water and alcohol) and distillation.
2. Criteria of Purity: Determination of melting and boiling points.
3. Preparations: Mechanism of various reactions involved to be discussed, Recrystallisation, determination of melting point and calculation of quantitative yields to be done.
(a) Bromination of Phenol/Aniline (b) Benzoylation of amines/phenols
(c) Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone

Books recommended:

- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G.,
- Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.
- Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi, 2011.

Teaching - learning activities:

Viva-voce

Laboratory-based practical components and experiments.

Workshop

Prof. (Dr.) Baljit Singh
Prof. (Dr.) Sonal Singhal
Mr. Ravinderjeet Singh
Ms. Rachna Bhardwaj
Dr. Ajay Sharma
Mr. Puneet Bhardwaj
Mrs. Priya Sharma

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