S.S.D. GIRL's COLLEGE, BATHINDA

Multidisciplinary UG (Chemistry)
B.Sc. / B.Sc. (Honours)
Session 2025-2026
B.Sc. (Medical) Part-1, Sem-1
Chemistry Major-I
Paper Code: BM103

Max Marks: 70
External Semester Exam: 50 **Credits: 03**
Internal Assessments: 20 **Time allowed: 3 Hrs.**
Passing Marks:35%

INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three sections, namely, Section A. B and C. Section A and B will have four questions from the respective section of syllabus. Each question will carry 08 marks and may be segregated into sub-parts. Section C will be compulsory with 09 short-answer type questions of 02 mark each covering the entire syllabus.

INSTRUCTIONS FORSTUDENTS

Students are required to attempt five questions selecting two questions from each of Section A & B while Section-C is Compulsory.

Section A

Atomic Structure

Idea of de-Broglie matter waves, derivation of de- Broglie equation, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, the significance of y and y^2, quantum numbers, radial and angular wave functions (excluding mathematical relations), probability distribution curves in terms of R(r) *vs* r and R(r) *vs* r^2 (for Is, 2s 3s and 2p, 3p, 4p subshells), shapes of *s, p, d* orbitals. Aufbau and Pauli exclusion principles, Hund's rule of multiplicity. Electronic configurations of the elements and ions (Atomic number up to 30).

Periodic Properties

Position of elements in the periodic table; effective nuclear charge and its calculations, atomic and ionic radii, ionization energy, electron affinity, and electronegativity -definition, trends in the periodic table.

Structure and Bonding

Hybridization, Bond length and bond angles, Bond Energy, Localized and Delocalized chemical bond, Van der Waal's interaction (dipole-dipole; dipole-induced dipole; induced dipole - induced dipole interactions), Resonance, Hyperconjugation, Inductive and Hydrogen Bonding.

Reaction Intermediates

Curved arrow notation, Drawing electron movements with arrows, half-headed and double headed arrows, hemolytic and heterolytic bond breaking, Types of reagents (Types, structure and stability)- Electrophiles and Nucleophiles, Reactive intermediates Carbocations, Carbanions, Free Radicals.

Section - B

Alkanes

Structure, IUPAC Nomenclature, and Isomerism. Methods of Preparation (from alkyl halide, Wurtz reaction, Corey-House synthesis), Physical properties, Halogenation of alkanes and its mechanism -Relative reactivities of halogens, and different classes of hydrogen atoms; Reactivity, and Selectivity.

Chemical Kinetics-I

Chemical kinetics and its scope, Rate of a reaction, factors influencing the rate of a reaction (qualitative analysis only) - concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions- zero order, first order, second order, pseudo-order, half-life, and mean life. Determination of the order of reaction - differential method, method of integration, method of half-life period, and isolation method. Radioactive decay as a first-order phenomenon (only numerical).

Chemical Kinetics-II

Theories of Chemical Kinetics, Effect of temperature on rate of reaction, Arrhenius equation (without derivation), concept of activation energy (graphical representation for exothermic and endothermic reactions). Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis). Expression for the rate constant based on equilibrium constant.

Course Outcomes

- Gain in-depth knowledge and understanding of core concepts in Chemistry.
- Acquire laboratory and fieldwork skills, including data collection, analysis, and interpretation.
- Prepare for further studies (like M.Sc., competitive exams) or employment in education, research, industry, or government.

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Multidisciplinary UG (Chemistry)
B.Sc. / B.Sc. (Honours)
Session 2025-2026
B.Sc. (Medical) Part-1, Sem-1
Chemistry Major-I
Paper Code: BM103P

Max Marks: 30
External Semester Exam: 20
Internal Assessment: 10
Passing Marks: 35%

Credits: 01
Time allowed: 3 hrs.
02 hrs./week

INSTRUCTIONS FOR THE PAPER SETTERS, EXAMINERS & CANDIDATES

The Practical Examinations will be held in the one morning session (one day) that will be of 3 hours duration. During this session students will perform following two types of experiments:

(a) Semi micro analysis along with
(b) Crystallization of the given sample.

Paper setter will enlist five different mixtures and the examiner will randomly distribute these mixtures amongst the students. Each candidate will analyze one mixture along with crystallization of the given sample. Students are pennitted to consult the books for the scheme of tests for semimicro analysis.

SEMI-MICRO ANALYSIS:

Cation analysis, separation, and identification of ions from Groups I, II, III, IV, V and VI.
Anion analysis (2 cations and 2 anions with no interference).

CRYSTALLIZATIONS:

(i) Phthalic acid from hot water;
(ii) Acetanilide from boiling water;
(iii) Naphthalene from ethanol;
(iv) Benzoic acid from water.

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Multidisciplinary UG (Chemistry)
B.Sc. / B.Sc. (Honours)
Session 2025-2026
B.Sc. (Medical) Part-1, Sem-II
Chemistry Major-II
Paper Code: BM203

Max Marks: 70
End Semester Exam: 50
Internal Assessment: 20
Passing Marks:35%

Credits: 03
Time allowed: 3 hrs.

INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three sections, namely, Section A. B and C. Section A and B will have four questions from the respective section of syllabus. Each question will carry 08 marks and may be segregated into sub-parts. Section C will be compulsory with 09 short-answer type questions of 02 mark each covering the entire syllabus.

INSTRUCTIONS FORSTUDENTS

Students are required to attempt five questions selecting two questions from each of Section A & B while Section-C is Compulsory.

Section – A

Chemical Bonding — I

Covalent Bond — Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization, and shapes of simple inorganic molecules and covalent ions: BeF2, CH4, PF5, SF6, Valence shell electron pair repulsion (VSEPR) theory to H3O+, SF4 and H2O. Percentage of ionic character from dipole moment and electronegativity.

Chemical Bonding — II

Ionic Solids - Concept of close packing, ionic structures (NaCl type, and Zinc blende), radius ratio rule and coordination number, limitation of radius ratio rule, lattice defects, semiconductors.

Geometrical and Conformational Isomerism

Concept of Isomerism. Types of isomerism. Cause and conditions for geometrical isomerism. Nomenclature of geometrical isomers- cis & trans, E and Z system. Determination of the configuration of geometrical isomers.
Representation of conformations (ethane and n-butane)-Sawhorse and Newman formulae. Conformational analysis of ethane and n-butane.

Section - B

Stereochemistry of Organic Compounds — Optical Isomerism

Tetrahedral concept of carbon, specific rotation. Optical isomerism: Enantiomerism, stereo genic center, optical activity, chiral and achiral molecules with one stereo genic center, Dia stereoisomers, Erythro and Threo isomers, Meso compounds. Representation of Stereoisomers — Flying edge, and Fischer Projection.
Relative and absolute configuration, sequence rules, D & L, and R & S system of nomenclature (with one Centre acyclic system).

Gaseous States

Gas laws (Boyel's, Charles, Avogadro's), Ideal and real gases, postulates of kinetic theory of gases, deviation from ideal behavior, Van der Waals equation of state — qualitative analysis, significance of a and b. Critical Phenomena: PV isotherms of real gases (Elementary Idea only), the isotherms of Van der Waals equation, relationship between critical constants and Van. der Waals constants (expression and their variations only), the law of corresponding states, reduced equation of state = its expression and importance.
Molecular Velocities: Root mean square, average, and most probable velocities (definition, expression and their relation). Collision number, mean free path, and collision diameter. Liquefaction of gases (a case study of CO2).

Thermodynamics I

Definition of Thermodynamic Terms: System, surroundings and universe. Types of systems: open close, adiabatic, intensive and extensive properties (examples and difference). State and path functions. First Law of Thermodynamics: Statement, definition of internal energy and enthalpy, Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's Law — Joule-Thomson coefficient and inversion temperature (expression and explanation).

Course Outcomes

- Gain in-depth knowledge and understanding of core concepts in Chemistry.
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Session 2025-2026
B.Sc. (Medical) Part-1, Sem-II
Chemistry Major-II
Paper Code: BM203P

Max Marks: 30
End Semester Exam: 20
Internal Assessment: 10
Passing Marks: 35%

Credits: 01
Time allowed: 3 hrs.
02 hrs./week

INSTRUCTIONS FOR THE PAPER SETTERS, EXAMINERS & CANDIDATES

In this session in morning students will perform physical and organic chemistry practical. Examiner will again conduct viva-voce of students.

Determination of melting points (range in °C):

a) Naphthalene (80-82),
b) Benzoic acid (121.5-122),
c) Urea (132.5-133),
d) Cinnamic acid (132.5-133),
e) Salicylic acid (157.5-158),
f) Acetanilide (113.5-114),
g) m-Dinitrobenzene (88-90°C),
h) p-Dichlorobenzene (50-52)

Determination of boiling points (range in °C):

a) Ethanol (78)
b) Cyclohexane (81.4)
c) Toluene (110.6°C)
d) Benzene (80)

Physical Chemistry Experiments

a) To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
b) To study the effect of acid strength on the hydrolysis of an ester.
c) Viscosity & Surface Tension of pure liquids.
d) To determine the viscosity and surface tension of C2H50H and glycerin solution in water.