

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

**Multidisciplinary Course Based On NEP-2020**

**B.Sc. / B.Sc. (Honours)**

**Session 2025-2026**

**B.Sc. (Non-Medical) Part-1, Sem-1**

**Chemistry Major-I**

**Paper Code: BNM103**

**Max Marks: 70**

**External Semester Exam: 50**

**Internal Assessments: 20**

**Passing Marks: 35%**

**Credits: 03**

**Time allowed: 3 Hrs.**

**03 Hrs./week**

**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 FOR STUDENTS**

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  $\psi$  and  $\psi^2$ , 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 1s, 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.

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## Reaction Intermediates

Curved arrow notation, Drawing electron movements with arrows, half-headed and double headed arrows, homolytic 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-Fittig 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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B.Sc (Non-medical) ( Sem -I)

**BNM102 : ALGEBRA AND TRIGONOMETRY (Major)**

Pass percentage: 35%  
Time allowed : 3hours.

External Evaluation: 70  
Internal Evaluation: 30

**Course objective :** The objective of the course is to help the students acquire skills to do calculations like finding roots of a polynomial using different methods, solving simultaneous linear equation system and solving problems related to trigonometry with ease.

**Course learning outcomes:** On completion of course, the student will be able to

CO-I: Understand DeMoivre's theorem and apply it to solve numerical problems.

CO-II: Understand exponential, logarithmic, hyperbolic functions of a complex variable.

CO-III: Understand how to find Eigen-values, Eigen-vectors of a matrix and characteristic equation of a matrix and Diagonalization of matrices.

CO-IV : Understand rank of the matrix and use it to recognize consistent and inconsistent system of linear equations using row echelon form of the matrices.

**INSTRUCTIONS FOR THE PAPER-SETTER/EXAMINER**

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having eleven short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 12 marks and Section C will be of 22 marks.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt five questions in all selecting two questions from each of the Sections A and B and compulsory question of Section C.

**SECTION:A**

D'Moivre's theorem and its application including primitive  $n$ th root of unity, Expansions of  $\sin n\theta$ ,  $\cos n\theta$ ,  $\sin^n \theta$ ,  $\cos^n \theta$  ( $n \in \mathbb{N}$ ). The exponential, logarithmic, circular and hyperbolic functions. Relation between the roots and coefficients of a general polynomial in

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One variable ,Transformation of equation, solutions of cubic equations using cardon's method, solutions of bi -quadratic equation using Descarte's method.

### SECTION:B

Hermitian and skew- Hermitian matrices, Elementary operations on matrices, linear independence and dependence of row and column vectors, row rank, column rank and rank of a matrix and their equivalence, Normal form of a matrix, Theorems on consistency of a system of linear equations (both homogeneous and non homogeneous). Eigen-values, Eigen-vectors and characteristic equation of a matrix, Cayley-Hamilton theorem and its use in finding inverse of a matrix, Diagonalization.

### Books Recommended:

- 1.K.B. Datta :Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi.
2. S.R .Knight and H.S. Hall : HigherAlgebra,H.M.Publications,1994.
3. R.S.Verma and K.S.Shukla: TextBook onTrigonometry ,Pothishala Pvt. Ltd., Allahabad.
- 4 Shanti Narayan and P.K .Mittal: A TextBook of Matrices, S. Chand &Co., NewDelhi, Revised Edition, 2007.
- 5 .C.Prasad, Textbook on Algebra and theory of equations, Pothishala Pvt. Ltd., Allahabad.

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**S.S.D. Girls' College, Bathinda**  
**Multidisciplinary course Based on NEP-2020**

**B.Sc./B.Sc. (Honours)**

**Session 2025-2026**

**B.Sc. (Non-Medical) Part-1, Sem-1**

**PHYSICS:-Mechanics**

**Paper Code: BNM101**

**(Major Theory)**

**Max. Marks: 70**

**Theory Paper:50**

**Internal Evaluation: 20 marks**

**Total Teaching Hrs.: 3 Hrs Per Week**

**Credits: 03**

**Pass Marks: 35%**

**INSTRUCTIONS FOR PAPER SETTER**

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective sections of the syllabus out of which the student will be required to attempt two questions from each Section. Each question will carry 8 marks. Section C will be compulsory with 9 short-answer type questions of 02 marks each which will cover the entire Syllabus.

**Instructions for Students**

Students have to attempt four questions in all from Section A and B by selecting 2 questions from each Section. Section C will be compulsory. Use of scientific calculator is allowed.

**SECTION-A**

Cartesian and spherical polar co-ordinate systems, area, volume, displacement, velocity and acceleration in these systems, Solid angle, Various forces in Nature (brief introduction), Centre of mass, Equivalent one body problem, Central forces, Equation of motion under central force, Equation of orbit in inverse square, Force field and turning points, Kepler laws and their derivations.

Inertial frame of reference, Galilean transformation and invariance, Non-inertial frames of reference, Centrifugal force and its effect on acceleration due to gravity, Coriolis force and its applications, Variation of acceleration due to gravity with latitude.

**SECTION-B**

Elastic collision in Laboratory and C.M. system, velocities, angles and energies, Cross section of elastic scattering, Rutherford scattering (qualitative).

Concept of stationary universal frame of reference and ether, Michelson-Morley experiment and its result, Postulates of special theory of relativity, Lorentz transformations, Observer and viewer in relativity, relativity of simultaneity, Length, Time, Relativistic addition theorem of velocities, Relativistic Doppler effect, Variation of mass with velocity, mass-energy equivalence, rest mass in an inelastic collision, Relativistic momentum and energy, their transformation, concepts of Minkowski space, four vector formulation.

**Course Outcomes**

1. To impart knowledge about various coordinate systems and their applications in different physical systems.
2. To understand various frame of reference and transformations.
3. To differentiate between laboratory and centre of mass systems and various scattering phenomenon.

*Bhaskar Singh*

*Neelam Chahal*

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