Choice Based Credit System (CBCS)
Syllabus of Examination
Fifth semester- Bachelor of Science(maths)

Subject- CHEMISTRY

CODE-BSCM 501A

UNIT-I

Organic Compounds of Nitrogen: preparation, properties and chemical reactions of nitro alkanes and nitroarenes. Mechanism of nucleophilic substitution in nitroarenes and their reduction in acidic neutral and alkaline media, picric acids.Halonitroarenes; structure and nomenclature, and their activity. Amines structure, and nomenclature, physical properties and Stereochemistry, separation of mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines.

UNIT-II

Carbohydrates Classification and nomenclature, monosaccharide, mechanism of osazone formation, chain lengthening and chain shortening of aldoses, epimerization, configuration of monosaccharide,erythro, threo diasterioisomers. Formation of glycosides, ethersand esters, determination of ring size of monosaccharide, cyclicstructure of D (+) glucose, mechanism of mutarotation.Structure of ribose and deoxyribose.

UNIT-III

Photochemistry: Electromagnetic radiation, range of different regions of the spectrum, different expression units for energy, wavelength and frequency Interaction of radiation with matter, difference between thermal and photochemical process. Laws of photochemistry – Grotthus-Draper law, Stark-Einstein law, Beer-Lambert law. Electronic transitions, JablonskiSdiagram depicting various quantum yield.

UNIT-IV

Bioinorganic Chemistry – I: Essential and trace elements in biological processes, metalloporphyrins with special reference to hemoglobin and myoglobin, Biological role of alkali and alkaline earth metal ions with special reference to Ca2+.

Bioinorganic Chemistry – II: Role of metal ions in biological process, nitrogen fixation, oxygen-uptake proteins, cytochromes and ferredoxins.

UNIT –V

Hard and Soft Acids and Bases (HSAB)of acids and bases as hard and soft, Pearson'HSAB concept, symbiosis.**Inorganic Polymers:** Introduction and scope of inorganic polymers, special characteristics, classification and their applications. Structure and nature of bonding in Silicones andtriphosphonitrilic chloride.

Recommended Books:

1. Physical Chemistry-Puri, Sharma and Pathania, Vikas Publications, New Delhi
2. Physical Chemistry -G.M. Barrow, International Student Edition, McGraw Hill.
3. Inorganic Chemistry – J.D. Lee, John Wiley
4. Inorganic Chemistry – Cotton and Wilkinson, John Wiley
5. Organic Chemistry, Morrison and Boyd, Prentice Hall.
6. Organic Chemistry, L.G. Wade Jr. Prentice Hall

Subject- CHEMISTRY

Practical

Inorganic Chemistry :
Analysis of inorganic mixture containing five radicals with at least one interfering radical or typical combination

Gravimetric analysi Barium as barium sulphate.

Organic Chemistry

i. Acetylation
ii. Benzoylation
iii. Meta-Dinitrobenezene
iv. Picric acid

Choice Based Credit System (CBCS)
Syllabus of Examination
Fifth semester- Bachelor of Science (maths)

Subject- **PHYSICS**

CODE-BSCM 502B

UNIT-I

Quantum Mechanics-1: Particles and Waves: Photoelectric effect. Black body radiation. Compton effect. De Broglie hypothesis. Wave particle duality. Davisson-Germer experiment. Wave packets. Concept of phase and group velocity. Two slit experiment with electrons. Probability. Wave amplitude and wave functions. Heisenberg's uncertainty principle with illustrations. Basic postulates and formalism of Schrodinger's equation. Eigenvalues. Probabilistic interpretation of wave function. Equation of continuity. Probability current density. Boundary conditions on the wave function. Normalization of wave function.

UNIT-II

Quantum Mechanics-2: Time independent Schrodinger equation: One dimensional potential well and barrier. Boundary conditions. Bound and unbound states. Reflection and transmission coefficients for a rectangular barrier in one dimension. Explanation of alpha decay. Quantum phenomenon of tunneling. Free particle in one-dimensional box, eigen functions and eigen values of a free particle. One-dimensional simple harmonic oscillator, energy eigenvalues from Hermite differential equation, wave function for ground state. Particle in a spherically symmetric potential. Rigid rotator. Orbital angular momentum, azimuthal quantum numbers and space quantization. Radial solutions and principle quantum number. Hydrogen atom.

UNIT-III

Atomic Spectroscopy: Atoms in electric and magnetic fields: Quantum numbers, Bohr model and selection rules. Stern-Gerlach experiment. Spin as an intrinsic quantum number. Incompatibility of spin with classical ideas. Orbital angular momentum. Fine structure. Total angular momentum. Pauli exclusion principle. Many particles in one dimensional box. Symmetric and anti-symmetric wave functions. Atomic shell model. Spectral notations for atomic states. Spin-orbit coupling, Vector model L-S and J-J coupling. Doublet structure of alkali spectra. Zeeman effect. Continuous and characteristic X-rays. Mossley's law.

UNIT-IV

Molecular Spectroscopy: Spectra: Various types of spectra. Rotational spectra. Intensity of spectral lines and determination of bond distance of diatomic molecules. Isotope effect. Vibrational energies of diatomic molecules. Zero point energy. Anharmonicity. Morse potential. Raman effect, Rotational Raman spectra and Vibrational Raman spectra. Stokes and anti-Stokes lines and their intensity difference. Electronic spectra. Born-Oppenheimer approximation. FrankCondon principle, singlet and triplet states. Fluorescence and phosphorescence.

UNIT-V

Nuclear Physics: Interaction of charged particles and neutrons with matter, working of nuclear detectors, G-M counter, proportional counter, Scintillation counter, Cloud chamber. Basic properties of nucleus: Shape, Size, Mass and Charge of the nucleus. Stability of the nucleus and Binding energy. Alpha particle spectra – velocity and energy of alpha par ticles. Geiger-Nuttal law. Nature of beta ray spectra. The neutrino. Energy levels and decay schemes. Positron emission and electron capture. Selection rules. Beta absorption and range of beta particles. Kurie plot. Nuclear reactions, pair production. Q-values and threshold of nuclear reactions. Nuclear reaction cross-sections. Examples of different types of reactions and their characteristics. Compound nucleus, Bohr's postulate of compound nuclear reaction, Semi empirical mass formula, Shell model, Liquid drop model, Nuclear fission and fusion (concepts).

References:

1 Quantum Mechanics: V. Devanathan, Narosa Publishing House, New Delhi, 2005.

2 Quantum Mechanics: B. H. Bransden, Pearson Education, Singapore, 2005.

3 Quantum Mechanics: Concepts and Applications, Nouredine Zettili, Jacksonville State University, Jacksonville, USA, John Wiley and Sons, Ltd, 2009.

4 Introductory Quantum Mechanics & Spectroscopy: K.M. Jain, South Asian Publications.

5 Physics of Atoms & molecules: B.H. Bransden & C.J. Joachaim, Pearson Education, Singapore, 2003

6 Fundamentals of Molecular Spectroscopy: C.M. Banwell & M. McCash, McGraw Hill (U.K. edition)

Choice Based Credit System (CBCS)
Syllabus of Examination
Fifth semester- Bachelor of Science(maths)

Subject- MATHEMATICS

CODE-BSCM 503B

UNIT – I

Rank of a matrix, Eigen values, Eigen vectors, Characteristic equation of a matrix, Cayley Hamilton theorem and its use in finding inverse of matrix,

UNIT- II

Application of matrix to a system of linear (both homogenous and non - homogenous) equations,

UNIT- III

Theorems on consistency and inconsistency of a system of linear equations, Solving the linear equations with three unknowns.

UNIT – IV

Relation between the roots and coefficients of a general polynomial equation in one variable, Transformation of equations, Descarte's rule of signs,

UNIT – V

De Moivre's theorem and its applications, Direct and inverse circular and hyperbolic functions, Expansion of trignometrical function

Text Books:-

1. **S.L. Loney – Plane Trigonometry Part II**
2. **K.B. Datta – Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd. New Delhi 2000**
3. **Chandrika Prasad – A Text Book on Algebra and Theory of Equations, Pothishala Pvt.Ltd. Allahabad**

Reference Books:-

1. **P. B. Bhattacharya, S. K. Jain and S.R. Nagpaul, First Courses in Linear Algebra, Wiley Eastern, New Delhi. 1983**
2. **R.S. Verma and K.S. Shukla, Text Book on Trigonometry Pothishala Pvt. Ltd.**

Choice Based Credit System (CBCS)

Syllabus of Examination
Fifth semester- Bachelor of Science(maths)

Subject- Probability and Statistics

CODE-BSCM 505A

UNIT – I

Probability, Continuous probability, probability density function and its applications.

UNIT – II

For finding the mean, mode, median and standard deviation of various.

UNIT-III

Continuous probability distributions Mathematical expectation, expectation of sum and product of random variables,

UNIT-IV

Moment generating functions,

UNIT- V

Theoretical distribution: Binomial, Poisson distributions and their properties and uses.

Text Books:-

1. **Statistics by M. Ray**
2. **Mathematical Statistics by J.N Kapoor, H.C Saxena (S. Chand)**

References Book:

1. **Fundamentals of Mathematical Statistics, Kapoor and Gupta**

Choice Based Credit System (CBCS)
Syllabus of Examination
Fifth semester- Bachelor of Science (maths)

Subject- - Mathematical Finance

CODE-BSCM 505B

UNIT – I

Basic principles: Comparison, arbitrage and risk aversion, Interest (simple and compound, discrete and continuous),

UNIT – II

Time value of money, inflation, net present value, internal rate of return (calculation by bisection and Newton-Raphson methods),

UNIT – III

Comparison of NPV and IRR. Bonds,bond prices and yields. Floating-rate bonds, immunization.

UNIT – IV

Asset return, short selling, portfolio return, (brief introduction to expectation, variance, covariance and correlation),

UNIT – V

Random returns, portfolio mean return and variance, diversification, portfolio diagram, feasible set, Markowitz model (review of Lagrange multipliers for 1 and 2 constraints).

Books Recommended:

1. David G. Luenberger, *Investment Science*, Oxford University Press, Delhi, 1998.
2. John C. Hull, Options, *Futures and Other Derivatives*, 6th Ed., Prentice-Hall India, Indian reprint, 2006.
3. Sheldon Ross, *An Elementary Introduction to Mathematical Finance*, 2nd Ed., Cambridge University Press, USA, 2003.