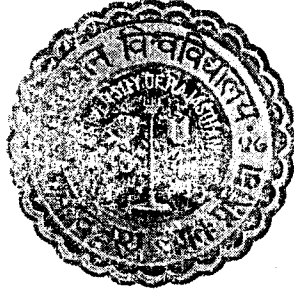


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**University of Rajasthan
Jaipur**

SYLLABUS

B.Sc. (Hons.)PART-II

2016

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B.Sc. Hons Pt II

Syllabus : B.Sc. (Hons.) Pt.-II

7

B.Sc. (HONS.) PART-II EXAMINATION

1. PHYSICS (HONS.)

Paper-V : Optics

Five questions are to be set taking one from each unit (each question will have an internal choice). Student will attempt all the five questions. 40% weightage will be given to problems and numericals.

Unit-I Interference

Superposition of waves from two point sources, the necessity of coherence correlation function of two light waves. Degree of partial coherences and visibility of fringes. Effective size of a point source. Brown and Twiss experiment. Self correlation function and degree of temporal coherence for quasimonochromatic light. Coherence time and wave packet. Interference of waves from two coherent point sources. Shape of Interference fringes in 3-dimensional space and their appearance on a screen. Intensity distribution in space. Fresnel's biprism experiment. Interference of waves from several synchronous sources. Directional transmission and reception of radio signals.

Interference by division of amplitude. Film of varying thickness. Colour of thin films in transmission and reflection. Fringes of equal inclination. Newton's rings. Determination of refractive index by Newton's rings, Michelson's. Interferometer. Fringes of different shapes with Michelson's interferometer. Determination of wavelength and refractive index with Michelson Interferometer fringes waves interferometer. Theory of Fabry-Perot interferometer, visibility and shape of fringes. Mountings for Fabry-Perot etalon, Lummer Gerhke Plate : basic theory and working.

Unit-II Fraunhofer Diffraction

Fraunhofer diffraction by a single slit, intensity distribution and positions of maxima and minima in diffraction pattern. Fraunhofer pattern of circular and rectangular apertures. Fraunhofer diffraction by two parallel slits., Missing orders. Diffraction by many parallel slits. Plane diffraction grating. Transmission and reflection gratings. Concave grating. Rowland's mounting. Dispersion by a grating. Rayleigh's criterion of resolution. Resolving power of a grating, RP of a telescope.



Unit-III Fresnel's diffraction and X-ray diffraction

Fresnel's diffraction by a circular aperture, straight edge and a thin slit. Cornu's spiral geometrical method to study Fresnel's diffraction Pattern. Zone plate multiplication of a zone plate.

X-Ray diffraction in crystals, atomic planes and inter-atomic plane separation in simple cubic FCC and BCC lattices. Bragg's law, Laue spots. Diffraction pattern of powdered samples.

Unit-IV Laser and Holography

Spontaneous and stimulated emission, density of states, Einstein's, A and B coefficients. Ratio of stimulated to spontaneous transitions in a system in thermal equilibrium. Energy density of radiation as a result of stimulated emission and absorption, condition for stimulated emission and absorption, condition for amplification. Population inversion, Methods of optical pumping, Energy level Scheme of He-Ne and Ruby lasers. Working of a laser source, special features of a laser source and their origin. Tunnel lasers (qualitative discussion only).


Basic concept of holography, difference between a hologram and a photograph. Construction of a hologram and reconstruction of image.

Unit-V Polarization

Plane Electromagnetic waves, E and B of plane polarized, circularly polarized and elliptically polarized light and mathematical representations. Boundary conditions for electric and magnetic fields at the vacuum dielectric interface. Reflection and refraction of EM Waves at a plane dielectric surface at normal and oblique incidence. Derivation of Fresnel's relations. Polarization by selective (dichroism) wire grid polarizer for microwaves. Polaroids Application of Polaroids in 3-D movies, Polarization by scattering.

Double refraction. Geometry of calcite crystal, Ordinary and extraordinary rays. Optical and crystallographic axes. Huygen's theory of double refraction. Propagation of plane waves in uniaxial crystals. Propagation of waves in calcite crystal with different orientation of refracting face with optic axis, quarter and half wave plates.

Optical activity, Specific rotation. Biquartz and half shade polarimeters.



Books Recommended :

1. Geometrical and Physical Optics by B.K. Mathur
2. An Introduction to Modern Optics by A.K. Ghatak
3. Optics by D.P. Kharelwal
4. An Introduction to Modern Optics by F.R. Fowles
5. Optical Physics by Lipson and Lipson.

Paper-VI : Mathematical Physics

Note : Five questions are to be set taking one from each unit (each question will have an internal choice). Student will attempt all the five questions. 40% weightage will be given to problems and numericals.

Unit-I

Orthogonal Curvilinear co-ordinate system. Scale factors, expression for gradient, divergence and curl and their applications to Cartesian, circular, cylindrical and spherical polar co-ordinate systems.

Co-ordinate transformation and Jacobian. Transformation of Covariant, Contravariant and Mixed Tensors. Addition, Multiplication and Contraction of Tensors. Metric tensor and its use in transformation of tensors. Dirac Delta Function and its properties.

Unit-II

Fourier series: Fourier theorem and computation of Fourier coefficients. Even and odd functions, half range expansion, sums and scale changes, forced oscillations, Expansion Techniques : integration and differentiation. Introduction to Fourier transform and its simple applications.

Unit-III

Solution of differential equations—Series method : Properties of power series, solution of ordinary differential equation : Legendre's Equation, Legendre Polynomials and Functions, Hermite Polynomials.

The method of Frobenius: Solution about regular singular points, The Gamma function, the Bessel-Clifford equation.

Roots differing by an integer : Series method, Solution of Bessel equation for :

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- (i) Roots not differing by an integer
- (ii) Equal roots
- (iii) Roots differing by an integer.

Basic identities involving Bessel Functions. Basic properties like orthogonality recurrence relation and generating functions of Bessel, Hermite, Legendre, and associated Legendre's function (simple applications).

Unit-IV

Solution of partial differential by separation of variable technique and its application to following Boundary Value Problems:

- (i) Laplace equation in three dimensional Cartesian co-ordinate system—line charge between two earthed parallel plates.
- (ii) Laplace equation in Spherical coordinate system—Electric potential about a spherical surface.
- (iii) Wave equation in two dimensional Cartesian co-ordinate system—Heat conduction in a thin rectangular plate.
- (iv) Diffusion equation in cylindrical co-ordinate system.

Unit-V

Matrices : Inverse of a matrix, adjoint, Hermitian adjoint, Solution of linear equations using matrix.

Norms and inner products, orthogonal sets and matrices, the Gram Schmidt process and the Q-R factorization theorem. Projection matrices. Least square fit of data. Eigen values and Eigen vectors, diagonalization of matrices. Examples involving up to 3×3 matrices and for the case of real symmetric and simple matrices. Solution of linear differential equations for the homogeneous and non-homogeneous cases.

Reference Books :

1. Mathematical Methods by Potter and Goldberg (Prentice Hall of India Pvt. Ltd.)
2. Applied Mathematics for Engineers and Physicists by Pipes and Harvill (McGraw Hill Book Co.)

Paper-VII : Quantum Mechanics

Note : Five questions are to be set taking one from each unit (each question will have an internal choice). Student will attempt all the five questions. 40% weightage will be given to problems and numericals.

Unit-I

Development of Quantum Theory : Black body radiation, Plank's Quantum Hypothesis, Specific heats of solids, The Photoelectric effect, The Compton effect, Uncertainty principle, Its applications such as (i) Non-existence of electrons in nucleus (ii) Ground state energy of H-atom (iii) Ground state energy of harmonic oscillator and (iv) Natural width of spectral lines.

The Schrödinger's equation and Stationary State : A free particle in one dimension, Generalization to three dimensions, The operator correspondence and the Schrödinger equation for a particle subject to forces, Physical Interpretation and conditions on the wave function : Normalization and Probability Interpretation, Non-normalizable wave functions and Box Normalization, Conservation of Probability, Expectation Values, Ehrenfest's Theorem, Admissibility conditions on the wave function.

Stationary States and Energy Spectra : Stationary States : Time independent Schrödinger equation, a particle in a square well potential, bound states in a square well ($E < 0$), admissible solutions of wave equation (b) The Energy Eigen values-Discrete Spectrum. (c) The Energy Eigen functions; Parity (d) Penetration into classically forbidden regions.

Unit-II

The Square Well—Nonlocalized States ($E > 0$). Square Potential Barrier : (a) Quantum Mechanical Tunneling, (b) Reflection at Potential Barriers and Wells. Multiple Potential Wells: Splitting of Energy Levels; Energy Bands : (a) The Wave Function : Transfer across Potential Well. (b) A Single Square Well : Energy levels. (c) The Wave function: Transfer across N Square Wells. (d) A Regular Array of N Square Wells : Energy Levels. (e) An Infinite Array of Square Wells : The Kronig-Penney Model.

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Unit-III

General Formalism of Wave Mechanics : The Schrödinger Equation and the Probability Interpretation for an N-Particle System. The Fundamental Postulates of Wave Mechanics : (a) Representation of States (b) Representation of Dynamical Variable, Expectation Values, Observables. The Adjoint of an Operator, and Self-Adjointness. The Eigen Value Problem, Degeneracy, Eigen Values and Eigen Functions of Self-Adjoint Operators. The Dirac Delta function, Observables: Completeness and Normalization of Eigen Functions, Closure, Physical Interpretation of Eigen Values. Eigen Functions and Expansion Coefficients. Momentum Eigen Functions. Wave Functions in Momentum Space : (a) Self-adjointness and Reality of Eigen Values (b) Normalization and Closure (c) The Wave Function and Operators in Momentum Space. The Uncertainty Principle, States with Minimum Value for Uncertainty Product, Commutating Observables; Removal of Degeneracy, Evolution of System with time; Constants of the motion, Non-Interacting and Interacting Systems, Systems of Identical Particles : (a) Interchange of Particles. Symmetric and Antisymmetric Wave Functions. (b) Relation between Type of Symmetry and Statistics, The Exclusion Principle.

Unit-IV

Exactly Soluble Eigen Value Problems : The Simple Harmonic Oscillator : The Schrödinger Equation and Energy Eigen Values. The Energy Eigen Functions : (a) Series Solution, Asymptotic Behaviour. (b) Orthonormality, Properties of Stationary States. The Abstract Operator Method : (a) The Ladder (or Raising and Lowering) Operators, (b) The Eigen Value Spectrum, (c) The Energy Eigen Functions, Coherent States, Angular Momentum Operators. The Eigen Value Equation for L^2 , Separation of variable, Admissibility Conditions on Solutions, Eigen Values. The Eigen Functions : Spherical Harmonics. Physical Interpretation, Parity, Angular Momentum in stationary States of Systems with Spherical Symmetry : (a) the Rigid Rotator, (b) A particle in a Central Potential, The Radial Equation, (c) The Radial Wave functions.

Three Dimensional Square Well Potential : Solution in the Interior Region. Solution in the Exterior Region, and Matching:




(a) Nonlocalized States ($E > 0$) (b) Bound States ($E < 0$). The Hydrogen Atom : Solution of the Radial Equation; Energy Levels, Stationary State Wave Functions, Discussion of Bound States.

Unit-V

Representations, Transformations and Symmetries :
Quantum States; State vectors and Wave Functions, The Hilbert Space of state Vectors; Dirac Notation—(a) State Vectors and their conjugates (b) Norm and Scalar Product (c) Basis in Hilbert Space, Dynamical Variables and Linear Operators—(a) Abstract Operators; the Quantum Conditions (b) The Adjoint; Self-Adjointness (c) Eigen values and Eigen Vectors (d) Expansion of the Identity; Projection Operators (e) Unitary Operators, Representations—(a) Representation of State Vectors: The Wave function (b) Dynamical Variables as Matrix Operators (c) Products of Operators : The Quantum Condition (d) Self-Adjointness and Hermiticity (e) Diagonalization, Continuous Basis – The Schrodinger Representation, Degeneracy; Labelling by commuting observables, Change of Basis; Unitary Transformations, Unitary Transformations Induced by change of Coordinate System : Translations, Unitary Transformation induced by Rotation of Coordinate System, The Algebra of Rotation Generators, Transformation of Dynamical Variables, Symmetries and Conservation Laws, Space Inversion (a) Intrinsic Parity (b) The Unitary Operators of Space Inversion (d) Parity Non-Conservation, Time Reversal.

Reference Books :

1. P.M. Mathews and K. Venkatesan—A Textbook of Quantum Mechanics.
2. A.K. Ghatak and S. Lokanathan—Quantum Mechanics (Third Edition).
3. H.S. Mani and G.K. Mehta—Introduction to Modern Physics.

Paper-VIII : Electronics

Note : Five questions are to be set taking one question from each unit. (each question will have an internal choice). The student will attempt all 5 questions. 40% weightage will be given to problems and numericals.

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Teaching : 4hrs/week

Max. Marks 75

Unit-I

Circuit analysis : Networks: Some topological definitions. Loop and Nodal analysis of d.c. and a.c. circuits (based on Kirchoff Laws).

Two port network : Current voltage conventions, Concept of Driving point and transfer impedance open circuit, short circuit and hybrid parameters. star delta / $T-\pi$ inter-conversions, open, short and characteristic impedance of symmetric $T-\pi$ network.

Network theorems : (reference of DC as well as AC circuits is to be given) superposition, Thevenin, Norton, Reciprocity, Compensation. Maximum power transfer.

Unit-II

Fundamentals of Semiconductors : Intrinsic and extrinsic semi-conductors, charge densities in intrinsic. P and N type semiconductors PN Junction, Conduction by drift and diffusion of charge, PN Diode equation. Capacitance effect, Zener effect.

Rectification and Power Supply : Diode parameters and Specifications (reference of some commonly used diodes should be given), Diode Approximations. Half-wave, full-wave and bridge rectifiers, calculation of efficiency. Ripple factor and Regulation, Filters: A comparative study of shunt capacitor, L section and pi section filter, diode voltage multiplier, Zener regulator.

Unit-III

Transistors : Basic ideas, operation, CB, CE, CC configurations. Input and output characteristics (for these configurations) and current voltages, notation, Concept of DC and AC load lines, Transistor as a switch, as a current source, Transistor biasing circuits : Base bias, collector and emitter feed back bias. Basic ideas about FET and MOSFETS.

Transistor Amplifiers : CE, CC and CB Amplifier and their approximate Analysis for gain, input and output impedance (using eber Mol's h-equivalent circuit).

Coupling of Amplifiers (basic ideas of R-C. L-C Transformer and direct coupling) basic idea of class A, B, AB and C. operation, effect of transistor Frequency capacitances on high frequency amplifier gain, gain and phase versus frequency effect of capacitors in transistor amplifier and frequency response of CE Amplifier.

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Unit-IV

Amplifiers with feedback : Concept of Feed back. Stabilisation of gain by negative feed back, effects of feed back on output and input resistance and nonlinear distortion. Voltage and current feed back circuits and frequency response of feed back Amplifiers.

Oscillators : Theory of sinusoidal oscillation. Wein bridge, phase shift, Colpit, Hartley, Clapp and crystal oscillators (only an approximate calculation of oscillator frequency and gain requirements, if necessary).

Unit-V

Operational Amplifier : Differential Amplifier. Operational Amplifier, basic idea and its basic parameters, Application; Unity gain buffer, inverting, voltage amplifier, Adder, subtractor integrator differentiate, comparator, Idea of wave form generator voltage regulation.

Digital Circuits : Logic Fundamentals AND, OR, NOT, NOR, NAND and XOR gates : Symbols and their truth tables. Boolean Algebra De morgon's theorem and circuit realisation of logic functions using various digital logic families : RTL, DTL, TTL, ECL and MOS logic families.

Integrated Circuits : Basic idea about pin configuration and block diagrams of some popular IC's. Op Amp. 741. Three pin Regulators, and Timer 555 and 7400, 7 segment display.

Reference Books :

1. A.P. Malvino : Electronics Principles
2. A.P. Malvino : Digital Computer Electronics
3. Van Valcumgurg : Network Analysis
4. J. Milliman and C.C. Halkyas : Integrated Electronics
5. G.K. Mithal : Integrated Electronics.
6. J.D. Ryder : Network Analysis
7. R.P. Jain : Digital Electronics.

Physics Practicals

Max. Marks : 100

Min. Pass Marks : 40

Two practicals of 5 hours each spread over two days.

The students are expected to perform 15 experiments in the academic session. The suggested list of experiments is given below

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the institution may however, set other experiments of the same level and may communicate the same to the convener, Board of Studies.

1. Using platinum resistance thermometer to find the melting point of a given substance.
2. Determine the thermodynamic constant γ (gamma) = C_p/C_v using elements and Desormes method.
3. Determine thermal conductivity of a bad conductor by Lee method.
4. Determination of a ballistic constant of a ballistic galvanometers and high resistance by leakage method.
5. Study of variation of total thermal radiation with temperature.
6. To study conductor interaction through fall to magnet in a hollow metal cylinder.
7. To study temperature variation of modulus of rigidity.
8. Plot thermo emf versus temperatures graph and find the neutral temperature uses and bath.
9. Study the magnetic field along the axis of a current carrying circular coil. Plot the necessary graph and hence find the radius of the circular coil.
10. Study of power supply using half wave. Full wave and bridge rectifier with various filter circuits.
11. Study of half wave rectifier using single diode and application of L and π section filter.
12. To study characteristics of a given transistor PNP/NPN.
13. Determination of band gap using a junction diode.
14. Study of single stage transistor audio amplifier (variation of gain with frequency).
15. To determine efm by Thomson's method.

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10

For Exam - 2015-2016

Appendix 2

B. Sc. (Hons.) Pt-II
2. CHEMISTRY

Scheme:

Max Marks: 400

	Duration (hrs)	Max. Marks	Min. Pass Marks
Paper V	3	75	
Paper-VI	3	75	120
Paper-VII	3	75	
Paper-VIII	3	75	
Practical	8	100	40

(Complete in TWO days)

Note: Each paper will contain ten questions having two questions from each unit. Candidates are required to attempt five questions in all selecting one question from each unit.

Paper-V Inorganic Chemistry
(4 hrs / Week)

UNIT-I

Coordination Chemistry:

Werner's coordination theory, effective atomic number, chelates, nomenclature of coordination compounds, isomerism in coordination compounds.

Magnetic properties of transition metal complexes:

Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula, L-S coupling, correlation of μ_s and μ_{eff} values, orbital contribution of magnetic moments, application of magnetic moment data for 3d-metal complexes.

UNIT-II

Theories of Coordination Compounds:

Valence bond theory of transition metal complexes, limitations of valence bond theory.

Crystal field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes. factors affecting the crystal field parameters, Jahn-Teller effect.

Application of crystal field stabilization energy in explaining ionic radii of divalent ions of first transition series, heat of hydration of divalent ions of first transition series.

UNIT-III

Electronic spectra of Transition metal complexes:

Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series, Orgel-energy level diagrams for d^1 and d^9 states, discussion of the electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ complex ion.

Thermodynamic and kinetic aspects of metal complexes:

A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes.

UNIT-IV

Chemistry of Lanthanide elements:

General study, occurrence and isolation, electronic configuration, oxidation states and ionic

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radii, lanthanide contraction, magnetic properties, complex formation of lanthanide compounds.

Chemistry of Actinides:

General study, chemistry of separation of Np, Pu and Am from U, electronic configuration, oxidation states, magnetic properties, complexation behaviour, comparison of lanthanides and actinides, super heavy elements.

UNIT-V

Oxidation and Reduction:

Redox potential data and their analysis, redox stability in water, Frost, Latimer and Pourbaix diagrams, Application of redox data in the extraction of the elements.

Acids and bases:

Theories: Arrhenius, Bronsted-Lowry, Lux-Flood. Solvent system concept and Lewis concept of acids and bases. Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness, symbiosis, theoretical basis of hardness and softness, electronegativity, hardness and softness.

Non-aqueous Solvents:

Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2 .

Paper-VI Organic Chemistry

(4 hrs./week)

Unit-I

Alcohols

Classification and nomenclature.

Monohydric alcohols: Primary, secondary and tertiary alcohols. methods of preparation. Hydrogen bonding. Acidic nature, reactions of alcohols.

Dihydric alcohols: Nomenclature, methods of formation. chemical reactions of vicinal glycols, oxidative cleavage [$\text{Pb}(\text{OAc})_4$ and HIO_4] and pinacol-pinacolone rearrangement.

Trihydric alcohols: Nomenclature, methods of formation and chemical reactions of glycerol.

Phenols

Nomenclature, structure and bonding. Preparations of phenols, physical properties and acidic character. Comparative acidic strength of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols. Mechanism of Fries, Claisen rearrangement, Gatterman synthesis, Hauben-Hoesch reaction, Laderer-Manasse reaction and Reimer-Tiemann reaction.

Ethers and Epoxides

Nomenclature of ethers and methods of their formation, physical properties. Chemical reactions- cleavage and autoxidation. Ziesel's method, Crown ethers.

Synthesis of epoxides. Acid and base catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides.

UNIT II

Aldehydes and Ketones

Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to formaldehyde, acetaldehyde, acetone, benzaldehyde, acetophenone and

benzophenone Physical properties, reactivity. Mechanism of nucleophilic addition to carbonyl group, condensation with ammonia and its derivatives, Benzoin, Aldol and Knoevenagel condensation. Perkin, Wittig, Mannich and Cannizzaro's reactions.

Use of acetals as protecting group. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones. MPV (Meerwein-Ponndorf-Verley) reduction, Clemmensen, Wolff-Kishner, LiAlH_4 and NaBH_4 reductions. Halogenation of enolizable ketones.

An introduction to α,β -unsaturated aldehydes and ketones. Preparation and properties of acrolein, crotonaldehyde and vinyl methyl ketone, Michael reaction.

Acidity of α -hydrogen, alkylation of diethyl malonate and ethyl acetoacetate (EAA). Synthesis of EAA: The Claisen condensation, keto-enol tautomerism in EAA, synthetic importance of diethyl malonate and ethyl acetoacetate. Alkylation and acylation of enamines.

UNIT-III

Carboxylic Acids

Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substitution on acid strength, comparison of acidity with phenols. Preparation of carboxylic acids. Reactions of carboxylic acid, Hell-Volhard-Zelinsky reaction, synthesis of acid chlorides, ester and amides, Reduction mechanism of decarboxylation.

Aromatic carboxylic acids: Synthesis and reactions of benzoic acid, salicylic acid, phthalic acid and cinnamic acid.

Methods of preparation and chemical reaction of α , β and γ -hydroxy acids. malic, tartaric and citric acids.

Methods of formation and chemical reactions of unsaturated monocarboxylic acids. Dicarboxylic acids: Methods of formation and effect of heat and dehydrating agents.

Carboxylic Acid Derivatives

Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.

Preparation of carboxylic acid derivatives. chemical reactions: Mechanism of esterification and hydrolysis (acidic and basic).

Fats, Oils and Detergents : Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils, saponification value, iodine value, acid value. Soaps, synthetic detergents, alkyl and aryl sulphonates.

UNIT-IV

Organic Compounds of Nitrogen

Preparation and chemical reactions of nitroalkanes. Mechanism of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid.

Structure and nomenclature of amines, physical properties. Stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase-transfer catalysts. Preparation of alkyl and aryl amines (reduction of nitro compounds and nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction. Hofmann Bromamide reaction. Reactions of amines.

Aryl diazonium salts: Preparation and synthetic transformations, azo coupling. Diazomethane and its applications.

UNIT-V

NMR spectroscopy

Proton magnetic resonance spectroscopy : Introduction, nuclear spin and energy levels, transitions, equivalent and non-equivalent protons, nuclear shielding and deshielding, chemical shift, spin-spin coupling and coupling constant, areas of signals, interpretation of PMR spectra of simple organic molecules like C_2H_5Br , C_2H_5OH , CH_3CHO , 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone.

Note: Mechanism of the reactions should be studied wherever possible.

Paper-VII Physical Chemistry (4 hrs./week)

Unit - I

Electrochemistry:

(a) Electrolytic conduction, specific, equivalent and molar conductivities and their determination. Variation of conductance with dilution. Effect of temperature, pressure, solvent and viscosity on conductance.

Kohlrausch's law and its applications in determination of

- (1) Degree of dissociation and dissociation constant of weak acids
- (2) Solubility of sparingly soluble salts
- (3) Hydrolysis constant
- (4) Ionic product of water

Inter-ionic attraction theory, quantitative treatment of theory of strong electrolytes, verification of the Debye-Huckel Onsager equation, activity and activity coefficient, ionic strength.

(b) Transference number and their determination by

- (1) Hittorf's method
- (2) Moving boundary method.

Abnormal transference numbers.

Unit - II

Thermodynamics:

Limitations of first law of thermodynamics. Spontaneous processes. Second law of thermodynamics. Carnot cycle, Kelvin Scale of temperature, concept of entropy. Entropy change for an ideal gas. entropy changes for physical transformation. Entropy of mixing, physical significance of entropy. Free energy and work function. Criteria of chemical equilibrium. Gibb's Helmholtz equation. Third law of thermodynamics and determination of absolute entropies. Effect of temperature on free energy and enthalpy. Maxwell's thermodynamic relations.

Unit - III

Spectroscopy:

Electromagnetic radiations and wave parameters interaction of electromagnetic radiations with matter. Ultraviolet and visible spectroscopy having absorption interaction. Chromophores and auxochromes. Determination of wavelength (λ_{max}) and molar extinction coefficient of compound. Bathochromic and hypsochromic shifts. Colours in complexes. Applications of UV-

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visible spectroscopy, electronic spectra. Modes of vibrations in diatomic, linear and non-linear polyatomic molecules. Force constant and its significance. Applications of infrared spectroscopy in elucidation of structure of molecules.

Unit – IV

Quantum Chemistry:

Quantum theory of radiations, photoelectric effect and Compton effect. Limitations of Bohr's model, Heisenberg uncertainty principle, wave nature of electron, de Broglie wave equation and its experimental verification. Operators and their applications. Sinusoidal wave motion, derivation of Schrodinger's wave equation. Physical significance of ψ (psi) and ψ^2 (psi)². Eigen values and Eigen functions. Characteristics of wave functions. Normalization and orthogonality of wave functions. Solution of Schrodinger wave equation. Particle in one dimension box.

Unit – V

Photochemistry:

Absorption of light, Grothus – Dropper law. Einstein law of photochemical equivalence. Quantum yield of photochemical reactions, reasons for high and low quantum yield of photochemical equations. Primary and secondary processes, photochemical reactions such as (1) $H_2 + Cl_2$ reaction (2) photolysis of ammonia (3) hydrolysis of monochloro acetic acid. Consequences of light absorption phosphorescence, fluorescence, chemiluminescence and photosensitization.

Nuclear Chemistry:

Nature of radioactivity, artificial radioactivity, radioactive disintegration. Group displacement law: half – life period and average life period. Radioactive equilibrium, artificial radioactivity and transmutation of elements. Fundamental particles, positron, antiproton, anti-neutron and anti neutrinos.

Nuclear Models: Liquid drop model, magic number and shell model.

Nuclear Fission: nuclear reactor and atom bomb

Nuclear Fusion: Hydrogen bomb

Applications of radioactivity in chemistry

Tracer techniques:

- (1) Radiocarbon dating
- (2) Reaction mechanism
- (3) Biology and medicine

Suggested Books:

1. Physical Chemistry by S. Glasston.
2. Elements of Physical Chemistry by Lewis and Glasston.
3. Physical Chemistry by Atkins.
4. Thermodynamics by Mishra & Rastogi.
5. Physical Chemistry by Moore.

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Paper-VIII Analytical Chemistry

(4 hrs./week)

UNIT-I

Chromatography: Principles of absorption and partition chromatography, techniques and application of column, paper and thin layer chromatography. Electrophoresis and its applications in separation of amino acids.

Ion exchange methods : General discussion, action of ion exchange resins, column operation, experimental techniques, types of ion exchange resins, determination of the following pairs by ion exchange techniques : (a) chloride and bromide (b) nickel and cobalt.

UNIT-II

Conductometric titrations: The basis of conductometric titrations. Apparatus and measurement, application of conductometric titrations. High frequency titrations, advantages of the techniques, some examples of high frequency titrations.

Potentiometric titrations: Introduction, electrodes, instrumentation, potentiometric titrations, differential potentiometric titrations, automatic potentiometric titrations, location of end points, determination of some metals through potentiometric titrations.

UNIT-III

Spectrophotometric titrations: Basic principle. instrumentation experimental techniques, spectrophotometric analysis of Fe (III), Co (I), Ni (II), Fe (II) in presence of Al (III) with EDTA.

Nephelometry & Turbidimetry: General discussion, instrumentation, some nephelometry determination (a) sulphate (b) phosphate.

Unit-IV

Flame emission and Atomic absorption spectrometry: Basic principle, instrumentation. Nebulization, flames and flame temperatures, interferences, flame spectrometric techniques.

Atomic emission spectrography: Spectroscopic sources, instruments for emission spectrographic analysis, qualitative and quantitative spectrographic analysis. Qualitative spectrographic analysis of a non ferrous alloy and complex organic mixture.

UNIT-V

Thermal analysis: Thermogravimetry (TG) instrumentation, application. Differential thermal analysis and differential scanning calorimetry, instrumentation.

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B.Sc. (HONS.) Pt.-II CHEMISTRY PRACTICALS

(8 hrs. or 12 periods / week) (Spread over Four days)

Inorganic Chemistry

Quantitative (Gravimetric) (any three)

- Estimation of Barium (as sulphate)
- Lead (as chromate)
- Copper (as Cuprous thiocyanate)
- Nickel (as dimethyl glyoximate)
- Silver (as chloride)
- Zinc (as Zinc ammonium phosphate)
- Magnesium (as Magnesium hydrogen phosphate, $MgHPO_4$)

Inorganic Preparations (any four) of coordination compounds and their characterization:

- Chloropentamminecobalt(III) chloride.
- Cuprous chloride, Cu_2Cl_2 .
- Tetramminecopper(II) sulphate.
- Pyridine complex of copper
- Prussian blue.
- Hexaamminenickel(II) chloride.

Organic Chemistry

(i) Identification of simple organic compound and preparation of its suitable derivative.

(ii) Simple one step organic preparation-the students are expected to perform at least five of the following preparations:

- Preparation of m-dinitrobenzene from nitrobenzene.
- Preparation of acetanilide from aniline.
- Preparation of aspirin from salicylic acid.
- Preparation of o-and p-bromo acetanilide from acetanilide.
- Preparation of o-and p-bromo aniline from o-and p-bromoacetanilide.
- Partial reduction, m-dinitrobenzene into m-nitro aniline.
- Preparation of methyl orange from sulphanilic acid.
- Preparation of acetylglycine from glycine.

Physical Chemistry

Exercises

At least four experiments are to be performed from each Unit.

Chemical Dynamics experiments:

- To find the velocity constant of the hydrolysis of methyl acetate catalyzed by an acid.
- To determine the order of saponification of ethyl acetate by NaOH.
- To find out the rate constant and order of reaction between potassium persulphate and potassium iodide,
- To study the reaction between acetone and iodine.

Transition temperature:

- Determination of transition temperature by thermometric method.

Molecular weight determination:

- Determination of molecular weight of non-volatile solute by cryoscopic method and application of technique for determination of the Van't Hoff factor or degree of dissociation of an electrolyte.

Conductometry:

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M. ...
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- To find out the strength of strong acid by titrating it against strong alkali.
- To find out the strength of weak acid by titrating it against a strong alkali.
- To find out the strength of hydrochloric acid and acetic acid in a mixture of both, by titrating it against sodium hydroxide.
- Determination of equivalent conductivity of an electrolyte at different dilutions.

(Instructions to the Examiner)
B.Sc. (HONS.) Pt.-II CHEMISTRY PRACTICAL EXAMINATION

Max. Marks: 100 Duration of Exam: 8 hrs. (Complete in Two days)

Inorganic Chemistry

- Ex.1 **Quantitative:** One of the gravimetric exercises mentioned in the syllabus. 18
 Ex.2 **Inorganic preparation:** One of the exercises mentioned in the syllabus. 12

Organic Chemistry

- Ex. 3 Identification of the simple organic compound and preparation of their suitable derivative. 15
 Ex. 4 Organic preparation: One of the exercises mentioned in the syllabus. 10

Physical Chemistry

- Ex. 5 Perform one of the physical chemistry experiments given in the syllabus. 25
 Ex. 6 **Viva-voce** 10
 Ex. 7 **Record** 10

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3. ZOOLOGY

Paper-VII	Animal Diversity-3	50 Marks
Paper-VIII	Animal Diversity-4	50 Marks
Paper-IX	Physiology-1	50 Marks
Paper-X	Physiology-2	50 Marks
Paper-XI	Immunology -	50 Marks
Paper-XII	Ethology	50 Marks
Practicals	2 days (10 Hrs.)	100 Marks

Seminars, Posters, models, visits, reports, practical record etc. will carry internal marking of 20 marks which will be added in the Practicals (Total=80+20=100)

B.Sc. Part-II (Hons.)

Paper-VII : Animal Diversity-3 Max. Marks : 50

Scheme of Examination :

1. There will be 5 questions in each paper. All questions are compulsory and carry equal marks.
2. Question No. 1 will comprise 10 very short answer (maximum 25 words) type questions, each of 1 mark. Question should be evenly distributed covering entire syllabus.
3. Each paper is divided in to four units/sections. There will be one question from each unit/section. The question No. 2 to 5 will have internal choice.

Section-A

1. Origin and general characteristics of chordates.
2. Protochordates—Classification upto orders Inter relationships, structural organisation of Hemichordates, Urochordates, and Cephalochordates.
3. Agnatha—Classification upto orders.

Section-B

4. Fishes—Classification upto orders, parental care, respiratory organs, migration.
5. Pisciculture

Section-C

6. Amphibians—Origin and evolution of land vertebrates, classification upto orders, parental care.

Section-D

7. Reptiles—Classification upto orders, extinct reptiles, poisonous and nonpoisonous snakes of India.

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Paper-VIII : Animal Diversity-4

Max. Marks : 50

Scheme of Examination :

1. There will be 5 questions in each paper. All questions are compulsory and carry equal marks.
2. Question No. 1 will comprise 10 very short answer (maximum 25 words) type questions, each of 1 mark. Question should be evenly distributed covering entire syllabus.
3. Each paper is divided in to four units/sections. There will be one question from each unit/section. The question No. 2 to 5 will have internal choice.

Section-A

1. Origin of birds. Bird migration. Principles of bird flight.
2. Palaeognathae and Neognathae-Distribution and classification. Beaks and claws.

Section-B

3. Poultry Keeping.
4. Mammals-Origin, classification general characters.

Section-C

5. Comparative anatomy of systems (Integument. Skeletal system, Digestive system.

Section-D

6. Comparative analony of systems : Circulatory system. Respiratory system, sensory organs, Urinogenital system) of fishes, Amphibians, Reptiles, Aves and mammals.

Paper-IX : Physiology-1

Max. Marks : 50

Scheme of Examination :

1. There will be 5 questions in each paper. All questions are compulsory and carry equal marks.
2. Question No. 1 will comprise 10 very short answer (maximum 25 words) type questions, each of 1 mark. Question should be evenly distributed covering entire syllabus.
3. Each paper is divided in to four units/sections. There will be one question from each unit/section. The question No. 2 to 5 will have internal choice.

Section-A

1. Aim and Scope of Physiology—Cell Physiology, mammalian physiology, comparative physiology and applied physiology.

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2. Chemical foundations of physiology—solutions, osmotic pressure, diffusio, pK and pH. buffers.
3. Physiology of Excretion : Kinds of nitrogenous excretory end-products (ammonotelic, uricotelic and ureotelic) : role of liver in the formation of these end products. functional architecture of mammalian kidney tubule and formation of urine: hormonal regulation of water and electrolyte balance.

Section-B

4. Blood—Composition and function of Blood and lymph : Blood groups; Blood coagulation; Structure and function of haemoglobin.
5. Heart—Structure, Origin, conduction and regulation of heart beat : cardiac cycle and ECG.
6. Peripheral circulation—Blood pressure, capillary pressure, regulation.

Section-C

7. Respiration—Mechanism and control of breathing, concept of partial pressure of gases, Bohr's effect.

Section-D

8. Digestion and absorption of dietary components.
9. Nutritional requirements and disorder.

Paper-X : Physiology-2

Max. Marks : 50

Scheme of Examination :

1. There will be 5 questions in each paper. All questions are compulsory and carry equal marks.
2. Question No. 1 will comprise 10 very short answer (maximum 25 words) type questions, each of 1 mark. Question should be evenly distributed covering entire syllabus.
3. Each paper is divided in to four units/sections. There will be one question from each unit/section. The question No. 2 to 5 will have internal choice.

Section-A

1. Physiology of Nerve Impulse and Reflex Action : Functional architecture of a neuron, origin and propagation of nerve impulse, synaptic transmission; spinal reflex arc; central control of reflex action.
2. Physiology of Muscle Contraction; Functional architecture of skeletal muscle; chemical and biophysical events during contraction and relaxation of muscle fibers.

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Section-B

3. Types of Endocrine Glands; Their Secretions and Functions. Classification of Hormones. Brief account of structural histology of endocrine glands. Pituitary, adrenal, thyroid, islets of Langerhans, testis and ovary.

Section-C

4. Hormonal control of male and female reproduction and implantation parturition and lactation in mammals.
5. Preliminary idea of neuron secretion : Hypothalamic control of pituitary function, neuroendocrine and endocrine mechanism of insects.

Section-D

6. Thermoregulation : Physiological process. Thermoregulation in Cold & Hot Environments. Thermoregulation in Poikilotherms and Homeotherms.
7. Physiology of High altitude : Acclimatisation and Adaptations. Diseases due to High altitudes.
8. Physiology of Diving (Basic outline) Oxygen toxicity decompression sickness.

Paper-XI : Immunology

Max. Marks : 50

Scheme of Examination :

1. There will be 5 questions in each paper. All questions are compulsory and carry equal marks.
2. Question No. 1 will comprise 10 very short answer (maximum 25 words) type questions, each of 1 mark. Question should be evenly distributed covering entire syllabus.
3. Each paper is divided in to four units/sections. There will be one question from each unit/section. The question No. 2 to 5 will have internal choice.

Section-A

1. Immunology : Definition, types of immunity-innate and acquired, humoral and cell mediated.
2. Antigen : Antigenicity of molecules haptens.

Section-B

3. Antibody : Definition (IgG, IgM, IgD, IgA, and IgE) outline idea of properties and function of each class of immunoglobulin.
4. Antigen : Antibody reactions : Precipitation reaction, agglutination

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reaction, neutralizing reaction, complement and lytic reactions and phagocytosis.

Section-C

5. Cells of Immunity : Macrophages, Lymphocytes (B- and T-types) T-Helper cells, T-killer cells, plasma cells, and memory cells.
6. Mechanism of humoral or antibody mediated immunity.

Section-D

7. MHC genes and gene products.
8. Immunotolerance, autoimmunity and hypersensitivity Concept.
9. Cytokines.

Paper-XII : Ethology

Max. Marks : 50

Scheme of Examination :

1. There will be 5 questions in each paper. All questions are compulsory and carry equal marks.
2. Question No. 1 will comprise 10 very short answer (maximum 25 words) type questions, each of 1 mark. Question should be evenly distributed covering entire syllabus.
3. Each paper is divided in to four units/sections. There will be one question from each unit/section. The question No. 2 to 5 will have internal choice.

Section-A

1. Introduction : Ethology as a branch of biology and its significance
2. Concepts of ethology : Fixed Action Pattern, Action Specific Energy, Sign Stimulus, Innate Releasing Mechanism, Learning and Imprinting.
3. Methods of studying brain and behaviour : Neuroanatomical, Neurochemical and Neurophysiological techniques.
4. Feeding strategies among animals.
5. Brain and behaviour.

Section-B

6. Genetic and environmental components in the development of behaviour.
7. Communication : Chemical, Visual, Light and Audio.
8. Learning : Habituation, Conditioning, Trial and Error, Latent and Imprinting.
9. Social Behaviour cooperation.

Section-C

10. Reproductive behaviour.

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- 10.1 Evolution of sex and reproductive strategies
- 10.2 Mating systems
- 10.3 Courtship
- 10.4 Sexual selection
- 10.5 Parental care
- 11. Biological rhythms
 - 11.1 Circadian and annual rhythms
 - 11.2 Taxes Kineses and navigation
 - 11.3 Migration of fish and birds

Section-D

- 12. Learning and memory : Conditioning, Habituation
 - 12.1 Conditioning,
 - 12.2 Habituation,
 - 12.3 Insight learning,
 - 12.4 Association learning,
 - 12.5 Reasoning,
 - 12.6 Cognitive skills
- 13. Wildlife of Rajasthan and behaviour of few wild animals in their habitat and captivity.

Practical Zoology

B.Sc. (Hons.) Part-II

Total number of laboratory periods-240

Note

- (i) With reference to item 1 the candidate must be well versed with the techniques of flag-labelling and black paper insertion as the case may be for a clear illustration of his/her dissection.
- (ii) With reference to whole mounts and museum specimens in case of unavailability of certain animal, diagram/photograph/model. etc. should be substituted.
- (iii) Candidate will keep a record of all work done in the practical class and it will be submitted for inspection at the time of practical examination.

1 Anatomy :

- 1. Scoliodon-Afferent, Efferent branchial arteries. cranial nerves. eye-muscles and internal ear.
- 2. Labeo-cranial nerves.
- 3. Heteropneustes-Accessory breathing organs.



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4. Dissection of any lizard and bird
- (i) External features
 - (ii) Digestive system
 - (iii) General viscera
 - (iv) Blood vascular system
 - (v) Urinogenital system
- B. (i) Hyoid apparatus and columella of lizard.
(ii) Air sacs of bird, pecten in bird.
- C. Neck nerves and ear ossicles of a mammal.
- II Museum Specimens :** Herdmania, Botryllus, Pyrosoma, Salpa, Doliolum, Ammocoete larva, Petromyzon, Amia, Lepidosteus, Hippocampus, Syngnathus, Exocoetus, Echinus, Protopterus, Anguilla, Ichthyophis, Proteus, Necturus, Siren Alytes, Rhacophorus, Chelone, Testudo; Hemidactylus, Varanus, Phrynosoma, Draco, Chameleon, Sphenodon, Mabuya, Eryx, Hydrophis, Naja, Viper, Krait, Crocodilus, Alligator, Gavialis, Archeopteryx, Peacock, Ostrich, Emu, Ornithorynchus, Tachyglossus.
Didelphis, Kangaroo, Loris, Bat, Manis, Shrew, Monkey.
- III Osteology :** Vertebral column, girdles, limbs and skull of Frog, Varanus, Fowl, and Rabbit.
- IV Study of Permanent Microscopic slides**
- (i) Amphioxus—T.S. passing through different regions of the body.
 - (ii) Ammocoete larva—T.S. passing through different regions of the body.
 - (iii) Scoliodon—T.S. passing through different regions of the body.
 - (iv) Mammalian histology—Liver, lung, testis, ovary, pancreas, thyroid, parathyroid, adrenal, pituitary. T.S. stomaelo, T.S. Duodesum, T.S. intestine, T.S. bone and T.S. cartilage.
- V (1) Permanent preparation of the following :**
- Herdmania—Pharyngeal wall
Amphioxus—Oral hood, velum and pharyngeal wall of Amphioxus.
Scoliodon—Ampulla of Lorenzini, placoid scales.
Labeo-Cyeloid Scales
Frog-Muscle fibre, cartilage.

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VI. Microtomy procedure : Section cutting (Histological study)

VII. Physiology :

- (i) **Blood** : Haemoglobin, haemoglobin estimation, W.B.C. and RBC counting.
- (ii) **Blood film** : Identification of various types of leucocytes.
- (iii) **Demonstration of salivary amylase and catalase (liver) activity.**

VIII. Immunology :

Blood groups : ABO and Rh factor.

IX. Exercises of Ethology

1. Food preference in Tribolium.
2. Antennal grooming in Cockroach.
3. Chemical communication among Earthworms.
4. Reaction of Paramecium to dilute acid drop.

X. Study of evolution of man with the help of models

XI. Educational tour to museum of Natural history, Sea shore and wild life sanctuary, Zoo for collection and on the spot observation of living animals. Students are expected to submit the report of their visit.

Suggested Readings :

Animal Diversity :

1. Young, J.Z. : The Life of Vertebrates, Oxford University Press, London, 1962 (Low Priced Text Reprint English Language Book Society London, 1962).
2. Colbert. E.H. : Evolution of the Vertebrates, John Willey & Sons in New York, 1969 (Indian reprint : Wiley Eastern Pvt. Ltd. New Delhi, 1970).
3. Barrington, E.J.W. : The Biology Hemichordata and Protochordata. Oliver & Boyd, London, 1965.
4. Berril, N.J. : The tunicate. The Roy Society, London, 1950.
5. Young J.Z. : The Life of Mammals. Oxford University Press London. 1963.

Ethology

6. Manning. An introduction to Behaviour. Edward, Arnold, London.
7. Hindi. R.A., Animal Behaviour. Publication McGraw Hill Co., New York.
8. Animal Societies and Evolution, Scientific American Publications.

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9. MacFar Ind D., Animal Behaviour : Publications. ELBS.
10. Werlace, R.A., Animal Behaviour : Goodyear Publishing Co. Inc.
11. Grizimek's Encyclopaedia of Ethology.
12. Hand book of Ethological Method Laharen Publ. Garland STPM Press.

13. Reena Mathur : Animal Behaviour, Rastogi Publications, Meerut.
Physiology

14. Vander, A.J., Sheerman, J.H. Luciano, D.S. : Human Physiology. McGraw Hill Publishing Company, New York.
15. Guyton, A.C., Hall, J.H. : Text Book of Medical Physiology. Hascourt Asia, PTE, Ltd.
16. David, R., Burggren, W., French, K. : Eckert Animal Physiology, W.H. Freeman and Company, New York.
17. Hill, R.W., Wyse, G.A., Anderson, M. : Animal Physiology Sinauer Associates, Inc., USA.
18. Sastry, K.V. : Animal Pysiology and Biocemistry Rastogi Publication, Meerut.

Immunology

19. Goldsby, R.A., Kindt, T.J., Osborne, B.A. : Kuby Immunology. W.H. Freeman and Company, New York.

PRACTICAL ZOOLOGY

Scheme of Examination :

Max. Marks = 100

Min. Marks = 36

Duration = 8 hrs. (Two days)

Distribution of marks :

1. Major Dissection	11
2. Minor Dissection	7
3. Permanent preparation/Microtomy	7
4. Physiology	7
5. Immunology	7
6. Ethology	7
7. Identification and comment upon spots (1 to 8)	24
8. Viva-voce	10
9. Record	10
10. Seminar/Tour report (Internal marking)	10
Total	100

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U. B.Sc. Botany Honours

Appendix - II *KA*

B.Sc. Part I 2015-16

Maximum Marks: 400

Min. Pass Marks: 160

- Paper-I Cytology, Genetics and Plant Breeding 75marks
- Paper- II Algae, Fungi and Bryophyta 75marks
- Paper-III Plant Physiology and Biochemistry 75marks
- Paper-IV Ecology and environmental science 75marks
- Practical (6 hrs.) 100marks

B.Sc. Part II 2015-16

Maximum Marks: 400

Min. Pass Marks: 160

- Paper-I Molecular biology 75marks
- Paper-II Pteridophyta, Gymnosperm and Paleobotany 75marks
- Paper-III Morphology and Anatomy of angiosperms 75marks
- Paper-IV Microbiology and plant pathology 75marks
- Practical (6 hrs.) 100marks

B.Sc. Part III 2016-2017

Maximum Marks: 400

Min. Pass Marks: 160

- Paper-I Plant Biotechnology 75marks
- Paper-II Systematics of angiosperms 75marks
- Paper-III Plant utilization and Ethanobotany 75marks
- Paper-IV Embryology of angiosperms and Seed science 75marks
- Practical (6 hrs.) 100marks

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B.Sc. Part II
Paper I- Molecular Biology

UNIT-I

Structure of Nucleic Acid

Miescher to Watson and Crick- historic perspective, DNA structure, Salient features of double helix. Types of DNA, Types of genetic material, denaturation and renaturation, cot curves. Organelle DNA -- mitochondria and chloroplast DNA. Structure of RNA, types of RNA (tRNA, mRNA, Ribosomes, miRNA, siRNA) and their functions.

DNA replication, damage and repair

Replicons-linear, circular and D-loops, initiation of replication, DNA polymerases, helicase, primase and other enzymes and proteins used in replication, coordinating synthesis of the leading and lagging strands, Okazaki fragments, Causes of DNA damage and molecular mechanisms of repair - excision repair system in bacteria and eukaryotes, base excision, mismatch repair systems.

UNIT-II

Transcription

Prokaryotic and eukaryotic RNA polymerases, promoter sequences, start point for RNA polymerase, transcription initiation, promoter clearance and elongation, termination, attenuation and antitermination.

RNA Modifications

Split genes, concept of introns and exons, removal of Introns, spliceosome machinery, splicing pathways, alternative splicing.

UNIT- III

Translation: Protein synthesis in Prokaryotes and Eukaryotes: Assembly line of polypeptide synthesis - ribosome structure and assembly, various steps in protein synthesis. Charging of tRNA, aminoacyl tRNA synthetases. Proteins involved in initiation, elongation and termination of polypeptides. Fidelity of translation.

Inhibitors of protein synthesis. Regulation of translation.

Gene regulation

Prokaryotic transcription regulation: Lac and Trp operones, cis and trans acting elements, eukaryotic transcription regulation, protein-protein interactions, DNA binding domains, histone acetylation, promoter activation and turning on off the gene

Suggested laboratory exercises

1. Preparation of culture medium (LB) for E.coli (both solid and liquid) and raise culture of E.coli.
2. Demonstration of antibiotic resistance. (Culture of E.coli containing plasmid (pUC 18/19) in LB medium with/without antibiotic pressure and interpretation of results).
3. Isolation and quantitative estimation of DNA using colorimeter (Diphenylamine reagent) or spectrophotometer (A260 measurement).
4. To perform Ames test in Salmonella / E.coli to study mutagenicity.
5. To isolate plant DNA.
6. Study of semiconservative replication of DNA through micrographs/schematic representations.

SUGGESTED BOOKS

1. Karp, G. 2010 Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
3. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.
4. Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R., 2008 Molecular Biology of the Gene. 6th edition. Cold Spring Harbour Lab. Press, Pearson Pub.

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Paper-II Pteridophyta, Gymnosperm and Paleobotany

UNIT-I

Pteridophytes: History, occurrence and distribution, general characters, classification and economic importance, Salient features of primary vascular plants.

Comparative study of morphology, anatomy and reproduction of *Pistia*, *Lycopodium*, *Selaginella*, *Equisetum*, *Marsilea*, *Pteris*.

Heterospory and seed habit, Detailed account of stellar system.

UNIT-II

Gymnosperms: Classification and salient features; Evolutionary significance of gymnosperms.

Comparative study of morphology, anatomy and reproduction of Cycadales-*Cycas*; Coniferales-*Pinus*; and Gnetales-*Ephedra*.

UNIT-III

Paleobotany: Fossil formation and types of fossils.

Geological time scale: sequence of plants in geological time.

Fossil Pteridophytes: *Rhynia*, *Lepidodendron*, *Calamites*.

Fossil gymnosperms: *Williamsonia*.

Applied aspects of Palaeobotany: Exploration of fossil fuels.

Suggested laboratory exercise

Pteridophytes

Study of Specimens, external morphology and T.S. of Stem of the following-

- *Lycopodium* T.S. of stem.
- *Selaginella* T.S. of stem.

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- *Equisetum*-T.S. of stem.
- *Marsilea*- Sporocarp, Petiol.
Pteris

Gymnosperms

External Morphology and Permanent slides of-

- *Cycas*- Coralloid roots, Rachis (T.S.), Leaflet (V.S.) *Cycas*- Megasporophyll and Male cone with Microsporophylls, Mature Ovule.
- *Pinus*- Stem (TLS & RLS), Needle (V.S.), Male and Female Cone, Mature Ovule
- *Ephedra*- Stem (T.S.), Male and Female Flowers, Mature ovule.
- *Williamsonia*- Chart Specimen (Fossil).

Suggested Books:

1. Gifford. E.M. and Foster, A.S. 1989. Morphology and evolution of vascular plants. W.H. Freeman & Co. New York, USA.
2. Sporne, K.R. 1991>The morphology of gymnosperms. B.I. Publication Pvt. Ltd. Mumbai, Kolkata, Delhi.
3. Wilson N.S. and Rohwell, G.w. 1993 Paleobotany and the evolution of plants (2nd edition) Cambridge University Press. UK.
4. Sharma O.P. Pteridophytes. 2000 . Today and Tomorrow Publication.
5. Sarabhai R.C. and Saxena R.C. 1990. A text book of Botany . Rastogi Publications, Meerut.
- 6.

Paper-III Morphology and Anatomy of Angiosperms

UNIT-I

The basic body plan of flowering plants:

- Modular type of growth, diversity of plant forms in annuals, biennials, perennials plant.
- Branching pattern and canopy architecture.
- Morphology of Inflorescences, Flower and fruits.

UNIT-II

Convergence of evolution of tree habit in Spermatophyta, Tissues; simple, complex and secretory tissues, tissue system.

Shoot and root systems : variation in habit and longevity.

UNIT-III

Organization of the higher plant body

Meristems and development: Shoot apical meristem, root apical meristem, lateral meristems and their functions. Range of form and structure of stem, leaf and root; their tissues and functions.

Secondary body of the plant: Secondary growth in stem and roots, Vascular cambium, secondary xylem (basic structure of wood); secondary phloem and periderm.

Anomalous secondary growth

Suggested Laboratory Exercises:

- Study of any commonly occurring dicotyledonous plant to understand the body plan and modular type of growth.
- Life forms exhibited by flowering plants (by visit to a forest or a garden).
- L.S. of shoot tip to study the organization of meristem and origin of leaf primordia.
- Monopodial and sympodial types of branching in monocots & dicots.
- Anatomy of primary and secondary growth in monocots and dicots using hand out sections of sunflower, maize, cucurbita stem and roots.
- Monocot-maize (root, stem and leaves).
- Dicot-*Helianthus*, *Cicer* and *Mangifera* (root, stem and leaves).
- Anomalous secondary growth in stem: *Salvadora*, *Bignonia*, *Bougainvillea*, *Boerhaavia*, *Nyctanthes*, *Leptadenia*, *Dracena*.
- Study of diversity in leaf shape and size. Internal structure of leaf-Dorsiventral and isobilateral leaves; study of stomatal types.

Suggested Books:

1. Cutter E.G. 1971. Plant Anatomy: Experiment and Interpretation. Part II. Organs. Edward Arnold, London.
2. Esau, K. 1977. Anatomy of seed plants, 2nd edition, John Wiley and Sons, New York.
3. Fahn, A. 1974: Plant Anatomy 2nd edition, Pergamon press. Oxford.
4. Mauseth, J.D. 1988. Plant Anatomy. The Benjamin/Cumins Publishing Company Inc., Menlo Park, California, USA.

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Paper IV: Microbiology and Plant Pathology

UNIT-I

Discovery of Micro-organisms: Systematic position of micro-organisms in biological world; classification of micro-organisms and characteristic features of different groups.

Methods in Microbiology: Basic principles of microscopy, micrometry, staining, sterilization methods; culture media; pure culture methods; methods for population estimation, growth determination.

Ultrastructure of Micro-organisms: Prokaryotic microorganisms; fine structure of prokaryotic cell; eukaryotic micro organisms; viruses—properties and classification; characteristic features of host-virus interaction; bacteriophage T4; tobacco mosaic virus, general account of mycoplasma.

Genetic recombination in prokaryotes: Conjugation, transformation and transduction.

UNIT-II

General account of plant pathogens: Historical developments; general account of diseases caused by plant pathogens.

Plant diseases by fungi: Rust and smuts of wheat, downy mildew and green ear disease of bajra, white rust of crucifers, late blight of potato, powdery mildew of cucurbits and grapes, red rot of sugarcane.

Pathogen attack and defence mechanisms: Physical, physiological and biochemical aspects.

Plant disease epidemiology : Transmission and spread of plant pathogens; disease cycles, epidemics: modelling and disease forecasting.

Plant disease management: Chemical, biological; IPM systems; biopesticides.

UNIT-III

Genetics of resistance and susceptibility: Genes for virulence and avirulence, their application in resistance and susceptibility; induced resistance (immunization).

Molecular plant pathology: Molecular diagnosis, identification of genes and specific molecules in disease development.

Role of micro-organisms : in biogeochemical cycling of nitrogen and carbon; biological N₂ fixation.

Industrial application of micro-organisms: Organic acids, alcohol, food processing, milk products, antibiotics, biopesticides.

Application of information technology in plant pathology: Stimulation of epidemics; programmes for diagnosis.

Suggested laboratory exercises

Microbiology

- Sex barr body (photograph).
- Microscope and its various parts description.
- Sterilization techniques for microorganisms.
- Study of yeast, lactobacilli and cyanobacteria.
- Media preparation (Nutrient agar).
- Culture of microorganisms by streaking on agar plates.
- Study of diseases- Citrus canker, TMV, little leaf of brinjal.
- Bacteriophage (photograph).
- Study of symptoms of virus infected plants.
- Bacterial staining in milk and curd.

Plant diseases

- White rust of crucifers – *Cystopus*.
- Late blight of Potato - *Phytophthora infestans*.
- Early blight of Potato- *Alternaria solani*.
- Green ear disease of bajra- *Sclerospora graminicola*.
- Powdery mildew.
- Tikka leaf spot disease of groundnut.
- Red rot of sugarcane - *Colletotrichum fulcatum*.

Suggested Books:

1. Bilgrami, K.S. and Dube, H.C. A text book of modern Plant Pathology, Vikas Publication, New Delhi 2000.

Handwritten signatures and initials: V, S, Anand, R, M, W.

2. Biswas, S.B. and Biswas A. An introduction to Viruses, Vikas Publication Vikas Publication, New Delhi 2000.
3. Clifton A. A introduction to Bacteria, McGraw Hill Co. Ltd. New York, 1985.
4. Palzar M.J. Microbiology, McGraw Hill Edu. Pvt. Ltd. London, 2001.
5. Sharma P.D. Microbiology and pathology, Rastogi Publication, Meerut 2003.

B.Sc. Part –III

PAPER I- Biotechnology

UNIT I

Plant Tissue culture

Historical perspective; composition of media; nutrient and hormone requirement; methods of sterilization; totipotency; concept of differentiation, dedifferentiation and redifferentiation; physical-chemical conditions for propagation of plant cells and tissues; Plant regeneration routes: micropropagation, organogenesis and somatic embryogenesis; Anther culture, production of androgenic haploids; protoplast isolation culture and fusion; somatic hybrids & cybrids. Application of Plant Tissue culture.

UNIT II

Recombinant DNA Technology

Introduction, Restriction endonucleases (history, types and role); Other enzymes, Cloning vectors: plasmids, bacteriophages, cosmids. Introduction of recombinant DNA into host cells, methods for identification of recombinants, Gel Electrophoresis: PCR; DNA Sequencing (Sanger's method and Maxam Gilbert's method); Southern, Northern and Western blotting; construction of genomic and cDNA library; Introduction to Bioinformatics.

UNIT III

Plant Transformation Technology

Handwritten signatures and marks: "W", "AS", "Archoze", "36", and a crossed-out signature.

5. MATHEMATICS

Appendix-V

B.A./B.Sc. (Hons) Part – II – 2016

Teaching : 3 hours per week per Theory paper.
2 Hours per Week per Batch for Practical
(20 candidates in each batch)

Examination:

	Min.Pass Marks		Max. Marks
Scheme:	Science – 160		400
		Duration	Max.Marks
Paper – V	Real Analysis and Metric Space	3 hrs.	100
Paper – VI	Differential Equations	3 hrs.	100
Paper – VII	Numerical Analysis and Vector Calculus	Theory: 2½ hrs. Practical: 2 hrs.	68 32
Paper – VIII	Operations Research	3 hrs.	100

Note:

1. Papers V, VI and VIII will be divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All question carry equal marks.
2. Paper VII is divided into FOUR Units. TWO questions will be set from each Unit. Candidates are required to attempt FOUR questions in all taking ONE question from each Unit. All questions carry equal marks.
3. Common paper will be set for both the Faculties of Social Science and Science. However, the marks obtained by the candidate in the case of Faculty of Social Science will be converted according to the ratio of the maximum marks of the papers in the two Faculties.
4. Each candidate is required to appear in the Practical examination to be conducted by internal and external examiners. External examiner will be appointed by the University and internal examiner will be appointed by the Principal in consultation with Local Head/Head, Department of Mathematics in the college.
5. An Internal/external examiner can conduct Practical Examination not more than 100 (Hundred) candidates (20 Candidates in one batch).
6. Each candidate has to pass in Theory and Practical examinations separately.

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~~21~~
37

Paper – V: Real Analysis and Metric Space**Teaching : 3 Hours per Week****Duration of Examination : 3 Hours****Max. Marks: 100**

Note: This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.

Unit 1: Real numbers as complete ordered field, Limit point, Bolzano-Weierstrass theorem, Closed and Open sets, Union and Intersection of such sets. Concept of compactness. Heine-Borel theorem. Connected sets.
Real sequences- Limit and Convergence of a sequence, Monotonic sequences.

Unit 2: Cauchy's sequences, Subsequences, Cauchy's general principle of convergence. Properties of continuous functions on closed intervals. Properties of derivable functions, Darboux's and Rolle's theorem.

Unit 3: Notion of limit and continuity for functions of two variables.
Riemann integration – Lower and Upper Riemann integrals, Riemann integrability, Mean value theorem of integral calculus, Fundamental theorem of integral calculus,

Unit 4: Sequence and series of functions – Pointwise and Uniform convergence, Cauchy's criterion, Weierstrass M-test, Abel's test, Dirichlet's test for uniform convergence of series of functions, Uniform convergence and Continuity of series of functions, Term by term differentiation and integration.
Metric space – Definition and examples, Open and Closed sets, Interior and Closure of a set, Limit point of a set.

Unit 5: Subspace of a metric space, Product space, Continuous mappings, Sequence in a metric space, Cauchy sequence. Complete metric space, Baire's theorem, Compact sets and Compact spaces, Connected metric spaces.

Paper – VI: Differential Equations**Teaching : 3 Hours per Week****Duration of Examination : 3 Hours****Max. Marks: 100**

Note: This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.

Unit 1: Degree and order of a differential equation. Equations of first order and first degree. Equations in which the variables are separable. Homogeneous equations and equations reducible to homogeneous form. Linear equations and equations reducible to linear form. Exact differential equations and equations which can be made exact.

38

22

Unit 2: First order but higher degree differential equations solvable for x, y and p . Clairaut's form and singular solutions with Extraneous Loci. Linear differential equations with constant coefficients, Complimentary function and Particular integral.

Unit 3: Homogeneous linear differential equations, Simultaneous differential equations. Exact linear differential equations of n th order. Existence and uniqueness theorem.

Unit 4: Linear differential equations of second order. Linear independence of solutions. Solution by transformation of the equation by changing the dependent variable/the independent variable, Factorization of operators, Method of variation of parameters, Method of undetermined coefficients.

Unit 5: Partial differential equations of the first order. Lagrange's linear equation. Charpit's general method of solution. Homogeneous and non-homogeneous linear partial differential equations with constant coefficients. Equations reducible to equations with constant coefficients.

Paper – VII: Numerical Analysis and Vector Calculus

Teaching : 3 Hours per Week

Duration of Examination : 2½ Hours

Max. Marks: 68

- Note:** (i) This paper is divided into FOUR Units. TWO questions will be set from each Unit. Candidates are required to attempt FOUR questions in all taking ONE question from each Unit. All questions carry equal marks.
(ii) Non-Programmable Scientific Calculators are allowed.

Unit 1: Differences. Relation between differences and derivatives. Differences of a polynomial. Newton's formulae for forward and backward interpolation. Divided differences. Newton's divided difference, Lagrange's interpolation formula.

Unit 2: Central differences. Gauss's, Stirling's and Bessel's interpolation formulae. Numerical Differentiation. Derivatives from interpolation formulae. Numerical integration, general Derivations of quadrature formula, Trapezoidal rule, Simpson's one-third, Simpson's three-eighth and Gauss's quadrature formulae.

Unit 3: Process of Gauss elimination and Iterative methods (Jacobi and Gauss-Seidal) for solving system of linear algebraic simultaneous equations. Partial Pivoting method, ill conditioned systems, Solutions of ordinary differential equations of first order with initial condition using Picard's Euler and modified Euler's method.

Unit 4: Scalar and Vector point functions. Differentiation and integration of vector point functions. Directional derivative. Differential operators. Gradient, Divergence and Curl. Theorems of Gauss, Green, Stokes (without proof) and problems based on these theorems.

39

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Practical:
Teaching: 2 Hours per Week per Batch
(20 Candidates in each Batch)

Examination:	Duration: 2 Hours
Scheme	
Max.Marks	32
Min.Pass Marks	13
Distribution of Marks:	
Two Practicals one from each group	
10 Marks each	= 20 Marks
Practical Record	= 06 Marks
Viva-voce	= 06 Marks
Total Marks	= 32 Marks

Group A: Numerical integration using Trapezoidal and Simpson's rules. Numerical solution of Algebraic and Transcendental equations using

(i) Iteration method (ii) Newton- Raphson Method and (iii) Regula-Falsi method.

Group B: Numerical Solution of system of linear equations by Gauss elimination, Jacobi and Gauss-Seidel methods. Solution of linear differential equations of first order and first degree with initial and boundary conditions using Picard's and modified Euler's method.

Note:

1. Problems will be solved by using Scientific Calculators (non-Programmable)
2. Candidates must know about all functions and operations of Scientific Calculator.
3. Each Candidate (Regular/non-Collegiate) has to prepare his/her practical record.
4. Each Candidate has to pass in Practical and Theory examinations separately.

Paper – VIII: Operations Research

Teaching : 3 Hours per Week

Duration of Examination : 3 Hours

Max. Marks: 100

Note: This paper is divided into FIVE Units. TWO questions will be set from each Unit.

Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.

Unit 1: Theory of Games – Introduction, Basic definitions, Minimax (Maximin) criterion and Optimal strategy, Saddle point, Minimax-Maximin principle for mixed strategy games, Fundamental theorem of Game theory. Two-by-two games without saddle point, Arithmetic method for 2x2 games. Graphical method for 2x2 games.

40

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Unit 2: Inventory Models – Definition, Types of inventory models, Classification of inventory models, Economic ordering quantity (EOQ), EOQ models without shortage, EOQ models with shortage, EOQ models with constraints.

Unit 3: Probability theory – Probability distributions of a random variable, Standard deviation, Variance, Mathematical expectation, Binomial, Poisson and Normal distributions.

Unit 4: Queueing Theory – Introduction, Probability distributions in queueing systems. Models-Erlang model, general Erlang model, Model III(M/M/I): (N/FCFS).

Unit 5; Sequencing Models: Sequencing problems, processing n jobs through two machines. Processing n jobs through three machines, processing two jobs through m machines and processing n jobs through shortest cyclic Route Models. Minimal path problem (shortest Acyclic Route Models).

41


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Recommended Readings:

- Monkhouse, F. J. and Wilkinson, F.J. 1985: Maps and Diagrams. Methuen, London.
Raisz, E. 1962: General Cartography. John Wiley and Sons, New York. 5th edition.
Sarkar, A. K. 1997: Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
Singh, R.L. and Singh Rana P.B. 1991: Elements of Practical Geography. Kalyani Publishers, New Delhi.
Singh, L.R 2006: Fundamentals of Practical Geography. Sharda Pustak Bhawan, Allahabad.
शर्मा, जे.पी. 2012: प्रायोगिक भूगोल। रस्तोगी पब्लिकेशन्स, मेरठ।

6. B.A./B.Sc. (Hons.) Geography Part-II Examination 2016 and onwards Scheme of Examination

Min. Pass Marks 160 (40%)		Max. Marks 400
Paper –V 3 hour duration	Introduction to Political Geography	Max. Marks 80
Paper –VI 3 hour duration	Cultural Geography	Max. Marks 80
Paper –VII 3 hour duration	Fundamentals of Biogeography	Max. Marks 80
Paper–VIII 3 hour duration	Statistical Methods in Geography	Max. Marks 80
Practical		Max. Marks 80

Notes

1. Students are permitted to use the stencils, simple calculator and log tables wherever needed in both theory and practical examinations.
2. There will be a common paper for Arts and Science.
3. Q.1 will be compulsory and will cover the entire course of the paper.
Q.No. 1 of 20% marks of the maximum marks be set in two parts.
(a) Part (a) will have ten items for locating on a map (to be supplied by examination centre) carrying 10% marks of the maximum marks and candidates shall attempt any five items.
(b) Part (b) will have 10 short answer questions carrying 10% marks of the maximum marks and candidates shall attempt any five items.
4. Remaining 9 questions carrying equal marks will be set with three questions from each section of the syllabus.
5. Candidate will attempt 5 questions including question No. 1 in all selecting at least one question from each section.
6. Practical examination will be conducted by the board of examiners.
7. The candidate will have to pass in theory and practical separately.

SYLLABUS

Paper V: Introduction to Political Geography

Section A

Meaning, nature, scope and subject matter of political geography, political geography and critical geopolitics, approaches to the study of political geography, morphological, functional

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42
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and united field theory, role of physical, demographic, economic, socio-cultural and historical factors in the emergence of states.

Section B

State as a politico-territorial phenomenon: changing nature of location, size and shape in political geography of states, political and administrative framework and its hierarchical relationship to unitary and federal forms of governance, boundaries and frontiers, functions and classification of international boundaries, global strategic views: the views of Mackinder, Spykman, de Seversky and Mahan and their relevance to contemporary world situation.

Section C

Underdevelopment and international policies, the North-South dialogue, SAARC and ASEAN the new international economic order, international tensions, West Asia and Indian Ocean region, regionalism in international relations, geopolitical dimensions of environment.

Recommended Readings :

- Adhikari, S. 2004: Political Geography. Rawat Publications, Jaipur.
Alexander, L.M. 1966: World Political Patterns. John Murray and Co., London.
Blij, H.J. de and Glassner, Martin 1968: Systematic Political Geography. John Wiley, New York.
Dikshit, R.D. 1985: Political Geography: A Contemporary Perspective. Tata McGraw-Hill Publishing Co., New Delhi.
East, W.G. and Spate, O.H.K. 1966: The Changing Map of Asia. Methuen, London.
Pounds, N.J.G. 1972: Political Geography. McGraw Hill, New York.
Short, J.R. 1982: Political Geography of the 20th Century: A Global Analysis. New York.
सक्सेना, एच.एम. 2009-10: राजनैतिक भूगोल। रस्तोगी पब्लिकेशन्स, मेरठ।
Taylor, P. 1985: Political Geography. Longman, London

Paper VI: Cultural Geography

Section A

Definition, components of culture evolution and branches of cultural geography, cultural realms convergence and divergence process, cultural diversity in world, evolution of man, rise and dominance of homosapiens, their pattern of spread over the globe, primary races and their relationship with surrounding environment, landscape ecology.

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Section B

Evolution of civilization: with special reference to mesopotamian, Nile, Indus and Hwang-ho valley civilization, Indus valley civilization- development, growth, expansion, organization and causes for its downfall, characteristics and distribution of races, ethnic groups, linguistic families, religious groups.

Section C

Domestication of plants and animals, patterns of livelihood: various economic activities & cultural adaptations, agriculture, industrialization and modernization, technological changes and their spatial implications, social structure and technology, pattern of rural and urban society, social processes in the city, the city in the developing countries.

Recommended Readings :

- Broek, J.C. and Webb, J.W. 1978: A Geography of Mankind. McGraw Hill, New York.
दीक्षित, श्रीकान्त एवं त्रिपाठी, रामदेव 2001 : सांस्कृतिक भूगोल। वसुन्धरा प्रकाशन, गोरखपुर।
Husain, M. 2007, Models in Geography. Rawat Publications, Jaipur
Johnson, D.C. et al 2012: World Regional Geography: A Development Approach. PHI Learning Private Limited, New Delhi, Edition
Mukherjee, A.B. and Aijazuddin, A. 1985: India-Culture, Society and Economy. Inter-India Publication, New Delhi.
प्रसाद, गायत्री 2005 : सांस्कृतिक भूगोल। शारदा पुस्तक भवन, इलाहाबाद।
Rubenstein, J.M. and Bacon, R.S. 1990: The Cultural Landscape: An introduction to Human Geography. Prentice Hall of India Private Limited, New Delhi
Spencer, J.E. et al : Cultural Geography. John Wiley and Sons, New York.
रिजवी, एस.एस. 1994: सांस्कृतिक भूगोल। राजस्थान हिन्दी ग्रंथ अकादमी, जयपुर।

Paper VII: Fundamentals of Biogeography

Section A

Definition, scope and significance of bio-geography, basic ecological principles: bio-energy cycle in the terrestrial ecosystem and energy budget of the earth: trophic and food chain, Darwin's theory of evolution, concept of biome and community.

Section B

Origin of fauna and flora: geographical distribution, major gene-centres domestication of plants and animals and their dispersal, distribution of plant life on the earth and its relation to

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44
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soil types climates and human practices, geographical distribution of animal life on the earth and its relations to soil, vegetation types, climates and human practices.

Section C

Ecological changes over space and time, ecosystem stability and disturbance, managed ecosystems : agricultural, urban, case studies of human induced ecological changes: desert ecosystems with specific reference to Rajasthan, wetland ecosystems with specific reference to the Rajasthan wetlands, agricultural ecosystems with specific reference to the Indira Gandhi Nahar Pariyojna (IGNP), industrial affluent and its effect on fresh water biology and riverine ecosystem management practice (special reference to Rajasthan).

Recommended Readings :

- Cox, C.B. Moore, P.D. 2010: Biogeography- An Ecological and Evolutionary Approach. Johnwiley and Sous, U.S.A.
- Huggett, R.J. 1998: Fundamental of Biogeography. Routledge, London.
- गुर्जर, आर.के. एवं जाट, बी.सी. 2012: पर्यावरण भूगोल। पंचशील प्रकाशन, जयपुर।
- Ladle, R.J. and Whittaker, R.J. 2011: Conservation Biology. Blackwell Publications Co., U.S.A.
- Mathur, H.S. 1988: Essentials of Biogeography. Pointer Publishers, Jaipur.
- Macdonald, Geen, 2002: Biogeography: Introduction to Space-Time and Life. John Wiley, New York
- Odum, E.P. 1975: Ecology, Rowman and Littlefield. Lanhan, U.S.A.
- Robinson, H. 1982: Biogeography. Eles, Mc. Donald and Evans London.
- Singh, M.B. et al (ed.) 1986: Forest Resource: Economy and Environment. Concept Publishing Company, New Delhi.
- Singh, S. 2012: Environmental Geography. Prayag Pustak Bhawan, Allahabad.
- सिंह, एस. 2013: जैव भूगोल। प्रयाग पुस्तक भवन, इलाहाबाद।

Paper VIII: Statistical Methods in Geography

Section-A

Sources of data methods of data collection, processing analysis and results, questionnaire and schedule, frequency distributions, characteristics of frequency distribution: number of classes: class-interval, graphical representation data: histogram, frequency polygon, frequency curve and cumulative frequency curve (ogive).

Section-B

Measures of central tendency: median, mode, arithmetic mean and geometric mean, measure of variations of dispersion: crude range, quartile deviation, standard deviation, Coefficient of variation, normal curve, measures of Skewness: Kurtosis, simple correlation and regression.

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76
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Section-C

Theory of probability-basic principles: axioms probability: probability distribution, theory of sampling: types of sampling random systematic and stratified sampling: problems application of sampling methods in Geography t-test and chi-square test.

Books Recommended :

Aslam, Mahmood 1977: Statistical Methods in Geographical Studies. Rajesh Publications, Delhi.

Duncan, O.D. et. Al. 1961: Statistical Geography, (Problems in Analysing Areal Data). Free Press of Blenco, New York.

Gregory S. 1963: Statistical Methods and the Geographer. Longmans, London.

King, L.J.: Statistical Analysis in Geography. Prentice Hall, Englewood Cliffs, NJ.

Lewis, Peter 1977: Maps and Statistics. Methuen & Co. Ltd., London.

Gupta, S.P. 1979: Statistical Methods. Sultan Chand & Sons, New Delhi.

Mahmood, A. 1998: Statistical Methods in Geographical Studies. Rajesh Publication, New Delhi.

Nagar, K.N. 1992: Sankhiki Ke Mool Tatva. Meenakshi Prakashan, Meerut.

Practicals

Scheme of examination

Min. Pass Marks: 32

Max. Marks: 80

	Marks	Time
Written test	40	3 hrs.
Field survey and viva voce	15+5	2½ hrs.
Record and viva voce	15+5	
Total Marks	80	

N.B. 1. There shall be 6 questions in written test selecting at least two questions from each section. Candidates are required to attempt 3 questions selecting 1 question from each section. All question carry equal marks.

SYLLABUS

Section A

Maps and diagrams: one dimensional (bar & pyramid), two dimensional (square, rectangle, wheel, circles & ring), three dimensional diagrams (cube, sphere and block pile), distributional maps: dot, isopleth, choropleth, chorochromatic and chroschematic.

Section B

11

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Measures of central tendency & dispersion: mean, median and mode, mean deviation, quartiles & standard deviation.

Section C

Plane table surveying: Equipments, procedure, traversing – open and closed traverse, methods- radial and intersection, concept of resectioning: two point problem, three point problem

Use of Indian pattern clinometer.

Recommended Readings:

Monkhouse F.J. and Wilkinson, H.R. (1971), Maps and Diagrams: Their Compilation and Construction. B.I. Publications Private Limited. New Delhi.

Singh R.L. and Singh R.P.B. (1991); Elements of Practical Geography. Kalyani Pub. New Delhi.

Sarkar A. (1997); Practical Geography: A Systematic Approach. Orient Longman. Ltd. Hyderabad.

Robison, A.H. et al 2004: Elements of Cartography. John Willey & Sons, New York.

शर्मा, जे.पी. 2012: प्रायोगिक भूगोल। रस्तोगी पब्लिकेशन्स, मेरठ।

Mishra, R.P. and Ramesh, A (1989); Fundamentals of Cartography. Concept Publishing Company, 1989, New Delhi.

~~B.A./B.Sc. (Hons.) Geography Part-III Examination 2017 and onwards~~

~~Scheme of Examination~~

Min. Pass Marks 160 (40%)		Max. Marks 400
Paper –IX 3 hour duration	Geography of India	Max. Marks 80
Paper –X 3 hour duration	Evolution of Geographical Thoughts	Max. Marks 80
Paper –XI 3 hour duration	Fundamentals of Agricultural Geography	Max. Marks 80
Paper–XII 3 hour duration	Applied Geography	Max. Marks 80
Practical		Max. Marks 80

Notes

1. Students are permitted to use the stencils, simple calculator and log tables wherever needed in both theory and practical examinations.
2. There will be a common paper for Arts and Science.
3. Q.1 will be compulsory and will cover the entire course of the paper. Q.No. 1 of 20% marks of the total marks be set in two parts.
 - (a) Part (a) will have ten items for locating on a map (to be supplied by examination centre) carrying 10% marks of the maximum marks and candidates shall attempt any five items.
 - (b) Part (b) will have 10 short answer questions carrying 10% marks of the maximum marks and candidates shall attempt any five items.
4. Remaining 9 questions will be set with three questions from each section of the syllabus carrying equal marks.

47

12

278
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7. PSYCHOLOGY

29

B.A./B.Sc. Honours Part-II

SCHEME OF EXAMINATION :

Papers	Nomenclature	Duration	Max. Marks	Min. Pass Marks
Paper-V	Systems and Theories of Psychology	3 Hrs.	75	120
Paper-VI	Psychopathology	3 Hrs.	75	
Paper-VII	Counselling Psychology	3 Hrs.	75	
Paper-VIII	Biological Basis of Behaviour	3 Hrs.	75	
Practicals		3 Hrs.	100	40

NOTE :-

- There will be four theory Papers in Psychology in B.A. Honour Part-I. It would be common for Arts and Science. Each paper will be of 3 hours. It would comprise 3 Sections A, B and C and would cover the entire course content of the paper.

Section-A will contain 10 questions of 20 words consisting of 1.5 marks each. Thus, Part-A will be of 15 marks.

Section-B will contain 7 questions of 50 words each, out of which students are required to attempt 5 questions. Each question will be of 3 marks. Thus, Part-B will be of 15 marks.

Section-C will contain 3 long questions each with internal choice. Each question will be of 15 marks. Thus, Part-C will be of 45 marks.

For clarification the distribution of marks is tabulated as below:-

B.A. Honours (Psychology) Part-I			
Section	No. of Questions	Marks	Total
A	10	1.5	15
B	5 (Out of 7)	03	15
C	3 (with internal choice)	15	45
Total Marks			75

- Use of simple calculator will be allowed for statistical portions of all papers.

(48)

Paper-V:**Systems and Theories of Psychology****Section-A**

1. Psychological Foundations : Helmholtz, Weber and Fechner.
2. Structuralism: Wundt and Titchner.
3. Functionalism: William James, Galton and Cattell

Section-B

4. Behaviorism: Thorndike, Pavlov, Watson and Tolman
5. Gestalt Psychology : Wertheimer, Koffka and Kohler.
6. Dynamic Psychology: Mc Dougall and Woodworth.

Section-C

7. Psychoanalysis: Freud, Jung and Adler
8. Neo Freudians: Horney, Fromm, Sullivan and Erikson
9. Humanistic Psychology: Rogers and Maslow

Books Recommended:

- Hergenhahr, B.R. (2001) An Introduction to the History of Psychology (4th edition), New Delhi: Cengage Learning
- Leahey T.H. (2006) History of Psychology: Main Currents in Psychological thoughts, New Delhi: Pearson Education.
- Shultz D.P. (2003). History of Psychology, New Delhi: Pearson Education
- Singh, A.K. (1997), The Comprehensive History of Psychology. New Delhi : Motilal Banarsi Das.

Paper-VI:**Psychopathology****Section-A**

1. Abnormal Behaviour: Nature and Concept; Vulnerability, Resilience and Coping Paradigm, Mental Health: Meaning and Components.
2. Theoretical Perspectives: Biological, Psychodynamic, Behavioural, Cognitive, Humanistic, Existential, Community-Cultural and Interactional.
3. Symptomatology and Etiology of Abnormal Behaviour: Cognitive, Affective and Affective Symptoms; Biological, Psycho-Social, Socio-cultural Causes

Section-B

4. Classification and Assessment: The latest classification system of APA and WHO. Interview and Psychometric Assessment: Personality, Behavioural, Cognitive, Relational, Bodily Assessment.
5. Somatoform and Anxiety Disorders: Nature and Clinical Picture of Pain, Somatization, Conversion-Disorders and Hypochondriasis. Nature and Clinical Picture of Generalized Anxiety, Panic, Obsessive-Compulsive and Post-Traumatic Disorder and Phobias.
6. Personality Disorders: Nature, Classification, and Clinical Picture.

Section-C

7. Schizophrenia and other Psychotic disorders: Nature, Clinical Picture and Types.
8. Mood Disorders and Substance Related Disorders: Nature and Clinical Picture of Depression, Depressive and Bipolar Disorders. Nature of Substance-Use and Substance-Induced Disorders; Clinical Picture of Alcohol-related, Nicotine-related and Sedative-Hypnotic/Anxiolytics-Related Disorders.
9. Treatment and Prevention: Psychotherapies-Client Centered, Cognitive, Psychoanalytic, Behavioural Therapies; Prevention: Levels, Situation-Focused and Competency-Focused, Sites of Prevention.

50

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Books Recommended:



- Sarason, I.G. and Sarason, B.R. (2005) Abnormal Psychology. Delhi, Pearson Education
- Lamm, A (1997): Introduction to Psychopathology N.Y. Sage.
- Buss, A.H, (1999): Psychopathology, N.Y. John Wiley.
- Arun Kumar Singh (2002), Adhunik Asamanya Manovigyan, Delhi, Motilal Banarsidas.

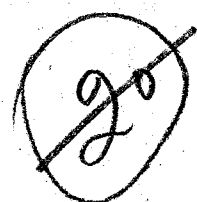
Paper-VII:**Counselling Psychology****Section-A**

1. Introduction: Meaning, Purpose and Goals; History and Current Trends in Counselling.
2. Counselling Process; Counselling Relationships: Nature and Determinants; Steps of Counselling Process; Initial Interview: Types and Conduction, Exploration and the Identification of Goals.
3. Personal and Professional Aspects: Personality and Background of the Counsellor; Professional Counselling - related activities; Ethical and legal aspects : Ethics, morality, law, and Counselling, Professional Codes of Ethics and Standards; Ethical decisions.

Section-B

4. Psychoanalytical and Psychodynamic Approach: Freudian, Neo-Freudian and Modern.
5. Humanistic Approach : Existential and Client-centered.
6. Cognitive and Behavioural Approach : Rational Emotive, Transaction Analysis and Behaviour Modification.



Section-C

7. Counselling with Diverse Populations; Aged Populations, Gender-based Counselling, Group Counselling and Crisis Intervention Counselling.
8. Counselling in a Multicultural Society – Counselling across Culture and Ethnicity, History of Multicultural Counselling, Issues in Multicultural Counselling, Counselling with specific Cultural groups.
9. Career Counselling over the Life Span – Importance of Career Counselling, Scope of Career Counselling and Careers, Career Information, Career Counselling with Diverse Populations.

Books Recommended :-

- Gladding, Samuel T. (2014) – Counselling A Comprehensive Profession. Sixth Edition, Pearson Publication.
- Gibson, R.L. and Mitchell, M.H. (2005). Introduction to Counselling and Guidance. New Delhi: Pearson education.
- George, R.L. and Cristiani, T.S. (1994) Counselling Theory and Practice (IV Ed.) New Delhi: Prentice – Hall.
- Gelso, C.G. and Fretz, B. Counselling Psychology; Practices, Issues and Interventions. New Delhi: Cengage learning.
- Capuzzi's (2008). Counselling and Psychotherapy (4th Ed.). New Delhi: Pearson Education.

Paper-VIII:

Biological Basis of Behaviour

Section-A

1. Introduction: Definition, Scope and Methods of studying Biological basis of Behaviour.
2. Cells of Nervous system : Structure and Functions; Communication within a Neuron, Communication between Neurons.





3. Structure and Functions of Nervous System: Central Nervous System and Peripheral Nervous System: Basic features and Functions; Neurotransmitters.

Section-B

4. Lateralization of Brain Functions: Difference between Left and Right Hemispheres, Cortical localization of Language, Aphasia.
5. Ingestive behavior : Physiological Regulatory mechanism; Brain mechanism in Eating and Eating Disorders.
6. Sleep and Waking: Physiological mechanism of Sleep and Waking; Biological Clock and Sleep Disorders.

Section-C

7. Learning and Memory: Neural Mechanism of learning and Memory, Disorders of Memory.
8. Emotion, Stress and Health: Neural Mechanism of Fear, Anger and Aggression; Stress and Health; Hormones and Emotion.
9. Developmental Disorders : Genetic and Neurological basis for Autism, ADHD, Mental Retardation.

Books Recommended:

- Carlson, N.R. (2007) Foundations of Physiological psychology. Delhi, Pearson Education Inc.
- Pinel, J.P. (2007), Biopsychology. Delhi, Pearson Education Inc.
- Levinthal, C.F. (1996): Introduction to physiological Psychology, New Delhi, Prentice Hall.

Practicals:

1. Method of Average Error- Muller Lyer Illusion
2. Biofeedback
3. Experiment on Classical Conditioning
4. Measurement of Emotions by Facial Expression
5. Word Association Test
6. High School Personality Questionnaire
7. Thematic Apperception Test
8. Level of Aspiration
9. Wechsler Adult Intelligence Scale
10. Neuropsychological Assessment
11. Assessment of Mental Health
12. PGI Battery of Memory Dysfunction



54

~~23~~