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VEER KUNWAR SINGH UNIVERSITY, Ara

content

B. SC. PART- III

GENERAL, SUBSIDIARY AND HONOURS

<u>SERIAL No.</u>	<u>Subject</u>
1.	Physics : Honours & Sub.
2.	Chemistry : Honours & Sub.
3.	Math : Honours & Sub.
4.	Botany
5.	Zoology

B.Sc. Part – III**B.Sc. Physics****Part – III****(Honours)**

The Course shall consist of three Theory papers V, VI and VII each of 100 marks. The pass marks in the three theory papers taken together will be 135 and the examination in each will be of 3 hours duration. There will be Two, practical paper VIII A. and VIII B each of 50 marks and 6 hours duration, The pass marks taken together will be 45.

The following will be the detailed Courses-**Paper – V****Theory****Time : 3 Hours****Full Marks : 75**

10 questions to be set, 5 to be answered. Question number one will be objective (20 Questions) and it will be Compulsory, 3 questions will be set from each Group A, Band C. Atleast one question from each group is to be answered. All questions will be of equal marks.

Group – A**Mathematical Physics :****3 Questions**

Curvilinear Coordinates Cartesian, Spherical, Polar and Cylindrical – Coordinates, Orthogonal transformation of coordinates, Scalar, Vector, Scalar and vector fields, Divergence and curl. Line surface and volume integrals, Theorem of Gauss, Stoke and Green, Tensor and its elementary properties, Partial differential equations and its solution by separation of variables, Laplace's equation and its solution, Wave equation and its solution Poisson's equation and its solution. Function of complex variable, Cauchy-Riemann equation. Zero and poles, Taylor and Laurent Theorems, Cauchy's integral Theorem, Residue Theorem: Integration of complex functions.

Group – B

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Classical Mechanics:**3 Question**

Hamilton's principle, Euler-Lagrange 'S equation. Principle of least action. Conservation theorems and symmetry properties, Application of Hamiltonian, Dynamic to simple problem-Charged particle in an electromagnetic field (non-relativistic Case), Laws of motion of rigid body Moment of inertia and Products of inertia, Eulerian angle, Euler's equation of Motion of a rigid body. Gyroscopic motion, Motion of symmetrical top canonical 'transformation. Example of Canonical transformation, Contact transformation, Hamilton-Jacobi; equation. Action angle variations.

B.Sc. Part – III

Group – C

Quantum Mechanics:

3 Question

Inadequacy of classical mechanics Dual nature of matter and radiation. De Broglie's. Concept of state, The correspondence principle. Postulates of Quantum mechanics, Eigen functions and eigen values of Hamilton operators, Uncertainty relations.

Schrodinger wave equation and its physical meaning, its application in problems of free particle, Transmission of particle through potential step, One dimensional square well particle in a box. Linear harmonic oscillator. Rigid rotator, Hydrogen atom. Commutation rules of orbital angular momentum. Their eigen functions, eigen values. Spin Half angular momentum. Pauli's spin matrices, Pauli spin operators. Symmetric and anti symmetric wave functions, Pauli's exclusion principle.

Paper – VI

Theory.

Time : 3 Hours

Full Marks : 75

10 questions to be set, 5 be answered. Question number one will be objective (20 Questions) and it will be Compulsory. 4 questions will be set from Group-A, 2 from Group-B and 3 from Group-C Atleast one question from each group is to be answered. All questions will be of equal marks.

Group – A

Statistical Physics

3 Question

The fundamental assumption of statistical mechanics. Probability distribution and entropy, Partition function and its Conversion to the thermodynamic functions, Sackur-Tetrode equation and Gibb's paradox.

Elements of ensemble theory and Liouville's Theorem Canonical ensemble and thermodynamics. Energy fluctuations in the canonical ensemble. Grand Canonical ensemble and thermodynamics Density and energy fluctuation in the grand Canonical ensemble, Simple application of ensemble theories to perfect gas.

Boltzmann distribution, fermi -Dirac distribution Bose-Einstein Distribution and their Simple application, Radial distribution function and its relation to thermodynamics functions, A brief introduction to first and second order phase transformation. Critical exponent, Lsing model in Zeroth approximation, Introduction to Fluctuations. The probability of thermodynamics fluctuations.

Group – B

Electronics

3 Questions

Thermionic-Richardson's equation and its experimental verification. Child-Langmuir equation, Schottky effect. Semi conductor devices, p-n junction and zenor diode, BIT and FET transistors, opto-electrical devices, Photo devices, LDR photo voltaic cell, photo transistor.

B.Sc. Part – III

Circuit Theory:

Coupled LCR Circuits, Super position theorem, Thevenin Reciprocity Theorems, maximum power transfertheorem. One part and two part network: (only h- parameter) T and Pi

equivalence of two part network, Ladder network and constant X filters (low high and band pass) Attenuators.

Group – C

Solid State Electronic Circuit:

Equivalent Circuit of BJT and FET, Half wave and full-wave rectifiers. Power supply. with specific reference to smoothing Circuits and voltage stabilization by cold Cathode valve and zenor diode, A F Amplifiers (R.C Coupled amplifier) Feedback amplifiers, Pushpull power amplifier, Simplem Circuits for oscillation, L.C. (Hartley and colpitts) Oscillator, R.C oscillator, Astable Multivibrator, Principle of amplitude modulation, amplitude modulator average and envelop detection, radio receiver, super hetrodyne receivers, Simple idea of transmitters (with block diagram) CRO and its application Logic circuits AND, OR, NAND, NOR operation with the help of simple logic gates. Types of Computers and their basic Components, Input Output devices, concept of hardware and software, BITS and BYTES Computer Programming of some simple mathematical problem in BASIC and FORTRAN Languages.

Paper – VII

Theory

**Time : 3 Hours
: 75**

Full Marks

10 questions to be set, 5 10 be answered. Question number one will be – objective (20. Questions) and it will be Compulsory. 3 questions will be set from each group A and C. Atleast one question from each group is to be answered, AL questions will be of equal marks.

Group – A

Plasma And Classical Electro Dyamics:

Microscopic and Macroscopic properties of Plasma Plasma oscillation Debye' s potential. Wave propagation in isotropic plasma lonospheric reflection pinch effect, Alfven wave, Shaha's theory of ionisation, Retarded and advanced potential, Field due to ar oscillating current, Element Oscillating Dipole, Lienard-Wichart Potentials, Potential and field due u uniformly moving charge.

Convriance of Maxwell equation under Lorentz transformation Transformation equation for electromagnetic fields

Group – B

Solid State Physics:

3 Questions

Elements of crystallography, Bravis lattice, miller indices, seven crystal system simple, crystal structure of NaCl, CaCl₂, and diamond of X- rays, Neutrons and Electrons with Diffraction of X-rays from perfect Crystal, – Bragg" s law, Reciprocal lattice, Ewald Construction and Brillouin Zones. Crystall binding, ionic, metallic, Covalent and vander waals binding . Vanderwaals–London interaction and Cohesive energy of inter gas crystals, madelung energy and Madelung constant. Free electrons theory of metals. Heat Capacity of electron gas Electrical Conductivity of metals. Boltzmann: Transport equation Sommerfeld theory of electrical conductivity, Band Theory of solid. Bloch's theorem, Kronig-Penny model, Distinction between metal Semi-Conductor and Insulator, intrinsic and Extrinsic semi Conductors Transistors,p-n Junction, rectifier, Hall-Effect.

Group – C

Atomic And Nuclear Physics:

Origin of atomic spectra, Bohr's theory and Bohr-Sommer theory of hydrogen atom, Spectra of alkali and alkaline, earth metals. Selection rules, Excitation potential. Fine Structure, Stem gerlach experiment Vector model of atom, Zeeman effect and Paschen Back effect of single valence atom Moseley's law, origin of X-rays spectra.

Rotational Vibrational spectra of diatomic molecules, Rotation Vibration and electronic bands, Introduction to NMR, ESR, Laser spectroscopy General Properties of

nuclear mass, Charge spin, static magnetic moment, size and stability, Nuclear models, liquid drop model and mass formulae, The shell model, Classical theory of Rutherford Scattering.

Paper – VIII (A)

Practical

Time : 6 Hours

The course shall -be include the following experiments-

1. Junction Diode Characteristics.
2. Zener Diode Characteristics.
3. FET Characteristics 4. BJT Characterishes
5. BJT Characteristics (Common emitter)
6. VJT Characteristics
7. Frequency response of R-C amplifier
8. Effect of Negative Feedback of R-C amplifier
9. Properties of Hartley oscillator
10. Study of logic gates (AND, NAND, OR NOR)
11. Verify the child's Langmuir law.
12. Study the load Characteristics of rectifier.
13. Study the plate modulated wave. 7
14. Multivibrator and study of its wave from.
15. Design and study of power supply.

B.Sc. Part – III

Paper – VIII B

Practical

Time : 6 Hours

Full Marks :

50

The course shall be include the following experiments-

1. Verification of Brewster's law
2. Verification of Fresnel's law of reflection and refraction of polarized light.
3. Analysis of elliptically polarized light a babinets compensator:
4. Inductance of coil by Anderson's Bridge.
5. Mutual Inductance by Carey – Foster Bridge.
6. Frequency characteristics of low pass filter.
7. e/m by Braun's tube and high pass filter.
8. e/m by Helical method.
9. Planck's constant by photo – cell method
10. Power factor of A.C Fan by (i) Three ammeter method (ii) Three voltmeter method.
11. e/m by Miliken's oil drop method.
12. Phase shift measurement using oscilloscope.
13. Measurement of band gap of given semi conductor.
14. A comparative study of series and parallel circuits and
 - (a) Measurement of Q of the circuit
 - (b) Measurement of L 'C and R
15. Study of Resonance in series L,C, R circuit

B.Sc. Physics

Part – III

(General)

The course shall consist of one Theory paper of 75 marks. The pass marks will be 23 and the examination will be of 3 hours. There will be one practical paper of 25 marks. The pass

marks will be 10 and the examination will be of 3 hours duration.

The following will be the detailed courses-

Paper – III

Theory

Time : 3 Hours

Full Marks :

75

10 Question to be set 5 to be answered. Question number one will be objective (15 questions) and it will be compulsory. 2 question will be set from Group – A, 4 from Group – B and 3 from Group – C. Atleast one question from each group is to be answered. All question will be equal marks.

Group – A

Quantum Mechanics

Need of Quantum mechanics, Dual nature of matter and radiation, Debroglie's relation, Uncertainty principle. Postulates of Quantum Mechanics. Schrodinger wave equation and its application to the problems –

- (i) Particle in Box :
- (ii) Particle in one dimensional square well
- (iii) Transmission across a potential barrier.
- (iv) Linear harmonic oscillator.

Group – B

Solid State Physics:

Crystal Structure, Bravais lattice, miller indices. Simple crystal structure of NaCl, CaCl₂, Crystal binding, ionic, metallic, Covalent and Vander Waal's binding.

London interaction and Cohesive energy inert gas Crystal modelung energy and Madelung constant.

Free Electron:

Theory of metals, Heat Capacity of electron gas, Electrical Conductivity of metals, Band Theory of solid, Bloch's theorem. Distinction between metal, Semi Conductor and Insulator, Intrinsic and Extrinsic semi Conductors, Transistor and p-n Junction rectifier, Electrical Polarization and displacement in materials, Local electric field in an atom. Dielectric Constant and polarization, Langevin Debye equation.

Thermodynamics:

Richardson's equation and its experimental verification. Child- Langmuir equation, Schottky's effect, Semi conductor devices-p-n Junction and Zener diode, BJT and FET transistors, opto electrical devices, Photo devices, LDR photo voltaic cell, Photo transistor. CIRCUIT THEORY :

Coupled LCR Circuits, Super position theorem, Maximum: power transfer theorem. One part and two part networks (only h-parameter), and equivalence of two part network. Ladder network.

Group – C

Solid State Electronic Circuits:

Equivalence Circuit of BJT and FET, Halfwave and full-wave rectifiers Power supply with special reference to smoothing Circuits and Voltage stabilization by cold Cathode valve and Zener diode, A F Amplifiers (R.C) Feedback amplifiers Push pull power amplifier. RC oscillator, Astable Multi-vibrator, Solid state amplitude modulator. Logic Circuits AND. OR, NAND, NOR operation with the help of simple logic gates.

Types of Computers and its basic Components. Input and output devices, Concept of hardware and software.

Practical Paper

Time : 3 Hours

The course shall include the following exams.

1. Junction Diode characteristics.
2. Zener Diode characteristics.
3. FET characteristics.
4. BJT characteristics (Common – base)
5. BJT characteristics (Common emitter)
6. Frequency response of R – C coupled amplifier
7. Study of logic gates AND, OR, NOR
8. e/m By Helical method.

Chemistry (Hons)**B.Sc. Part – III****Paper – V****Physical Chemistry**

There will be TEN questions each of twenty (20) marks including Question No.-I (one) will be of objective type and compulsory covering the entire syllabus. Three questions will be set from each group out of which FOUR to be answered selecting at least ONE from each group.

Group – A**1. Gaseous State:**

Collision number, collision frequency, collision diameter and mean free path of molecules of gas (including temperature and pressure dependence), viscosity of gases, relation between mean free path and Co-efficient of viscosity, temperature and pressure dependence of Viscosity (η), degree of freedom motions principle of equipartition of energy, its use for determination of Avogadro's number.

2. Spectroscopy:

Basic principles of different types of absorption, idea of IR, UV- VIS spectroscopy.

3. Photo Chemistry:

Basic principles, Lambert – Beer Law. Molar extinction coefficient, Stark-Einstein law of photochemical equivalence; primary and secondary processes, examples of low and high quantum yield. Photochemical reaction such as $H_2 + Cl_2 \rightarrow 2HCl$, $H_2 + Br_2 \rightarrow 2HBr$ and decomposition of HI. Phosphorescence and Fluorescence,

Elementary idea of electron Spectroscopy and area of its applications.

Group – B**1. Thermodynamics:**

Derivations of law of mass action, molar elevation and molar depression-constants, van t Hoff reaction isochore and isotherms Maxwell thermodynamic relations, partial molar quantities chemical potential, variation of chemical potential with temp and pressure Chemical potential in an ideal gas mixture, Absolute entropy and third law of thermodynamics.

2. Phase Equilibrium.

Three component systems, idea of sorting out triangular coordinates, partially miscible liquids and role of added salts $Cl(NH_4)$, S_0, H_2O , Phase diagram of cement.

3. Wave Mechanics:

de-Broglie equation uncertainty principle, Schrodinger wave equation and its application of H- atom (only interpretation of solution and no solution), Idea of operators.

Group – C**1. Chemical Kinetics.**

Kinetics of third order reactions, half period, and its unit, kinetics of complex reaction: side reactions, opposing reactions and consecutive reaction, chain reactions.

2. Electrochemistry:

(a) Reversible and irreversible cells and electrodes, E.M.F. of a cell and its measurement, Galvanic cells, electrode potential and its origin, standard, electrodes potential, Nernst equation determination of electrode potential concentration cells, definition, classification, E.M.F. of concentration cells

with and without transference, liquid junction potential application of emf. measurements,

(b) Electrodes: Hydrogen electrode calomel, electrode, quinone hydroquinone electrode, glass electrode, measurement of pH using hydrogen electrode

(c) Transport number and its determination by Hittorf's and moving boundary methods. Abnormal transport number, Determination of mean activity by emf, method.

3. Surface Chemistry:

Types of adsorption, adsorption isotherms, Freundlich, Langmuir and Gibbs adsorption isotherms, Limitations and applications.

B.Sc. Part – III (Hons)

Paper – VI

Inorganic Chemistry

There will be TEN questions each of twenty (20) marks including Question

Na. 1 {one} will be of objective type and compulsory covering the entire syllabus. Three questions will be set from each group out of which FOUR to be answered selecting at least from each group.

Group – C

1. Atomic Structure:

Idea of wave mechanical model of atom, Schrodinger equation and its derivation; significance of wave functions, Normal and orthogonal wave functions, Probability density pattern for H-atom (qualitative ideas only and no derivation required), radial and angular Wave functions Sign of wave functions.

2. Chemical Bonding:

(a) Molecular orbital method (qualitative treatment only), ECAO combinations of s-s, p-p-p-d orbitals. Rules of LCAO bonding antibonding and non-bonding orbitals simple M.O. diagrams of homo nuclear diatomic molecules, calculation of bond order. Resonance.

(b) Metallic bonding; M.O. method of explanation of bonding in metals, outline of structure of interstitial alloys and substitution alloys, super conductivity and its applications.

3. Nuclear Chemistry:

Ground state properties of nucleus-constituents of Nucleus, nuclear properties, binding energy per nucleon and stability of Nucleus, α and γ emissions And their properties Concept of potential barrier, radioactive decay law, partial decay constant, half life and mean life periods. features of $4n$, $4n+2$, $4n+3$ and $4n+1$ radioactive series, Nuclear fusion and stellar energy, Synthesis of transuranic elements.

Group – B

1. General chemistry of the following elements with reference to their periodic position, important, compounds their structures and uses.

(a) Nitrogen, phosphorus, arsenic, antimony and bismuth.

(b) Oxygen, sulphur, selenium tellurium.

2. Comparative chemistry of the following transition metals with reference to their P.T. position, oxidation states, complex formation and formation of organometallic compounds.

(a) V, Nb and Ta

- (b) Cr, Mo and W
- (c) Platinum metals.

3. General chemistry off – block elements. Electronic configuration and periodic position of lanthanides and actinides, lanthanide contraction and consequence magnetic properties of lanthanides.

Group – C

1. Organometallic Chemistry :

Definitions, nomenclature of simple organometallic compounds E.A.N rule ionic and electron deficient compounds, metal alkyls of group 1,2 and 13 elements. Elementary idea of carbonyls, nitrosyls and ferrocenes.

2. Inorganic Chemistry in Biological Systems:

Elementary idea of the role of the following biological systems: Na, K, Mg, Ca, Fe and Co.

3. Inorganic Chains, Rings Cages and Clusters:

Elementary idea of the terms involved with examples, idea of catenation and intercatation chemistry and heteropolyanions, borazenes, boranes and metal-metal bonding.

Paper – VII

Organic Chemistry

Full Marks: 100

There will be TEN questions each of twenty (20) marks including. Question No. 1 (one) will be of objective type and compulsory covering entire syllabus, Three questions will be set from each group out of FOUR to be answered selecting at least ONE from each group.

1. General Principles:

Hyperconjugation, mesomeric effect, hydrogen bond intermediate species their detection and characterization, carbocation, carbanion, carbenes, nitrene and benzyne.

2. Types of Reactions:

Nucleophilic substitution at saturated and unsaturated carbon electrophilic and nucleophilic substitution in benzene nucleus, Addition reactions: Electrophilic and nucleophilic elimination reactions H of Markovnikov's rule and Saytzeff's rule.

3. Name Reactions and Rearrangements (Definition & Mechanism only) Aldol condensation, Knoevenagel reaction, Claisen condensation, Mannich reaction, Michael reaction, Pinacol-Pinacolone rearrangement Wagner-Meerwein rearrangement, Benzilic acid rearrangement.

Group – B

- 1. (a) Polynuclear hydrocarbons, Naphthalene, anthracene and phenanthrene
- (b) Amino acids.
- (c) Heterocyclic compounds, furan, thiophene, pyrrole, pyridine, quinoline and isoquinoline.

3. (a) Dyes: AZO, TPM dyes Phthalic dyes, Zanthene dyes, Vat dyes (indigo including its structure and stereochemistry)

(b) Alkaloids and Terpenes: Brief idea of general methods of isolation and structural elucidation.

Group – C

1. Drugs:

Sulpha drugs, antimalarials, antibiotics, analgesics, pyrogenic sedatives, antiseptics.

- 2. (a) synthetic fuels and propellants.
- (b) Explosives, insecticides, adhesives.

3. Uses of Reagents:

HIO₄, lead tetra acetate, N.B.S. Br₂ SeO₂

B.Sc. Part – III

Chemistry Practical

Paper – VIII

Time : 6 Hours

Full

Marks : 100

1. Anyone experiments from the following
 - (a) Determination of molecular weight of volatile liquids by victor- meyer method,
 - (b) Determination of surface tension of liquids using stalagmometer and calculation of parachor values.
 - (c) Determination of co – efficient of viscosity of liquids using Ostwald viscometer.
 - (d) Determination of partition co – efficient of solutes between two liquids.
 - (e) Determination of rate constant for hydrolysis of ester catalyzed by H^+ ions at room temperature.
 - (f) Determination of refractive index of liquids by abbe refractometer and calculation of molecular refractivity.
 - (g) Thermochemistry : heat of solution of solute in a solvent, heat of neutralization.Graces Analysis of any on estimation of Ag^+ , Cu^{2+} , Ni^{2+} , Ba^{++} , Cl^- and
Vive Voce
Note book

Group – A

Physical Chemistry

Full

Marks : 75

There will be TEN questions each of fifteen (13) marks including Question NO.1 (one) will be of objective type and Compulsory covering the entire syllabus. Three questions will be Set from each Group out of Which FOUR to be answered selecting at least ONE from each group.

1. Physical properties of liquids and their application in establishing molecular structure: viscosity, surface tension and refractive index,
2. **ELECTRO CHEMISTRY.**
 - (a) Standard electrode potential E.M.F, and application of emf. measurements. :
 - (b) Transport number and its measurement by Hittorf s method

CHEMICAL KINETICS AND CATALYSES:

- (a) idea of side reactions, opposing reactions and consecutive reaction, Chain reactions. ,
- (B) catalysis : Definition and classification, Theory of catalysis, ideas of acid base and enzyme catalysis.

4.Photo Chemistry:

- (a) (a) Basic principles. Lambert-Beet Law, Star-Einstein Law of Photo chemical Equivalence, $H_2 + Cl_2$, and $H_2 + Br_2$, reactions (only reactions) Quantum yield, Phosphore-science, fluorescence, elementary idea of photoelectron spectrograph.

Group – B

Inorganic Chemistry

1. **(a)** Atomic Structure and Bonding : Idea of VBT ux MOT (qualitative treatments only) MO correlation diagram for homonuclear diatomic molecules. Calculating of bond order an it basis. ,
 - (b) Complexes:E.A.N. rule, shapes of d-orbitals Nomenclature, isomerism
2. Outline of the chemistry involved in the following industries cement, fule

and industrial gases.

3. Uses of organic reagents in inorganic analysis EDTA Dimethyl glyoxime
L-nitroso, n-naphthol, cupferron.

4. Chemistry of the following elements and important compounds.

(a) N, P, As. (b) O, S, Se.

Group – C

Organic Chemistry

Structure And Mechanism:

Hyperconjugation, carbonium and carbanion, carbene nitrene in reactions involving nitrene formation addition reactions electrophilic and nucleophilic elimination reactions, Saytzeff rule. Friedel-Craft reaction pinacol – pinacolone rearrangement.

2. Synthetic Organic Chemistry:

(a) Malonic ester and use in synthesis acetoacetic ester (MC)

(b) Use of the following reagents in organic chemistry.

Na₂, NH₂, LiAlH₄ and AlCl₃

3. Aromaticity and Huckel's Rule

Chemistry Practical

Physical Chemistry

Time : 3 Hours

Full

Marks : 25

(a) Determination of surface tension of liquids (e.g. Benzene, Acetone, Chloroform) using stalagmometer.

(b) Determination of Co-efficient of viscosity of liquid e.g. Benzene, Acetone, Chloroform using Ostwald Viscometer.

(c) Determination of Partition co-efficient of solutes between two immiscible liquids.

(d) Determination of Molecular Weight of volatile liquid by Victor Meyer method.

2. Record of class and viva – voce.

B.A/B.Sc. (Hons.)

Math

There will be twelve questions 1 be set in each and every paper (i.e Paper, V, VI & VII) and six to be answered in each paper selecting at least one from each group. One question will be objective! short answer will be compulsory. This question will be of twenty marks and the rest questions are of each sixteen marks, Paper VIII will be optional paper, ten questions to be answered.

Paper – V

Time : 3 Hours

Full Marks : 100

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|-------------|---------------------|--------------|
| 1. Group A: | Real Analysis | : 3 Question |
| 2. Group B: | Riemann Integration | : 4 Question |
| 3. Group C: | Infinite Series | : 4 Question |

Real Analysis:

Function of two variables, limit Repeated limits Moore-Osgood Theorem, Continuity and differentiability of function of two variables Young's and Schwartz Condition of equality of F_{xy} and F_{yx} Implicit function theorem Continuity and differentiability of functions of two variables, Taylor's theorem, Dima & Minima of two variables.

Group – B

Definitions and Existence Of R-integrals of bounded functions, Darbox Condition of inegraity. Riemann intergrability of Continuous function and monotone functions. R-integral of function with file number of discontinuities with discontinuous point as a finite number of limit point. Riemann-integral as she Limit of a sum, Mean value theorem and fundamental theorems of Integral Calculus (2 questions) :

Improper integrals, convergence of an improper integral, comparison test, dirichlets test. Beta and Gamma functions, their properties and relationship. Differentiation under integration {one question}

Double and triple integrals, Change of order of integration, line surface and volume integrals, Green, Gauss and Stokes theorem, (one question)

Group – C

Infinite Series

Sequences and series of function and their point wise convergency
Uniform convergence of sequence and series of function, Weistrass M-test.
Uniform convergence and Continuity Dini's test, Abel's test. Dirichlel's test
Uniform convergence and integration uniform convergence and differentiation.
(2 questions)

Infinite Product and its convergence and their mutual relationship. Double series, sum by rows, sum by columns, Pringsmeism theorem Elementary notice of metric spaces and Topological spaces with examples (2 question)

Time : 3 Hours

Full Marks : 100

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|------------|----------------|--------------|
| 1.Group A: | Groups | :3 Question |
| 2.Group B: | Ring | : 4 Question |
| 3.Group C: | Linear Algebra | : 4 Question |

Group – A

Group:

Center of a group, Normalized, Conjugacy class Equation, Autoorphism, inner isomorphism. Commutative Sub groups, Direct product of two groups. Solval Groups, Finite Groups. (3 questions)

Group – B

Ring

Division ring, Polynomial ring, Imbedding of a ring without unity in a ring with unity, Imbedding of a ring and integral domain in field. Characterization of a filed, Quotient field, Polynomial over commutative ring, Prime and ovaxinal deals in commutative ring. Euclidian Domain. Principal idea! Domain, Unique factorization Domain, (4 questions) :

Group – C

Linear Algebra:

Vector Spaces, Spaces, Bases and dimension. Linear transfor-motion, Mitnx and linear transformation. Algebra of Linear transformation.

Rank and nullity of linear transformation.dual spaes, characterstics values, characterstics vectors, Caley – Hamilton's Theorem.

PAPER – VII

TIME : 3 HOURS

FULL MARKS :

100

- | | | |
|--------------|------------------------------|-------------|
| 1. Group – A | : Complex Analysis | :3 Question |
| 2. Group – B | : (a) Attraction & Potential | :2 Question |
| | : (b) Hydeostatics | :2 Question |
| 3. Group – C | : Differential Equation | :4 Question |

Complex Analysis:

Complex numbers as ordered pairs. Geometric representation to Complex numbers, Stereo graphic Projection, Continuity and differentiability complex Functions, Analytic function, Cauchy Riemann equation, Harmonic function, Elementary functions, Mapping by elementary function, Möbius transformations Fixed points, Cross ratio. Inverse points, conformal mapping, complex integration.

GROUP – B

ATTRACTION POTENTIAL AND HYDROSTATICS:

Attraction And Potential: Attraction and potential of rod rectangular and circular dishes, spherical shells, sphere (Laplace's and Poisson's equation Theorems on equal potential surfaces, (2 questions),

'Hydrostatics ; Pressure at a point, Thrust on a plan surface centre of : Pressure, Meta centre Equilibrium of floating bodies. (2 questions –

GROUP – C

DIFFERENTIAL EQUATIONS

Second order equations with variable co-efficient, solution of second order differential Equations with variable Co efficient Method of variation of Parameters, Total differential Equations in three independent Variables

Simultaneously differential Equations, Lagrange's Linear partial differential equations standard forms; Charpit's method Partial differential equation of higher order with Variable Co- efficient, Monge' Method.

PAPER – VIII

(OPTIONAL PAPER)

Solution of difference equation of first order, General Solution, Linear differential equation with constant Co-efficient. Solution of ordinary differential equations-one step method. Euler's modified, Runge-Kutta methods, methods of starting the solution and Milne-Simpson's Method (3 questions).

Simultaneous Linear Equations : Gauss elimination, Gauss-Jordan's and relaxation methods (simple problem) (2 questions).

' Finding root of Polynomial Equations: Regular, false, Bisection, Newton-Raphson Method of several variables, Iterative method and its generalization. significant figures and error of computation. (2 questions

2. SPHERICAL TRIGONOMETRY AND ASTRONOMY:

Spherical Trigonometry: Spherical Triangle, Fundamental formulae (Cosine-sine, sine-Cosine, cotangent) Napier's and De Moivre's Analogies, "Right angled triangles and Napier's rule (2 questions).

Astronomy : Celestial sphere, Definition, Different system of Co-ordinates, Phenomenon of rising and setting of stars, Twilight (2 questions). Solar System, 'Two body problem, Equation of relative motion (one questions), Area Integral, Kepler 's laws, Anomalies, Kepler's equation (one questions). Stationary point-Phase of planet, Refraction, Simpson's-Bradley's and Cassini's formulae, Effect 'of refraction in the position of a body (2 questions), Annual aberration, Effect of aberration on celestial latitude and longitude. Effect of aberration on right ascension and declination, Parallax, Effect of parallax on latitude, longitude, R.A. and declination (2 questions).

3. NUMBER THEORY:

The Basic Representation Theorem, Linear Diophantine Equation, , Fundamental Theorem of Arithmetic, Fermat's Little theorem and Wilson's – "theorems (2 questions). .

Basic properties of Congruence, Residue System, Euler's theorem, Chinese Remainder theorem, Multiplicative arithmetic functions, The Euler's functions $F(n)$, $U(n)$, Mobius function and the function of $G(n)$ and their simple properties, Mobius inversion formulae, Perfect number and the function $t(n)$ (3 questions). The quadratic reciprocity law, Euler's criterion. The legendary "Symbol and its properties and applications, Gauss theorem, Gauss quadratic reciprocity law, quadratic congruences with Composite module (3 questions). Representation of integers as sums of squares, Sums of two squares, Theorems lemma, Fermat's Theorem, Sums of four squares and Euler's lemma, Lagrange theorem.

4. PROBABILITY THEORY:

Event, Probability of an event, Sample space, A finite sample space, Mutually exclusive and complementary events, independent events, conditional probability (one question).

Axiom for probability in finite sample space, Product rule of probabilities in a sample space, Baye's theorem, Random variables, and their probability function. Mathematical expectation and Mean absolute deviation. Variance Standard Variation, Chebyshev's theorem for a probability distribution frequency distribution of measurements, (3 questions) Convergence of sequence of random variables, convergence : distributions, Convergence in probability, almost sure convergence convergence in a quadratic mean, Halley's Bary theorem, (3 questions) Complex valued. random variables Characteristic functions, inversion theorem, Continuity theorem, Distribution and Kolmogorov's inequality, Weak and strong laws of large numbers (3 questions).

PART – III

B.A. B.Sc. MATHEMATICS

GENERAL COURSE

There will be sixteen questions to be set and eight to be answered selecting; at least one from each group, One question will be objective' short answer will be compulsory. This question will be of sixteen marks and the rest questions of twelve marks.

Time : 3 Hours

Full Marks : 100

Group A:	Abstract Algebra	:5 Question
Group B:	Complex Analysis	:5 Question
Group C:	Hydrostatics	:3 Question
Group D:	Attractive Potential	:2 Question

GROUP – A

ABSTRACT ALGEBRA:

Binary operations, Definitions of Group, Abelian and non abelian groups with Example, Uniqueness of identity element and inverse of an element in a group. Cancellation laws in a group, Definition of a sub group and Cyclic group With examples, Definition of ring, integral domain and field with examples. Homomorphism and isomorphism in group and ring. (5 questions).

GROUP – B

COMPLEX ANALYSIS:

a Complex number as ordered pair, Geometric representation to complex numbers; Continuity and differentiable of a complex function. Analytic function, Cauchy's Riemann Equation, Harmonic function, Mapping by bilinear transformation, Conformal mapping, Bilinear transformations, Inverse point cross ratio (8 questions)

Group – C

Hydrostatics:

Pressure at a point, Thrust on plane and curved surfaces, Centre of pressure and meta center. Equilibrating of floating bodies (3 questions)

GROUP – D

ATTRACTION AND POTENTIAL

Attractive and Potential of a rod, Rectangular and Circular disc, spherical shells, Spheres (Laplace's and Poisson's equations). Theorems of equipotential surface, (2 questions).

B.Sc. PART – III

BOTANY HONOURS

There would be three theoretical and two practical papers in B.Sc. Part-III examinations carrying 10 marks in each paper.

BIO CHEMISTRY – MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Time : 3 Hours

Full

Marks : 100

Ten questions have to be set, Question No. 1 will be objective type and compulsory covering the entire syllabus, Remaining 9 questions have to be set from three groups (A, B, C). Four questions are to be answered besides question no. 1, selecting at least one from each group.

GROUP – A BIO CHEMISTRY:

- CELLULAR CHEMISTRY:** Covalent and non covalent interactions; Hydrogen bond; structure properties and biological significance of water; pH and its significance; Buffers, (Both inorganic and organic) and its importance.
- ENERGY FLOW AND ENZYMOLOGY:** Concept of free energy, energy transfer and redox potential Classification and nomenclature of enzymes mode of action enzymes as biocatalysts; isozymes.
- NUCLEIC ACIDS :** Composition of nucleic acids and synthesis of nucleotides, DNA Structure – A, B & form of DNA; Denaturation and renaturation of DNA replication, DNA polymerases Different from of RNA and their roles.
- AMINOACIDS AND PROTEIN:** Metabolism structure: characteristics. and classification of amino acids :protein and non protein amino acids: Types and structure of Proteins Protein biosynthesis and its regulation.
- Carbohydrate:** Metabolism Classification and structure of various types of carbohydrates; biosynthesis and degradation of sucrose and starch.
- LIQUID:** Metabolism Saturated and unsaturated fatty acids, biosynthesis of fatty acids, Oxidation of fatty acids. Storage and mobilization of fatty acids and lipids.
- Outline of secondary plant metabolites and their Roles.

GROUP – B MOLECULAR BIOLOGY

- DNA as genetic materials (Both Prokaryotes and Eukaryotes)
- Genetic code;
- Gene structure expression and regulation: Gene concept Organization of gene in Prokaryotes and eukaryotes; Operon concept, Gene regulating (Lac operon and trp operon :
 - interrupted genes; RNA Splicing
- 5. Recombinant DNA Technology:**

Role of Vectors, Restriction enzymes, Cloning Strategies genomic and DNA libraries: Southern and Northern blots; Polymerase chain reaction DNA fingerprinting.

GROUP – C PLANT – BIOTECHNOLOGY

1. Basic concept and scope of plant Biotechnology.
2. Plant cell and tissue culture: History, scope, concept of cellular differentiation and totipotency.
3. Organogenesis and embryogenesis : Fundamental aspects.
4. Somatic hybridization: Isolation and culture of protoplast.
5. Application of Plant tissue culture: Clonal propagation, elementary knowledge of conservation and storage of germplasm.
6. Genetic engineering of Plants: Aims and development of transgenic plants; Agrobacterium as a natural genetic engineer.

MICROBIOLOGY PATHOLOGY AND AEROBIOLOGY

TIME : 3 HOURS

FULL MARKS

: 100

Ten questions have to be set. Question No. 1 will be object type and compulsory covering the entire syllabus, remaining 9 questions have to be set from two groups (A,B) in which four questions are to be answered besides "Question No. 1 selection at least one from each group.

GROUP – A

MICROBIOLOGY

1. **DISCOVERY OF MICROORGANISMS:** Systematic position of microorganism in the biological world; classification and characteristic features of various groups.
2. **METHODS IN MICROBIOLOGY:** Sterilization methods: preparation of culture media technique of isolation of microorganism, staining of bacteria.
3. **ULTRA STRUCTURE OF MICROORGANISM:** Structure and nature of TMV and T4 structure of bacterial cells, general account of mycoplasma and actinomycetes.
4. **NUTRITION BACTERIA**
5. Genetic recombination in bacteria.
6. Role of microorganism in biogeochemical cycles of N₂ and C cycle, Biological N₂ fixation.
7. **INDUSTRIAL APPLICATION OF MICROORGANISM:** Organic acids, alcohol, food processing, milk products, antibiotics, biopesticides – preparations, products from genetically engineered microbes.
8. Microbial degradation of food grain in storage.

GROUP – B

PLANT PATHOLOGY

1. General account of diseases caused by plant pathogens
2. 1 General account of diseases caused by plant pathogens.
3. 2 Role of toxins and enzymes in plant diseases.
- 3 Important plant diseases of Bihar, its etiology and control:
 - (a) Rust disease of wheat.
 - (b) Smut disease of wheat :
 - (c) Blast disease of rice juice.
 - (d) White rust of crucifers.
 - (e) Late blight of Potato
 - (f) Wilt Arhar
 - (g) Tobacco Mosaic virus,
 - (h) Tungro disease of wheat.
 - (i) Citrus Canker
 - (j) Little leaf of Brinjal .
4. Definition, scope and concept & Aerobiology

5. Morphology & common, airborne biopartic late pollen grains & fungus Spores.

6. A brief idea of allergic and respiratory diseases-Asthma and rhinitis.

PAPER – VII

SYSTEMATICS OF ANGIOSPERMS AND ENVIRONMENTAL BIOLOGY

Time : 3 Hours

Full

Marks : 100

Ten questions has to set. Question No, 1 will be object type and compulsory covering the entire syllabus , Remaining 9 question have to be set from two groups (A,B) in which four question are to be answered beside "Question No.t selection at least one from each group.

GROUP – A

SYSTEMATICS OF ANGIOSPERMS

1. **INTRODUCTION:** Definition of systematic, aims and components of systematic, its significance, Origin of systematic with some exploration from Indian old treatises and modern systems of classifications.
2. Systematic in Practice :Importance of herbarium specimens and the preparations, Role herbaria and Botanical gardens: Keys identification of plants.

GROUP – B

ENVIRONMENTAL BIOLOGY

Introduction : Definition of environment biology the components and dynamism, homeostasis, relevance in welfare of human society.

2, Earth 'as system -Biosphere (Biosphere)-hydrosphere, atmosphere and lithosphere

3. Definition and concept; general account and adaptations»

: Water, soil and atmosphere, Components of environment-a biotic and

4: individualistic, species, Populations, communities and their Characteristics. }

"A. Impact of human activity Pollution of Water, soil and air, a brief account of

– 5 'environmental toxicology; incidence of noise pollution; Prevention and

Control of pollution: Global warming and Ozone depletion

Indemnification,

A, Role of national and international organizations in environmental

management : Formulation of optimal models |

: 6 Bio-indicators.

PRACTICAL BASED ON PAPER – V, VI & VII

Time : 6 Hours

Full

Marks : 100

1. Chemical tests to demonstrate the presence of any one of the following starch, sugar, fat, alkaloids, flavonoids, tannins and protein in plant materials.

To identify the amino acids in 2 mixture by resolving through paper } chromatography or TLC

1. Colorimetric estimation of DNA using diphenylamine/RNA using orcinol.

3, Preparation of media for tissue culture, sterilization and inoculation of Plant material.

Or Demonstration of techniques of in vitro culture of various explants.

- 4 Preparation of a solid culture medium or isolation and inoculation of *Alternaria*/*Fusarium*/*Colletotrichum* or study of local microbial diseases.
Or Identification of aerospora by cellotape method | 0 |
- 5, Description of the locally available plant Gems only from the families Prescribed in the course.
- 6 To identify the Bacteria using method of Gram's Staining
- 7 Class records, herbaria and Tour Report
- 8 Viva-Voce.

PART – III

B.Sc. Botany General

There shall be one theoretical paper carrying 75 marks and one practical paper carrying 25 marks.

PLANT PHYSIOLOGY; BIOCHEMISTRY; BIOTECHNOLOGY, ECOLOGY AND UTILIZATION OF PLANT

Time : 3 Hours

Full

Marks : 75

Ten questions have to be set. Out of which Question 1 would be objective types compulsory. Remaining 9 Questions have to be set from two groups in which four questions are to be answered besides Question 1, selecting Ad more than two from any group.

1. Plant-water relationship: Diffusion and osmosis; absorption, translocation of water and transpiration, physiology of stomata,
2. Mineral nutrition: "Essential macro and micro-elements and their role mineral uptake, deficiency and toxicity symptoms.
3. Transport of organic substance – Mechanism of Phloem transport source sink relationship.
4. Photosynthesis : Mechanism and factors; Respiration: aerobic and anaerobic (glycolysis, Krebs's cycle and electron transport) .
5. Nitrogen metabolism: Nitrate reduction, amino-acids. Protein-Structure and types; N, Fixation
- 6; Enzymes: Nomenclature, characteristics and types of enzymes Regulation of activity and mechanism of action.
7. Phytohormones: Auxins, Gibberellins and cytokinins
8. Growth and development : Definition, Phases of growth and development seed germination.
9. Movements : Tropic movement
10. Biotechnology : Definition, Basic aspect of Plant tissue culture cellular totipotency, differentiation and morphogenesis: salient achievement in : crop technology Brief idea of Restriction enzyme. cloning vector product of genetic engineering.

Group – B

Ecology Environmental Biology And Utilization Of Plants

Plant and environment: Water, soil atmosphere, light temperature and biota.

- 2 Morphological, anatomical and physiological responses of plants to water hydrophytes and. Xerophytes, temperature (Vernalization), light (Photoperiodism) and salinity .
3. Plant community and ecosystems: succession-Hydrosere and Xerosere
4. Major vegetation types of India: Forests and Grasslands
5. Pollutions; Rice Maize, Potato, Sugarcane

- 6, Food Plans: Rice maize Potato, Supamace
7. Fibres: Cotton and jute
8. Vegetable Oils ; Mustard, Coconut, Groundnut ,
9. Pulses : Gram, Arhar, Masoor, Mung.
- 10 Forest wealth of Bihar with reference to timber yielding plants
11. Important drug yielding plants of your region
- 12 Beverages : Tea & Coffee :
13. Rubber

**PRACTICAL PAPER BASED ON
PAPER – III**

Time : 3 Hours

Full

Marks : 25

1. Ecological adaptation in Hydrophytes, Xerophytes Mesophytes Parasites and Epiphytes
Or To determine minimum size of quadrates required for reliable estimate of biomass in grasslands
2. Study of pH of different types of soil with the help of pit meter,
Or To measure dissolved O₂ content in polluted and unpolluted water samples.
3. Test for carbohydrate. Protein, amino acids and lipids.
Or Compare the rate of transpiration between mesophytes and Xerophytes Or O₂ is evolved during photoynthesis.
Or Compare the rate of imbibition of fatty and starchy seeds Or Compare the rate of absorption and transpiration Or Moll' experiment, :
Or Demonstration of the technique of micro propagation by using different explants e.g. axillary buds shoot meristems
4. Comment upon spots 1-4 of utilization of plants as described in syllabus
5. Class records
6. Viva-voce

**PAPER – III A
(THEORY)**

Time : 3 Hours

Full

Marks : 75

Five questions are set from each group, Students shall have to answer five questions attempting at least two from any group.

GROUP – A : ECOLOGY

1. Concept of biosphere.
2. Definition, structure and functions of a typical ecosystem.
3. Major, ecosystems of the world and their features.
4. Abiotic and biotic factors.
5. Biogeochemical cycles of oxygen, nitrogen and carbon.
6. Energy flow in ecosystem

Animal Behaviour

- (i) Scope of Ethology; innate and learned behavior.
- (ii) Parental care in fishes and amphibians.
- (iii) Social behavior in insects.
- (iv) Migratory behavior in birds & fishes.

GROUP – B Palaeo Zoology And Zoogeography

- (i) Different Geological eras of the world, their climatic conditions and fauna.
- (ii) Zoogeographic realms of the world and their boundaries.
- (iii) Biogeographical distribution of animals in oriental, Ethiopian and Australian regions.

(iv) Fossils and their mode of formation.

ECONOMIC ZOOLOGY:

- (i) Seri culture, Lac culture and pisci culture.
- (ii) Preliminary idea of the common pests of paddy & wheat, their control.
- (iii) Vectors of kalazar, malaria, Filaria their prevention and control.

**ECOLOGY, ANIMAL BEHAVIOUR, PALEOZOOLOGY,
ZOOGEOGRAPHY & ECONOMIC ZOOLOGY**

Time : 3 Hours

Full

Marks : 25

- 1, Quantitative estimation of dissolved O in water with the help of Winkler's volumetric methods,
- 2 Determination of pH of different water/Soil samples. 02
- 3, Moisture content of soil & identification and comment the organism present in water/soil samples,
- 04, Identification and comment on the specimen (spotting) on
 - (i) Palaeozoology-Fossils.
 - (ii) Economic Zoology-Silk Yam, Larva. Pupa, Adults of Silk Worm: Lac Sticks, Lac insect, Fishing gears. Museum specimens showing parental 'care; Mouth parts of male and female Culex, Anopheles, Sandfly and their different developmental stage.
- 5. Paractiical Records
- 7. Viva-voce

B.Sc. Honour's (Part – III)

PAPER – V

(Theory)

Time : 3 Hours

Full

Marks : 100

In all 10 questions are to be set out of which number 1 and 2 shall consist of Objective (1×20 Marks) and short answer (4×5) questions respectively and both shall span over the whole syllabus 1 the paper, Students would be required to answer five questions out of which question number 1 and 2 shall be compulsory.

BIO CHEMISTRY:

- 1 Structure and Classification of Protein, carbohydrate and Fats.
- 2 Structure and Classification of Amino Acid. :
- 3. Metabolism of Carbohydrate: Glycogenesis, Glycolysis and Krebs' cycle
- 4 Beta-oxidation of fatty acids
- 5 Vitamins Types and functions
- 6 Physiology {Mammals}
 - (i) Physiology of digestion
 - (ii) Physiology of respiration (ventilation of lungs and transport of gases).
 - (iii) Physiology of excretion and Osmoregulation.
 - (iv) Physiology of testicular and ovarian cycle,
 - (v) Histology of the various Endocrine glands of Mammal
 - (vi) Chemical nature and Physiological role of the Hormones secreted by

Adenophypophysis, Neurohypophysis, Adrenal, Thyroid, islet of Langerhans and gonads.

PAPER – VI
(THEORY)

Time : 3 Hours

Full

Marks : 100

In all 10 questions are to be set out of which number 1 and 2 shall consist of Objective (1×10 Marks) and short answer (4×5) questions respectively and both shall span over the whole syllabus in the paper. Students would be required to answer five questions out of which question number 1 and 2 shall be compulsory.

1. Cell Biology;

- (i) Ultra structure and function of the following cell organelles: Plasma membrane, Endoplasmic reticulum, Mitochondria, Golgi Complex, Ribosome, Chromosomes, Lysosomes, Nucleolus.
- (ii) Gametogenesis Fertilization and Parthenogenesis,
- (iii) Elementary idea of Immunology : Lymphoid tissues and organs, Innate and Acquired immune response.

2. Genetics

- (i) Linkage and crossing over. Structure and replication of DNA. Transcription and Translation,
- (ii) Chromosomal aberrations, the Genetic and Cytological manifestation and significance.
- (iii). Gene Mutation and Molecular Mechanism of its origin.
- (iv) Extra Nuclear genetic system
- (v) Sex determination and sex linked inheritance.

3. Economic Zoology

- (i) Lac Culture
- (ii) Seri Culture
- (iii) Api Culture
- (iv) Pisci Culture
- (v) Elementary idea of the common pests of paddy, wheat, sugarcane and vegetables and their control.
- (vi) vectors of Kalazar Malaria and Filaria, their biology, mode of infection, prevention and control.
- (vii) Wild-life conservation.

PAPER – VII
Evolution, Zoogeography & Paleozoology

Time : 3 Hours

Full

Marks : 100

In all 10 questions are to be set out of which number 1 and 2 shall consist of Objective (1×20 Marks) and short answer (4×5) questions respectively and both shall span over the whole syllabus in the paper. Students would be required to answer five questions out of which question number 1 and 2 shall be compulsory.

1. Evolution:

- (i) Sources of hereditary variation and their role in evolution,
- (ii) Principles of evolution : Lamarkism, Neo-Lamarkism, Darwinism & Neo Darwinism,
- (iii) Isolating mechanism and their role in evolution.
- (iv) Hardy-Wienberg law and genetic equilibrium.
- (v) Fossil history of horse & Man.

(vi) Micro, Macro and Mega evolution.

2. Zoogeography & Paleozoology

(i) Zoo geographical realms of the world, their boundaries and climatic peculiarities.

(ii) Characteristic & Peculiar fauna of Oriental, Ethiopian and Australian regions, ,

(iii) Characteristic of Isand fauna.

(iv) Theories & Principles pertaining to animal distribution.

(v) Different geological of the world, heir duration and climatic conditions.

(vi) Faunistic peculiarities of Paleozoic, Mesozoic and Cenozoic eras,

(vii) Fossil : their mode of formation & age determination.

PRACTICAL

Bio Chemistry, Physiology & Endocrinology

Time : 3 Hours

Full

Marks : 100

1. Bio Chemistry:

(i) Benedicts test for reducing sugar.

(ii) Molisch's test.

(iii) Iodine test for starch and glycogen.

(iv) Ninhydrin reaction for glycine / tyrosine / tryptophan.

(v) Millon s reaction for glycine / tyrosine / phenylalanine.

2. Physiology:

Experiments to be performed in frog, bird/ mammal, (Two experiments)

(i) Enumeration of total RBC.

(ii) Estimation of hemoglobin (gm/100mml) in blood.

(iii) Determination of ESR of blood.

(iv) Determination of bleeding and clotting time.

(v) Determination of o₂ uptake by terrestrial animal.

(vi) Simple heart-beat and muscle curve by drum method.

3. Dissection and display of any four of the following enmdocrine glands in a mammal – goaand, thyroid, adrenal, pancreas, spleen, thymus, pituetary.

4. Identification and comment upon the histological slides (five in number) of tie following pituitary, Adrenal, Ovary, Testes, Islets of Langerhans, 'thymus, thyroid, Parathyroid and Vaginal smears, Bone, cartilage, ear eye spleen.

Second Sitting

A. Cell Biology:

1. 1. Vital staining of secretory granules in salivary glands of Cockroach and Mitochondria in the buccal epithelium.

B. Genetics:

1. Aceto carmine stained squash preparation of the onion root tipsand tests Of grasshopper to demonstrate stage of mitotic divisions respectively,
2 Acepto carmine preparation of the giant chromosomes of the' Chirononius Drosophila larvae.

C. Evolution and Paleontology:

1. Serial homology as exhibites by the appendages of prawn.

2 Homology and Analogy as exhibited by the wings of birds, bat and insect

4, Study of Fossils..

5 'Identification and comment upon the specimens sides on-

Economic Zoology

– 3 Nos, and

Cytology

– 2 Nos

6. Practical Record
7. Viva – Voce

Group – A

1. Social Re from movements *in the [19th ad 20th Century*
2. *National Freedom Struggle* since 1857 A.D. and Attainment of Independence.
3. National Cultural Heritage.
4. General Awareness about important provisions of India Constitution.
5. Planning for Development in Post-Independent India
 - (i) Agricultural and Industrial Development
 - (ii) Problem of Poverty and unemployment
 - (iii) Priority of Reconstruction of Bihar
 - (iv) Priority of Reconstitution of Bihar
 - (v) Role of Gram Panchayat in eradication of poverty.

Comment Likhe:

- (i) United nations and its major agencies
- (ii) Hunan rights
- (ii) Value Education and
- (iv) Consument awareness.

7. Fascinating World Living being.
8. Elementary knowledge of Physics
9. Chemistry in Action
10. Modern achievements in Science and Technology.

Environmental Studies

Group – B

50

Marks

1. National resources-Land water, Forest and Mineral resources
2. Concept and its conservation-Hot spots and threats to biodiversity.
3. Biodiversity and its conservation-Hot spots and threats to biodiversity.
4. Pollution cause, effects and control measures.
5. Relevance and Sustainable development. Conservation and Water Land Reclanation.
6. Public awareness about and Environment issue, Population Growth & its impact on Environment-Woman and Child Development-AIDS.

Chemistry (Hons)

B.Sc. Part – III

Paper – V

Physical Chemistry

There will be TEN question each of twenty (20) marks including Question No.-I (one) will be of objective ~type and compulsory covering the entire syllabus. Three questions will be set from each group out of which FOUR to -be answered selecting at least ONE from each group.

Group – A

1. Gaseous State:

Collision number, collision frequency, collision diameter and mean free path of molecules of gas (including temperature and pressure dependence), viscosity of gases, relation between mean free path and Co-efficient of viscosity, temperature and pressure dependence of Viscosity (η), degree of freedom motions principle of equipartition of energy, its use for determination of Avogadro's number.

2. Spectroscopy:

Basic principles of different types of absorption, idea of IR, UV- VIS spectroscopy.

3. Photo Chemistry:

Basic principles, Lambert – Beer Law. Molar extinction coefficient, Stark-Einstein law of photochemical equivalence; primary and secondary processes, examples of low and high quantum yield. Photochemical reaction such as $H_2 + Cl_2 \rightarrow 2HCl$, $H_2 + Br_2 \rightarrow 2HBr$ and decomposition of HI. Phosphorescence and Fluorescence,

Elementary idea of electron Spectroscopy and area of its applications.

Group – B

1. Thermodynamics:

Derivations of law of mass action, modal elevation and modal depression-constants, van t Hoff reaction isochore and isotherms Maxwell thermodynamic relations, partial molar quantities chemical potential, variation of chemical potential with temp and pressure Chemical potential in an ideal gas mixture, Absolute entropy and third law of thermodynamics.

2. Phase Equilibrium.

Three component systems, idea of sorting out triangular coordinates, partially miscible liquids and role of added salts $Cl(NH_4)$, SO_4 , H_2O , Phase diagram of cement.

3. Wave Mechanics:

de-Broglie equation uncertainty principle, Schrodinger wave equation and its application of H-atom (only interpretation of solution and no solution), Idea of operators.

Group – C

1. Chemical Kinetics.

Kinetics of third order reactions, half period, and its unit, kinetics of complex reaction: side reactions, opposing reactions and consecutive reaction, chain reactions.

2. Electrochemistry:

(a) Reversible and irreversible cells and electrodes, E.M.F. of a cell and its measurement, Galvanic cells, electrode potential and its origin, standard, electrodes potential, Nernst equation determination of electrode potential concentration cells, definition, classification, E.M.F. of concentration cells

with and without transference, liquid junction potential application of emf. measurements,

(b) Electrodes: Hydrogen electrode calomel, electrode, quinone hydroquinone electrode, glass electrode, measurement of pH using hydrogen electrode

(c) Transport number and its determination by Hittorf's and moving boundary methods. Abnormal transport number, Determination of mean activity by emf, method.

3. Surface Chemistry:

Types of adsorption, adsorption isotherms, Freundlich, Langmuir and Gibbs adsorption isotherms, Limitations and applications.

B.Sc. Part – III (Hons)

Paper – VI

Inorganic Chemistry

There will be TEN questions each of twenty (20) marks including Question

Na. 1 {one} will be of objective type and compulsory covering the entire syllabus. Three questions will be set from each group out of which FOUR to be answered selecting at least from each group.

Group – C

1. Atomic Structure:

Idea of wave mechanical mode of atom, Schrodinger equation and its derivation; significance of wave functions, Normal and orthogonal wave functions, Probability density pattern for H-atom (qualitative ideas only and no derivation required), radial and angular Wave functions Sign of wave functions.

2. Chemical Bonding:

- (a) Molecular orbital method (qualitative treatment only), ECAO combinations of s-s, p-p-p-d orbitals. Rules of LCAO bonding antibonding and non-bonding orbitals simple M.O. diagrams of homo nuclear diatomic molecules, calculation of bond order. Resonance.
- (b) Metallic bonding; M.O. method of explanation of bonding in metals, outline of structure of interstitial alloys and substitution alloys, super conductivity and its applications.

3. Nuclear Chemistry:

Ground state properties of nucleus-constituents of Nucleus, nuclear properties, binding energy per nucleon and stability of Nucleus, α and γ emissions And their properties Concept of potential barrier, radioactive decay law, partial decay constant, half life and mean life periods. features of $4n$, $4n+2$, $4n+3$ and $4n+1$ radioactive series, Nuclear fusion and stellar energy, Synthesis of transuranic elements.

Group – B

1. General chemistry of the following elements with reference to their periodic position, important, compound their structures and uses.
- (a) Nitrogen, phosphorus, arsenic, antimony and bismuth.
- (b) Oxygen, sulphur, selenium tellurium.
2. Comparative chemistry of the following transition metals with reference to their P.T. position, oxidation states, complex formation and formation of organo metallic compounds.
- (a) V, Nb and Ta
- (b) Cr, Mo and W
- (c) Platinum metals.
3. General chemistry of f-block elements. Electronic configuration and periodic position of lanthanides and actinides, lanthanide contraction and consequence magnetic properties of lanthanides.

Group – C

1. Organometallic Chemistry :

Definitions, nomenclature of simple organo metallic compounds E.A.N rule ionic and electron deficient compounds, metal alkyls of group 1,2 and 13 elements. Elementary idea of carbonyls, nitrosyls and ferrocenes.

2. Inorganic Chemistry in Biological Systems:

Elementary idea of the role of the following biological systems: Na, K, Mg, Ca, Fe and Co.

3. Inorganic Chains, Rings Cages and Clusters:

Elementary idea of the terms involved with examples, idea of catenation and intercatenation chemistry and heteropolyanions, boranes, boranes and metal-metal bonding.

Paper – VII

Organic Chemistry

Full Marks: 100

There will be TEN questions each of twenty (20) marks including. Question No. 1 (one) will be of objective type and compulsory covering entire syllabus,
Three questions will be set from each group out of FOUR to be answered selecting at least ONE from each group.

1. General Principles:

Hyperconjugation, mesomeric effect, hydrogen bond intermediate species their detection and characterization, carbocation, carbanion, carbenes, nitrene and benzyne.

2. Types of Reactions:

Nucleophilic substitution at saturated and unsaturated carbon electrophilic and nucleophilic substitution in benzene nucleus, Addition reactions: Electrophilic and nucleophilic elimination reactions H of Markovnikov's rule and Saytzeff's rule.

3. Name Reactions and Rearrangements (Definition & Mechanism only) Aldol condensation, Knoevenagel reaction, Claisen condensation, Mannich reaction, Michael reaction, Pinacol-Pinacolone rearrangement Wagner-Meerwein rearrangement, Benzilic acid rearrangement.

Group – B

- 1.** (a) Polynuclear hydrocarbons, Naphthalene, anthracene and phenanthrene
(b) Amino acids.
(c) Heterocyclic compounds, furan thiophene, pyrrole, pyridine quinoline and isoquinoline.

- 3. (a) Dyes:** AZO, TPM dyes Phthalic dyes, Zanthene dyes, Vat dyes (indigo including its structure and stereochemistry)
(b) Alkaloids and Terpenes: Brief idea of general methods of isolation and structural elucidation.

Group – C

1. Drugs:

Sulpha drugs, antimalarials, antibiotics, analgesics, pyrogenic sedatives, antiseptics.

- 2.** (a) synthetic fuels and propellants.
(b) Explosives, insecticides, adhesives.

3. Uses of Reagents:

HIO, lead tetra acetate, N.B.S. Br₂ SeO₂

B.Sc. Part – III

Chemistry Practical

Paper – VIII

Time : 6 Hours

Full

Marks : 100

- 1.** Any one experiment from the following
(a) Determination of molecular weight of volatile liquids by Victor-Meyer method,
(b) Determination of surface tension of liquids using stalagmometer and calculation of parachor values.
(c) Determination of coefficient of viscosity of liquids using Ostwald viscometer.
(d) Determination of partition coefficient of solutes between two liquids.
(e) Determination of rate constant for hydrolysis of ester catalyzed by H⁺ ions at room temperature.
(f) Determination of refractive index of liquids by Abbe refractometer and calculation of molecular refractivity.
(g) Thermochemistry : heat of solution of solute in a solvent, heat of neutralization.
Gravimetric Analysis of any one estimation of Ag⁺, Cu²⁺, Ni²⁺, Ba²⁺, Cl⁻ and
Vive Voce

Group – A
Physical Chemistry

Full

Marks : 75

There will be TEN questions each of fifteen (13) marks including Question NO.1 (one) will be of objective type and Compulsory covering the entire syllabus. Three questions will be Set from each Group out of Which FOUR to be answered selecting at least ONE from each group.

1. Physical properties of liquids and their application in establishing molecular structure: viscosity, surface tension and refractive index,

2. ELECTRO CHEMISTRY.

(a) Standard electrode potential E.M.F, and application of emf. measurements. :

(b) Transport number and its measurement by Hittorf s method 3.

CHEMICAL KINETICS AND CATALYSES:

(a) idea of side reactions, opposing reactions and consecutive reaction, Chain reactions. ,

(B) catalysis : Definition and classification, Theory of catalysis, ideas of acid base and enzyme catalysis.

4.Photo Chemistry:

(a) (a) Basic principles. Lambert-Beet Law, Star-Einstein Law of Photo chemical Equivalence, $H_2 + Cl_2$, and $H_2 + Br_2$, reactions (only reactions) Quantum yield, Phosphore-science, fluorescence, elementary idea of photoelectron spectrograph.

Group – B

Inorganic Chemistry

1. (a) Atomic Structure and Bonding : Idea of VBT ux MOT (qualitative treatments only) MO correlation diagram for homonuclear diatomic molecules. Calculating of bond order an it basis. ,

(b) Complexes:E.A.N. rule, shapes of d-orbitals Nomenclature, isomerism

2. Outline of the chemistry involved in the following industries cement, fule and industrial gases.

3. Uses of organic reagents in inorganic analysis EDTA Damethyl glyoxime L-nitroso, n-riaphthol, cupeferron.

4. Chemistry of the following elements and important compounds.

(a) N,P As. (b) O,S, Se.

Group – C

Organic Chemistry

Structure And Mechanism:

Hyperconjugation, carbonium and carbanion, carbene nitrene in reactions involving nitrene formation addition reactions electrophilic and nucleophilic elimination reactions, satyzeff rule. Friedal craft reaction pinacole – pinacolone rearrangement.

2. Synthetic Organic Chemistry:

(a) Malonic easter and use in synthesis acetoacetic ester (MC)

(b) Use of the following reagents in organic chemistry.

Na₂, NHO, LiAlH and AlCl₂

3. Aromaticity and Huckel's Rule

Chemistry Practical

Physical Chemistry

Time : 3 Hours

Full

Marks : 25

(a) Determination of surface tension of liquids (e.g, Benzene, Acetone, Chloroform) using stalagmometer.

(b) Determination of Co-efficient of viscosity of liquid e.g. Benzene, Acetone, Chloroform using Ostwald Viscometer.

(c) Determination of Partition co-efficient of solutes between two immiscible liquids.

(d) Determination of Molecular Weight of volatile liquid by victor Meyer method.

2. Record pf class and viva – voce.

B.A/B.Sc. (Hons.)

Math

There will be twelve questions 1 be set in ech and every paper (i.e Paper, V vi & VI) and six to be answered in each paper selecting at least one from each group. One question will be objective! short answer will be compulsory. This question will be of twenty marks and the rest questions are Of each sixteen marks, Paper VIII will be optional paper, ten questions to he Answered.

Paper – V

Time : 3 Hours

Full Marks : 100

- | | | |
|------------|---------------------|--------------|
| 1.Group A: | Real Analysis | :3 Question |
| 2.Group B: | Riemann Integration | : 4 Question |
| 3.Group C: | Infinite Series | : 4 Question |

Real Analysis:

Function of two variables, lint Repeated limits Moore-osgood Theorem, Continuity and differentiable of function of two variables yong's and Schwartz Condition of equality of Fay and Fyx Implicit function theorem Continuity and differentiability of functions of two variables, Taylor's theorem, Daina & Minima of two variables.

Group – B

Definitions and Existence Of R-integrals of bounded functions, Darbox Condition of inegrarity. Riemann intergrability of Continuous function and monotone functions. R-integral of function with file number of discontinuities with discontinuous point as a finite number of limit point. Riemann-integral as she Limit of a sum, Mean value theorem and fundamental theorems of Integral Calculus (2 questions) :

Improper integrals, convergence of an improper integral, comparison test, dirichlets test. Beta and Gamma functions, their properties and relationship. Differentiation under integration {one question}

Double and triple integrals, Change of order of integration, line surface and volume integrals, Green, Gauss and Stokes theorem, (one question)

Group – C

Infinite Series

Sequences and series of function and their point wise convergency Uniform convergence of sequence and series of function, Weistrass M-test. Uniform convergence and Continuity Dini's test, Abel's test. Dirichlel's test

Uniform convergence and integration uniform convergence and differentiation.
(2 questions)

Infinite Product and its convergence and their mutual relationship. Double series, sum by rows, sum by columns, Pringsmeism theorem Elementary notice of metric spaces and Topological spaces with examples (2 question)

Time : 3 Hours

Full Marks : 100

- | | | |
|-------------|----------------|--------------|
| 1. Group A: | Groups | :3 Question |
| 2. Group B: | Ring | : 4 Question |
| 3. Group C: | Linear Algebra | : 4 Question |

Group – A

Group:

Center of a group, Normalized, Conjugacy class Equation, Autoorphism, inner isomorphism. Commutative Sub groups, Direct product of two groups. Solval Groups, Finite Groups. (3 questions)

Group – B

Ring

Division ring, Polynomial ring, Imbedding of a ring without unity in a ring with unity, Imbedding of a ring and integral domain in field. Characterization of a filed, Quotient field, Polynomial over commutative ring, Prime and ovaxinal deals in commutative ring. Euclidian Domain. Principal idea! Domain, Unique factorization Domain, (4 questions) :

Group – C

Linear Algebra:

Vector Spaces, Spaces, Bases and dimension. Linear transfor-motion, Mitnx and linear transformation. Algebra of Linear transformation.

Rank and nullity of linear transformation.dual spaes, characterstics values, characterstics vectors, Caley – Hamilton’s Theorem.

PAPER – VII

TIME : 3 HOURS

FULL MARKS :

100

- | | | |
|--------------|------------------------------|-------------|
| 1. Group – A | : Complex Analysis | :3 Question |
| 2. Group – B | : (a) Attraction & Potential | :2 Question |
| | : (b) Hydeostatics | :2 Question |
| 3. Group – C | : Differential Equation | :4 Question |

Complex Analysis:

Complex numbers as ordered pairs. Geometric representation to Complex numbers, Stereo graphic Projection, Continuity and differentiability complex Functions, Analytic function, Cauchy Riemann equation, Harmonic function, Elementary functions, Mapping by elementary function, Mobiles transformations Fixed points, Cross ratio. Inverse points, conformal mapping, complex integration.

GROUP – B

ATTRACTION POTENTIAL AND HYDROSTATICS:

Attraction And Potential:Attraction and potential of rod rectangular : and fircular dishes, spherical shells, sphere (Laplace’s and Prison’s equation Theorems on equal potential surfaces, (2 questions),

‘Hydrostatics ; Pressure at a point, Thurst on a plan surface centre of : Pressure, Meta centre Equilibrium of floating bodies. (2 questions –

GROUP – C

DIFFERENTIAL EQUATIONS

Second order equations with variable co-efficient, solution of second order differential Equations with variable Co efficient Method of variation of Paramees, Total differential Equations in three independents Variables

Simultaneously differential Equations, Lagrange's Linear partial differential equations standard forms; Charpit's method Partial differential equation of higher order with Variable Co- efficient, Mange' Method.

PAPER – VIII

(OPTIONAL PAPER)

Solution of difference equation of first order, General Solution, Linear differential equation with constant Co-efficient. Solution of ordinary differential equations-one step method. Eulefs modified, Pilchards, Runga-Kutta methods, methods of starting the solution and Milhe-Simpson's Method (3 questions).

Simultaneous Linear Equations : Gauss elimination, Gauss scidel's-jordon's and relaxation methods {simple problem} (2 questions).

' Finding root of Polynomial Equations: Regular, false, Bisection, Newton-Raphson Method of several variables, Iterative method and its generalization. significant figures and error of computation. (2 questions

2.SPHERICAL TRIGONOMETRY AND ASTRONOMY:

Spherical Trigonometry: Spherical Triangle, Fundamental formulae (Cosine-sine, sine-Coisine, cotangent) Napier's and D"Alembert's Analogies, "Right angled triangles and Napier's rule (2 questions).

Stronomy : Celestial sphere, Definition, Different system of Co-ordinates, Phenomenon of rising and setting of stars, Turlight (2 questions). Solar System, 'Two body problem, Equation of relative motion (one questions), Area Integral, Kepler 's laws, Anomalies, Keples's equation (one questions). Stationary point-Phase of planet, Refraction, Simpsons-Bradlay's and Cassine's formulae, Effect 'of refraction in the position of a body (2 questions), Annual abrasion, Effect albration on celestial latitude and longitude. Effect of abrration on right aseemnken and declination, Parralex, Effect of parallax on latitude, longitude, R.A. and declination (2 questions).

3. NUMBER THEORY:

The Basic Representation Theorem, Linear Diphantine Equation, , Fundamental Theorem of Arithmetic, Formats Little theorem and Wilson's – "theorems (2 questions) .

Basic properties of Congruence, Residue System, Euler's theorem, Chinese ' Remainder theorem, Multiplicative arithmetic functions, The Euler's functions $F(n)$, $U(n)$, Mobins function and the function of $G(n)$ and their simple properties, Mobius inversion formulae, Perfect number and the function $t(n)$ (3 questions). The quadratic reciprocity law, Euler's eviterian. The legendary "Symbol and its properties and applications, Gauss theorem, Gauss quadratic – reciprocity law, quadratic congvuences with Composite module (3 questions). ' Representation of integers as sums of squafe, Suis of two squares, Theories lemma, Formats" Theorem, Sums of four squares and Euler's lemma, . Lagrange theorem.

4.PROBABILITY THEORY:

Event, Probability of an event, Sample space, A finite sample space, Mutually exclusive and complimentary events, independent events, conditional probability (one question).

Axiom for probability in finite sample space, Product rule of probabilities in a sample space, Baye's theorem, Random variables, and their probability function. Mathematical expectation and Mean absolute deviation. Variance Standard Variation, Chebyshev's theorem for a probability distribution e frequency distribution of measurements, (3 questions)
 Convergence of sequence of random variables, convergence : distributions, Convergence in probability, almost sure convergence convergence in a quadratic mean, Halley' Bary theorem, (3 questions)
 Complex valued. random variables Characteristic functions, inversion theorem, Continuity theorem, Distribution and Kolomgavow's inequality, Weak 'and strong laws of large numbers (3 questions).

PART – III

B. A. B.Sc. MATHEMATICS

GENERAL COURSE

There will be sixteen questions to be set and eight to be answered selecting; at least one from each group, One question will be objective' short answer will be compulsory. This question will be of sixteen marks and the rest questions of twelve marks.

Time : 3 Hours

Full Marks : 100

Group A:	Abstract Algebra	:5 Question
Group B:	Complex Analysis	:5 Question
Group C:	Hydrostatics	:3 Question
Group D:	Attractive Potential	:2 Question

GROUP – A

ABSTRACT ALGEBRA:

Binary operations, Definitions of Group, Abelian and non abelian groups with Example, Uniqueness of identity element and inverse of an element in a group. Cancellation laws in a group, Definition of a sub group and Cyclic group With examples, Definition of ring, integral domain and field with examples. Homomorphism and isomorphism in group and ring. (5 questions).

GROUP – B

COMPLEX ANALYSIS:

A Complex number as ordered pair, Geometric representation to complex numbers; Continuity and differentiable of a complex function. Analytic function, Cauchy's Riemann Equation, Harmonic function, Mapping by bilinear transformation, Conformal mapping, Bilinear transformations, Inverse point cross ratio (8 questions)

Group – C

Hydrostatics:

Pressure at a point, Thrust on plane and curved surfaces, Centre of pressure and meta center. Equilibrium of floating bodies (3 questions)

GROUP – D

ATTRACTION AND POTENTIAL

Attractive and Potential of a rod, Rectangular and Circular disc, spherical shells, Spheres (Laplace's and Poisson's equations). Theorems of equipotential Surface, (2 questions).

B.Sc. PART – III

BOTANY HONOURS

There would be three theoretical and two practical papers in B.Sc. Part-iii examinations carrying 10 marks in each paper.

BIO CHEMISTRY – MOLECULAR BIOLOGY

AND BIOTECHNOLOGY

Time : 3 Hours

Full

Marks : 100

Ten questions has to be set, Question No, 1 will be objective type and compulsory covering the entire syllabus, Remaining 9 questions have to be set 'rom three groups (A,B\C). Four questions are to be answered besides question no.1, selecting at least one from each group.

GROUP – A BIO CHEMISTRY:

1. **CELLULAR CHEMISTRY:** Covalent and non covalent interactions; Hydrogen "bond ; structure properties and biological significance of water ; pH and its significance; Buffers, (Both inorganic and organic) and Its importance.
2. **ENERGY FLOW AND ENZYMOLOGY:** Concept of free energy, energy transfer and redox potential Classification and nomenclature of enzymes mode of action enzymes as biocatalysts; isozymes.
3. **NUCLEIC ACIDS :** Composition of nucleic acids and synthesis of nucleotides, DNA Structure – A,B & form of DNA; Denaturation and renaturation of DNA replication, DNA polymerases Different from of RNA and their roles.
4. **AMINOACIDS AND PROTEIN:** Metabolism structure: characteristics. and classification of amino acids :protein and non protein amino acids: Types and structure of Proteins Protein biosynthesis and its regulation.
5. **Carbohydrate:** Metabolism Classification and structure of various types of carbohydrates; biosynthesis and degradation of sucrose and starch.
6. **LIQUID:** Metabolism Saturated and unsaturated fatty acids, biosynthesis of fatty acids, Oxidation of fatty acids. Storage and mobilization of fatty acids and lipids.
7. Outline of secondary plant metabolites and their Roles.

GROUP – B MOLECULAR BIOLOGY

1. DNA as genetic materials (Both Prokaryotes and Eukaryotes)
2. Genetic code;
3. Gene structure expression and regulation: Gene concept Organization of gene in Prokaryotes and eukaryotes; Operon concept, Gene regulating (Lac operon and tryp operon :
4. interrupted genes; RNA Splicing

5. Recombiant DNA Technology:

Role of Vectors, Restriction enzymes, Cloning Strategies genomic and DNA libraries: Southern and Northern blots; Polymerase chain reach DNA fingerprinting.

GROUP – C PLANT – BIOTECHNOLOGY

1. Basic concept and scope of plant Biotechnology.
2. Plant cell and tissue culture: History, scope, concept of cellular differentiation and totipotency.
3. Organogenesis and embryogenesis : Fundamental aspects.
4. Somatic hybridization: Isolation and culture of protoplast.
5. Application of Plant tissue culture: Clonal propagation, elementary knowledge of conservation and storage of germplasm.
6. Genetic engineering of Plants: Aims and development of transgenic plants; Agrobacterium as a natural genetic engineer.

MICROBIOLOGY PATHOLOGY AND AEROBIOLOGY

TIME : 3 HOURS

FULL MARKS

: 100

Ten questions has to set. Question No, 1 will be object type and compulsory covering the entire syllabus , Remaining 9 question have to be

set from two groups (A,B) in which four question are to be answered beside "Question No.t selection at least one from each group.

GROUP – A

MIROBIOLOGY

1. **DISCOVERY OF MICROORGANISMS:** Systematic position of micro organism
ml biological world ; classification and characteristic features of various group.
2. **METHODS IN MICROBIOLOGY:** Sterilization methods: preparation of culture media technique of isolation of microorganism, staining of bacteria.
3. **ULTRA STRUCTURE OF MICROORGANISM:** Structure and nature of TMV and t4 structure of bacterial cells, general account mycroplasma and actinomycetes.
4. **NUTRITION BACTERIA**
5. Genetic recombination in bacteria.
6. Role of microorganism in biogeochemical cylings of N2 and C cycle, Biological N2 fixation.
7. **INDUSTRIAL APPLICATION OF MIROORGANISM:** Organic acids, alcohol, food processing, milk products, antibiotics, biopesticide – preparations, products from genetically engineered microbes.
8. Microbial degradation of food grain in storage.

GROUP – B

PLANT PATHOLOGY

1. General account of diseases caused by plant pathogens
2. 1 General account of diseases caused by plant pathogens.
3. 2 Role of toxins and enzymes in plant diseases.
- 3 Important plant diseases of Bihar, Its etiology and control:
 - (a) Rust disease of wheat.
 - (b) Smut disease of wheat :
 - (c) Blast disease of rice juice.
 - (d) White rust of crucifers.
 - (e) Late blight of Potato
 - (f) Wilt Arhar
 - (g) Tobacco Mosaic virus,
 - (h) Tundu disease of wheat.
 - (i) Citrus Canker
 - (j) Little leaf of Brinjal .
4. Definition, scope and concept & Aerobiology
5. Morphology & common, airbome biopartic lates pollen grains & fungus Spores.
6. A brief idea of allergic and respiratory diseases-Asthma and rhinitis.

PAPER – VII

SYSTEMATICS OF ANGIOSPERMS AND ENVIRONMENTAL BIOLOGY

Time : 3 Hours

Full

Marks : 100

Ten questions has to set. Question No, 1 will be object type and compulsory covering the entire syllabus , Remaining 9 question have to be set from two groups (A,B) in which four question are to be answered beside "Question No.t selection at least one from each group.

GROUP – A

SYSTEMATICS OF ANGIOSPERMS

1. **INTRODUCTION:** Definition of systematic, aims and components of

systematic, its significance, Origin of systematic with some exploration from Indian old treatises and modern systems of classifications.

2. Systematic in Practice :Importance of herbarium specimens and the preparations, Role herbaria and Botanical gardens: Keys identification of plants.

GROUP – B

ENVIRONMENTAL BIOLOGY

Introduction : Definition of environment biology the components and dynamism, homeostasis, relevance in welfare of human society.

2, Earth 'as system -Biosphere (Biomres)-hydrosphere, atmosphere and lithosphere

3. Definition and concept; general account and adaptations»

: Walt, soil and atmosphere, Components of environment-a biotic and

4: individualistic, species, Populations, communities and their Characteristics. }

"A. Impact of human activity Pollution of Water, sou and air, a brief account of

– 5 'environmental toxicology; incidence of noise pollution; Prevention and | _ cantol of pollution: Global warming and Pone depletion Indemnification,

A, Role of national aid international organizations in chvenmental

. _ – iinapement : Formulation of optimal models |

: 6 Bio-indicators.

PRACTICAL BASED ON PAPER – V, VI & VII

Time : 6 Hours

Full

Marks : 100

1. Chemical tests to demonstrate the presence of any one of te following starch, sugar, fat, alkaloids, flavonoids, tannins and protein int plant materials.

To identify the amino acids in 2 mixture by resolving through paper } chromatography or TLC

1. Colorimetric estimation of DNA using diphenylamine/RNA using orcinol.

3, Preparation of media for tissue culture, sterilization and inoculation of Plant material.

Or Demonstration of techniques of in vitro culture of various explants.

4 Preparation of a solid culture medium or isolation and inoculation of Alternaria/Fusarium/CoHetotrichun or study of local microbial diseases.

Or Identification of aerospora by cellotape method | 0 |

5, Description of the locally available plant Gems only from the families Prescribed in the course.

6 To identify the Bacteria using method of Gram's Staining

7 Class records, herbaria gnd Tour Report

8 Viva-Voce.

PART – III

B.Sc. Botany General

There shall be one theoretical paper carrying 75 sharks and one practical paper carrying 25 marks.

PLANT PHYSIOLOGY; BIOCHEMISTRY;

BIOTECHNOLOGY,

ECOLOGY AND UTILIZATION OF

PLANT

Time : 3 Hours

Full

Marks : 75

Ten question has be set. Out of which Question ! would be objective types compulsory. Remaining 9 Questions have to be set from two group in which tour questions are to he answered besides Question. 1, selecting Ad! more than two from any group.

1. Plant-water relationship: Diffusion and osmosis; absorption, transpotation of water and transpiration, physiology of stomata,
- 2 'Mineral nutrition: "Essential macro and micro-elements and their role mineral uptake,deficiency and toxicity symptoms.
3. 'Transport of organic substance – Mechanism of Phloem transport source sink relationship.
4. Phototynthesis : Mechanism and factors; Respiration: aerobic and anaerobic (glycolysis, Kreb"s cycle and electron transport) .
5. Nitrogen metabolism:Nitrate reduction, amino-acids. Protein-Structure and types; N, Fixation
- 6; Enzymes: Nomenclature, characteristics and types of enzymes Regulation of activity and mechanism of action.
7. Phytohormones: Auxins, Gibberellins and cytokinis
8. Growth and development : Definition, Phases of growth and development seed germination.
9. Movements : Tropic movement
10. Biotechnology : Definition, Basic aspect of Plant tissue culture cellular totipoteny, differentiation and morphogenesis: salient achievement in : crop technology Brief idea of Restriction enzyme. cloning vector product of genetic engineering.

Group – B

Ecology Environmental Biology And Utilization Of Plants

Plant and environment: Water, soil atmosphere, light temperature and biota.

- 2 Morphological, anatomical and physiological responses of plants to water hydrophytes and. Xerophytes, temperature (Veralization), light (Photoperiodism) and salinity .
3. Plant community and ecosystems: succession-Hydrosere and Xerosere
- 4.'Major vegetation types of India: Forests and Grasslands
- 5.'Pollutions; Rice Maize, Potato, Sugarcane '
- 6, Food Plans: Rice maize Potato, Supamace
- 7.Fibres: Cotton and jute
8. Vegetable Oils ; Mustard, Coconut, Groundnut ,
9. Pulses : Gram, Arhar, Masoor, Mung.
- 10 Forest weath of Bihar with reference to timber yielding plants
11. Important drug yielding plants of your region
- 12 Beverages : Tea & Coffee :
13. Rubber

PRACTICAL PAPER BASED ON

PAPER – III

Time : 3 Hours

Full

Marks : 25

1. Ecological adaptation in Hydrophytes, Xerophytes Mesophytes Parssites and Epiphytes
Or To determine minimum size of quadrates repaired for reliable estimate of biomass m grasslands

2. Study of pH of different types of soil with the help of pit meter, Or To measure dissolved O₂ content in polluted and unpolluted water samples.
3. Test for carbohydrate. Protein, amino acids and lipids.
Or Compare the rate of transpiration between mesophytes and Xerophytes Or O₂ is evolved during photoynthesis.
Or Compare the rate of imbibition of fatty and starchy seeds Or Compare the rate of absorption and transpiration Or Moll's experiment, :
- Or Demonstration of the technique of micro propagation by using different explants e.g. axillary buds shoot meristems
4. Comment upon spots 1-4 of utilization of plants as described in syllabus
5. Class records
6. Viva-voce

**PAPER – III A
(THEORY)**

Time : 3 Hours

Full

Marks : 75

Five questions are set from each group, Students shall have to answer five questions attempting at least two from any group.

GROUP – A : ECOLOGY

1. Concept of biosphere.
2. Definition, structure and functions of a typical ecosystem.
3. Major, ecosystems of the world and their features.
4. Abiotic and biotic factors.
5. Biogeochemical cycles of oxygen, nitrogen and carbon.
6. Energy flow in ecosystem

Animal Behaviour

- (i) Scope of Ethology; innate and learned behavior.
- (ii) Parental care in fishes and amphibians.
- (iii) Social behavior in insects.
- (iv) Migratory behavior in birds & fishes.

GROUP – B Palaeo Zoology And Zoogeography

- (i) Different Geological eras of the world, their climatic conditions and fauna.
- (ii) Zoogeographic realms of the world and their boundaries.
- (iii) Bio geographical distribution of animals in oriental, Ethiopian and Australian regions.
- (iv) Fossils and their mode of formation.

ECONOMIC ZOOLOGY:

- (i) Sericulture, Lac culture and pisciculture.
- (ii) Preliminary idea of the common pests of paddy & wheat, their control.
- (iii) Vectors of kala-azar, malaria, Filariasis their prevention and control.

**ECOLOGY, ANIMAL BEHAVIOUR, PALEOZOLOGY,
ZOOGEOGRAPHY & ECONOMIC ZOOLOGY**

Time : 3 Hours

Full

Marks : 25

1. Quantitative estimation of dissolved O₂ in water with the help of Winkler's volumetric methods,

2 Determination of pH of different water/Soil samples. 02

3, Moisture content of soil & identification and comment the organism present in water/soil samples,

04, Identification and comment on the specimen (spotting) on

(i) Palaeozoology-Fossils.

(ii) Economic Zoology-Silk Yam, Larva. Pupa, Adults of Silk Worm: Lac Sticks, Lac insect, Fishing gears. Museum specimens showing parental 'care; Mouth parts of male and female Culex, Anopheles, Sandfly and their different developmental stage.

5. Paractiical Records

7. Viva-voce

B.Sc. Honour's (Part – III)

PAPER – V

(Theory)

Time : 3 Hours

Full

Marks : 100

In all 10 questions are to be set out of which number 1 and 2 shall consist of Objective (1×20 Marks) and short answer (4×5) questions respectively and both shall span over the whole syllabus 1 the paper, Students would be required to answer five questions out of which question number 1 and 2 shall be compulsory.

BIO CHEMISTRY:

1 Structure and Classification of Protein, carbohydrate and Fats.

2 Structure and Classification of Amino Acid. :

3. Metabolism of Carbohydrate: Glycogenesis, Glycolysis and Kreb's cycle

4 Beta-oxidation of fatty acids

5 Vitamins Types and functions

6 Physiology {Mammals}

(i) Physiology of digestion

(ii) Physiology of respiration (ventilation of lungs and transport of gases).

(iii) Physiology of excretion and Osmoregulation.

(iv) Physiology of testicular and ovarian cycle,

(v) Histology of the various Endocrine glands of Mammal

(vi) Chemical nature and Physiological role of the Hormones secreted by Adenophophys, Neurohypoophys, Adrenal, Thyroid, islet of Langerhans and gonads.

PAPER – VI

(THEORY)

Time : 3 Hours

Full

Marks : 100

In all 10 questions are to be set out of which number 1 and 2 shall consist of Objective (1×10 Marks) and short answer (4×5) questions respectively and both shall span over the whole syllabus in the paper. Students would be required to answer five questions out of which question number 1 and 2 shall be compulsory.

1. **Cell Biology;**

(i) Ultra structure and function of the following cell organelles: Plasma membrane, Endoplasmic reticulum, Mitochondria, Golgi Complex,

Ribosome, Chromosomes, Lysosomes, Nucleolus.

(ii) Gametogenesis Fertilization and Parthenogenesis,

(iii) Elementary idea of Immunology : Lymphoid tissues and organs, Innate and Acquired immune response.

2. Genetics

(i) Linkage and crossing over. Structure and replication of DNA.

Transcription and Translation,

(ii) Chromosomal aberrations, the Genetic and Cytological manifestation and significance.

(iii). Gene Mutation and Molecular Mechanism of its origin.

(iv) Extra Nuclear genetic system

(v) Sex determination and sex linked inheritance.

3. Economic Zoology

(i) Lac Culture

(ii) Seri Culture

(iii) Api Culture

(iv) PISC Culture

(v) Elementary idea of the common pests of paddy, wheat, sugarcane and vegetables and their control.

(vi) vectors of Kalazar Malaria and Filaria, their biology, mode of infection, prevention and control.

(vii) Wild-life conservation.

PAPER – VII

Evolution, Zoogeography & Paleozoology

Time : 3 Hours

Full

Marks : 100

In all 10 questions are to be set out of which number 1 and 2 shall consist of Objective (1×20 Marks) and short answer (4×5) questions respectively and both shall span over the whole syllabus in the paper. Students would be required to answer five questions out of which question number 1 and 2 shall be compulsory.

1. Evolution:

(i) Sources of hereditary variation and their role in evolution,

(ii) Principles of evolution : Lamarckism, Neo-Lamarckism, Darwinism & Neo Darwinism,

(iii) Isolating mechanism and their role in evolution.

(iv) Hardy-Wienberg law and genetic equilibrium.

(v) Fossil history of horse & Man.

(vi) Micro, Macro and Mega evolution.

2. Zoogeography & Paleozoology

(i) Zoo geographical realms of the world, their boundaries and climatic peculiarities.

(ii) Characteristic & Peculiar fauna of Oriental, Ethiopian and Australian regions, ,

(iii) Characteristic of Isand fauna.

(iv) Theories & Principles pertaining to animal distribution.

(v) Different geological of the world, their duration and climatic conditions.

(vi) Faunistic peculiarities of Paleozoic, Mesozoic and Cenozoic eras,

(vii) Fossil : their mode of formation & age determination.

PRACTICAL

Bio Chemistry, Physiology & Endocrinology

Time : 3 Hours

Full

Marks : 100

1. Bio Chemistry:

- (i) Benedict's test for reducing sugar.
- (ii) Molisch's test.
- (iii) Iodine test for starch and glycogen.
- (iv) Ninhydrin reaction for glycine / tyrosine / tryptophan.
- (v) Millon's reaction for glycine / tyrosine / phenylalanine.

2. Physiology:

Experiments to be performed in frog, bird/ mammal, (Two experiments)

- (i) Enumeration of total RBC.
- (ii) Estimation of hemoglobin (gm/100ml) in blood.
- (iii) Determination of ESR of blood.
- (iv) Determination of bleeding and clotting time.
- (v) Determination of O₂ uptake by terrestrial animal.
- (vi) Simple heart-beat and muscle curve by drum method.

3. Dissection and display of any four of the following endocrine glands in a mammal – goad, thyroid, adrenal, pancreas, spleen, thymus, pituitary.

4. Identification and comment upon the histological slides (five in number) of the following: pituitary, Adrenal, Ovary, Testes, Islets of Langerhans, thymus, thyroid, Parathyroid and Vaginal smears, Bone, cartilage, ear, eye, spleen.

Second Sitting

A. Cell Biology:

- 1. Vital staining of secretory granules in salivary glands of Cockroach and Mitochondria in the buccal epithelium.

B. Genetics:

- 1. Aceto carmine stained squash preparation of the onion root tip and tests of grasshopper to demonstrate stage of mitotic divisions respectively,
- 2. Aceto carmine preparation of the giant chromosomes of the *Chironomus* *Drosophila* larvae.

C. Evolution and Paleontology:

- 1. Serial homology as exhibited by the appendages of prawn.
- 2. Homology and Analogy as exhibited by the wings of birds, bat and insect
- 4. Study of Fossils..
- 5. Identification and comment upon the specimens sides on-
Economic Zoology – 3 Nos, and
Cytology – 2 Nos
- 6. Practical Record
- 7. Viva – Voce

Group – A

- 1. Social Re from movements in the [19th ad 20th Century
- 2. National Freedom Struggle since 1857 A.D. and Attainment of Independence.
- 3. National Cultural Heritage.
- 4. General Awareness about important provisions of India Constitution.
- 5. Planning for Development in Post-Independent India
 - (i) Agricultural and Industrial Development
 - (ii) Problem of Poverty and unemployment
 - (iii) Priority of Reconstruction of Bihar
 - (iv) Priority of Reconstitution of Bihar

(v) Role of Gram Panchayat in eradication of poverty.

Comment Likhe:

(i) United nations and its major agencies

(ii) Human rights

(iii) Value Education and

(iv) Consumer awareness.

7. Fascinating World Living being.

8. Elementary knowledge of Physics

9. Chemistry in Action

10. Modern achievements in Science and Technology.

Environmental Studies

Group – B

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Marks

1. National resources-Land water, Forest and Mineral resources

2. Concept and its conservation-Hot spots and threats to biodiversity.

3. Biodiversity and its conservation-Hot spots and threats to biodiversity.

4. Pollution cause, effects and control measures.

5. Relevance and Sustainable development. Conservation and Water Land Reclamation.

6. Public awareness about Environment issue, Population Growth & its impact on Environment-Woman and Child Development-AIDS.