

## स्नातक (तकनीकी/विशिष्ट योग्यता) स्तरीय प्रतियोगिता परीक्षा-2017

### प्रारम्भिक परीक्षा:-

स्नातक (तकनीकी/विशिष्ट योग्यता) स्तरीय प्रतियोगिता परीक्षा-2017 की प्रारम्भिक परीक्षा का पाठ्यक्रम वही होगा जो संयुक्त स्नातक स्तरीय प्रतियोगिता परीक्षा-2017 के लिए निर्धारित है।

### मुख्य परीक्षा:-

मुख्य परीक्षा में तीन पत्र होंगे। इस परीक्षा के प्रश्न पत्र-1 एवं 2 का पाठ्यक्रम वही होगा जो संयुक्त स्नातक स्तरीय प्रतियोगिता परीक्षा-2017 के प्रश्न पत्र-1 एवं 2 के लिए निर्धारित है।

### प्रश्न पत्र-3

पद की शैक्षणिक अहर्ता के अनुसार विषय का चयन अभ्यर्थी कर सकेंगे तथा उस विषय की परीक्षा में सम्बन्धित अभ्यर्थी सम्मिलित होंगे।

विभिन्न विषयों का पाठ्यक्रम निम्नवत् है: -

### विषय : अर्थशास्त्र (ECONOMICS)

1. अर्थव्यवस्था का ढाँचा, राष्ट्रीय आय का लेखीकरण।
2. आर्थिक विकल्प (Economic Choice) – उपभोक्ता व्यवहार – उत्पादक व्यवहार और बाजार के रूप।
3. निवेश सम्बन्धी निर्णय तथा आय और रोजगार का निर्धारण-आय, वितरण और वृद्धि के समृद्ध आर्थिक प्रतिरूप।
4. बैंक व्यवस्था-योजनाबद्ध-विकासशील अर्थव्यवस्था के केन्द्रीय बैंक व्यवस्था के उद्देश्य और साधन तथा साख सम्बन्धी नीतियाँ। झारखण्ड के वाणिज्य बैंकों के क्रियाकलाप।
5. करों के प्रकार और अर्थव्यवस्था के बजटीय और राजकोषीय नीति के उद्देश्य और साधन।
6. अंतर्राष्ट्रीय व्यापार प्रशुल्क पद्धति, विनिमय दर, अदायगी शोध, अंतर्राष्ट्रीय मुद्रा व बैंक संस्थान।
7. भारतीय अर्थव्यवस्था, भारतीय अर्थ नीति के निदेशक सिद्धांत, योजनाबद्ध वृद्धि और वितरण न्याय-गरीबी का उन्मूलन। भारतीय अर्थव्यवस्था का संस्थागत ढाँचा-संघीय शासन संरचना-कृषि औद्योगिक क्षेत्र, सार्वजनिक और निजी क्षेत्र, राष्ट्रीय आय, उसका क्षेत्रीय और क्षेत्रीय वितरण कहाँ-कहाँ और कितनी।
8. कृषि उत्पादन-कृषि नीति-भूमि सुधार-प्रौद्योगिकीय परिवर्तन-औद्योगिक क्षेत्र से सह-सम्बन्ध।

9. औद्योगिक उत्पादन—औद्योगिक नीति। सार्वजनिक और निजी क्षेत्र क्षेत्रीय वितरण—एकाधिकार प्रथा का नियंत्रण और एकाधिकार।
10. कृषि उत्पादों और औद्योगिक उत्पादों के मूल्य निर्धारण सम्बन्धी नीतियाँ अधिप्राप्ति और सार्वजनिक वितरण।
11. बजट की प्रवृत्तियाँ और राजकोषीय वितरण।
12. मुद्रा और साख प्रवृत्तियाँ और नीति—बैंक व्यवस्था और वित्तीय संस्थाएँ।
13. वदेशी व्यापार और अदायगी कोष।
14. भारतीय योजना—उद्देश्य, व्यूह, रचना अनुभव और समस्याएँ।
15. झारखण्ड की अर्थ व्यवस्था :— कृषि एवं उद्योग के सापेक्षिक स्थान, आर्थिक विकास के मार्ग की रुकावटें, गरीबी एवं बेरोजगारी, भूमि सुधार की प्रगति।

### विषय : रसायन शास्त्र (Chemistry)

1. **Atomic structure, Periodic properties and chemical bonding** — Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of  $\Psi$  and  $\Psi^2$ , quantum numbers, radial and angular wave functions and probability distribution curves, shapes of S, p, and d orbitals, Aufbau and Pauli's exclusion principles, Hund's rule, electronic configuration classification of elements as s, p, d and f-blocks.  
  
Periodic tables and periodic properties (atomic and ionic radii, ionization energy, electron affinity, electro-negativity) and their trends in periodic table, Their applications in chemical bonding.  
  
Covalen bonding. V.B. Theory, VSEPR Theory, M O. Theory, homonuclear and heteronuclear diatomic molecules, bond order and magnetic properties.  
  
Resonance, hydrogen bonds and vander Waals forces. Ionic solids - Born-Haber cycle, Fajaris rule.
2. **Gaseous states** — Postulates of kinetic theory of gases, deviation from ideal behavior of van der Waal's equation of state. Critical temperature, pressure and volume. Liquification of gases, Critical constants and vander Waals constants, the law of corresponding states, reduced equation of state Molecular velocities — r:m.s. velocity, average velocity, most probable velocity. Maxwell's distribution of molecular velocities.
3. **Solid State** — Space lattice, Unit cell. Laws of crystallography. X-ray diffraction by crystals. Bragg's equation coordination number radius ratio rule, defects in crystals and their magnetic and electric behavior semi-conductors and super conductors
4. **Thermodynamics** — Law of thermodynamics, work, heat, energy. State functions — E, H, S and G and their significance criteria for chemical equilibrium and spontaneity of reactions. Variations

of free energy with T, P and V Gibbs Helmholtz equation. Entropy changes in gases for reversible and irreversible processes. Hess law Bond energy.

5. **Chemical kinetics and catalysis** — Order and molecularity, chemical kinetics and its scope, rate of a reaction, factors influencing rate of reaction. Rate equations of zero, first and second order reactions. Pseudo order, half life and mean life. Determination of order of reactions. Theories of chemical kinetics — collision theory, transition state theory, Arrhenius equation, concept of activation energy, effect of temperature on rate constant.

Catalysis, characteristics of catalysed reactions, theories of catalysis, examples.

6. **Electrochemistry** — Electronic conduction in electrolytic solutions, specific, equivalents and molar conductance, effect of dilution on them, cell constant, experimental method of determining conductance.

Migration of ions and Kohlrausch, law. Arrhenius theory of electrolytic dissociation and its limitations, weak and strong electrolytes Ostwald's dilution law, its uses and limitations Debye - Huckel Onsager's equation (elementary treatment) Transport number - definition, determination by Hittor method.

Galvanic cells, electrodes and electrode reactions, Nernst equation, E.M.F. of cells, Hydrogen electrode, electrochemical series, concentration cell and their applications  $p^H$ . Buffer solutions theory of buffer action,

7. **Transition and inner transition metals and complexes** — General characteristics of d-block elements, co-ordination compounds - nomenclature, isomerism and bonding in complexes V.B. theory and crystal field theory. Werners theory, EAN metal carbonyls, cyclopentadienyls, olefin and acetylene complexes.

Compounds with metal-metal bonds and metal atom clusters.

General chemistry of f-block elements Lanthanides and actinides - ionic radii, separation, oxidation states, magnetic and spectral properties.

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

9. **Photochemistry** — Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry — Grothus-Draper law, Stark-Einstein law, Jablonski diagram. Fluorescence, phosphorescence, Quantum yield Photoelectric cells.

10. **Hard and soft acids and bases** — Classification of acids and bases as hard and soft, Pearson's HSAB concept, acid-base strength and hardness and softness, symbiosis, theoretical basis of hardness and softness, symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

- 11. Structure and Binding** — Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, van der Waals interactions, inclusion compounds, clathrates, charge transfer complexes, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.
- 12. Mechanism of organic reactions** — Homolytic and heterolytic bond breaking, types of reagents - carbocations and nucleophiles, types of organic reactions, Reactive intermediates - Carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples) Different types of addition, substitution and elimination reactions -  $SN^1$ ,  $SN^2$ ,  $SN^i$ ,  $E_1$ ,  $E_2$ ,  $E_{1cb}$  etc.
- 13. Stereochemistry of Organic Compounds** — Isomerism, Optical isomerism - elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization.

Relative and absolute configuration, CIP rule, D & L and R & S nomenclature.

Geometric isomerism: Determination of configuration of geometric isomers - E & Z nomenclature, geometric isomerism of oximes and acyclic compounds. Configuration and conformation, conformations of ethane, butane and cyclohexane.

- 14. Organometallic Compounds** — Organometallic compounds of Mg, Li & Zn their formation, preparation, structure and synthetic applications.
- 15. Organic Synthesis via enolates** — Acidity of  $\alpha$ -hydrogens, preparation, properties and synthetic applications of diethyl malonate and ethyl acetoacetate, keto-enol tautomers.
- 16. Carbohydrates** — Classification and nomenclature Monosaccharides, mechanism of anomeric formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses and ketoses, Anomers and epimers Formation of glycosides, ethers and esters Ring structure of glucose and fructose mechanism of mutarotation.
- 17. Polymers** — Addition or chain growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerizations, Ziegler - Natta polymerization and vinyl polymers. Condensation or step-growth polymerization, Polyesters, polyamides, phenol-formaldehyde resins, urea-formaldehyde resins, epoxy resins and polyurethanes.
- Natural and synthetic rubbers. Inorganic polymeric systems - silicones and phosphazenes, nature of bonding in triphosphazenes
- 18. Study of following types of organic compounds:**

- a. Alkanes and cycloalkanes — Preparation of alkanes - wartz reactions Kolbe reaction, Corey - House reaction etc physical and chemical properties, free-radical halogenation of alkanes - reactivity and selectivity.

Cycloalkanes : Nomenclature, formation, properties - Baeyer's strain theory

- b. Alkenes, cycloalkenes, Dienes & Alkynes — Mechanism of dehydration of alcohols, and dehydrogenation of alkyl halides, regioselectivity in alcohol dehydration. The saytzeff rule, Hofmann elimination Mechanism involved in hydrogenation, electrophilic and free radical additions, Markovnikov's rule, Kharasch effect, hydroboration - oxidation, oxymercuration - reduction, Epoxidation, Ozonolysis, hydration, hydroxylation and oxidation with  $\text{KMnO}_4$ . Polymerization.

Substitution at the allylic and vinylic positions of alkenes. Uses Dienes: Classification, preparation, properties Alkynes : Preparation, properties, acidic reactions of alkynes, mechanism of electrophilic and nucleophilic addition reactions, hydroboration - oxidation, metal-ammonia reductions, oxidation and polymerization.

- c. Arenes and Aromaticity — Aromaticity : The Huckel rule, aromatic ions, M.O. diagram, anti-aromatic, Aromatic electrophilic substitution — Mechanism, role of  $\sigma$  and  $\pi$  complexes. Mechanism of nitration, halogenation, sulphonation, mercuriation and Friedel Crafts reaction. Energy profile diagram, activating and deactivating substituents, orientation, ortho-para ratio. Side-chain reactions of benzene derivatives. Birch reduction.

- 19. Study of some reactions** — Pinacol - pinacolone rearrangement, aldol reaction, Perkin reaction. Cannizzaro's reaction, Mannich reaction, Clemmensen reduction, Claisen rearrangement, Peimer Tiemann reaction, Friedel crafts reaction, Fries rearrangement. Reformatsky reaction.

- 20. Spectroscopy** — Basic principles of the following type of spectroscopy and their applications in determining structures.

- |    |      |   |                      |
|----|------|---|----------------------|
| a. | UV   | - | Visible spectroscopy |
| b. | IR   | - | "                    |
| c. | NMR  | - | "                    |
| d. | Mass | - | "                    |
| e. | ESR  | - | "(complexes)         |

## SUBJECT: MATHEMATICS

1. **Linear Algebra:** Vector space, Linear dependence and independence, Subspace, bases, dimension, Finite dimensional vector spaces.

Matrices: Cayley- Hamilton theorem, eigenvalues and Eigen vectors, matrix of transformation, row and column reduction, echelon form, rank, equivalence, congruence and similarity. Reduction to canonical forms. Orthogonal and unitary reduction of quadratic and hermitian forms, positive definite quadratic forms.

2. **Calculus :** Real numbers, bounded sets, open and closed sets, real, sequences, limits, continuity, differentiability, mean value theorems, Taylor's theorem with remainders, indeterminate form, maxima and minima, asymptotes, functions of several variables, continuity, differentiability, partial derivatives, maxima and minima, Lagrange's methods of multipliers, jacobian, Riemann's definition of definite integrals. Indefinite integrals, infinite & improper integrals, beta & beta gamma functions, double and triple integrals (evaluation techniques only), areas, surface and volumes, centre of gravity.

3. **Analytic geometry:** Cartesian and polar co-ordinates in two and three dimensions, second degree equations in two and three dimensions, reduction to canonical forms, straight lines, shortest distance between two skew lines plane, sphere, cone, cylinder, paraboloid, ellipsoid, hyperboloid of one and two sheets and their properties.

4. **Ordinary differential equations:** Formulation of differential equation, order and degree, equations of first order and first degree, integrating factors, equations of first order but not of first degree, Clairaut's equation, singular solution.

Higher order linear equations with constant coefficients, complementary functions and particular integrals, general solution, Euler-Cauchy equation.

Second order linear equations with variable coefficients, determination of complete solution when one solution is known, method of variation of parameters.

5. **Dynamics, Statics and Hydrostatics:** Degree of freedom and constraints, rectilinear motion, simple harmonic motion, motion in a plane projectile, constrained motion, work and energy, conservation of energy, motion under impulsive forces, Kepler's law, orbit under central forces, motion of varying mass, motion under resistance.

Equilibrium of a system of particles, work and potential energy, friction, common catenary, principle of virtual work, stability of equilibrium, equilibrium of forces in three dimensions.

Pressure of heavy fluids, equilibrium of fluids under a given system of forces, Bernoulli's equation, center of pressure, thrust on curved surfaces, equilibrium of floating bodies, stability of equilibrium, metacenter, pressure of gases.

6. **Vector analysis:** Scalar and vector fields, triple products, differentiation of vector function of scalar variable, gradient, divergence and curl in Cartesian, cylindrical and spherical co-ordinates and their physical interpretation. Higher order derivatives, vector identities and vector equations.

Application to geometry: Curves in spaces, curvature and torsion, Serret-Frenet formulae Gauss and Stoke's theorem, Green's identities.

7. **Algebra:** Groups, Sub groups, normal subgroups, homomorphism of groups, quotient groups basic isomorphism theorem, Sylow's theorem, permutation groups, Cayley theorem. Rings and ideals, principal ideal Domains, Unique Factorisation Domains and Euclidean Domains, and Euclidean Domains, field extensions, finite fields.

8. **Complex Analysis:** Analytic function, Cauchy-Riemann equations, Cauchy's theorem Cauchy's integral formula, power series, Taylor's series, Laurent's series, Singularities, Cauchy Residue theorem, Contour integration, Conformal mapping, Bilinear transformation.

9. **Operations Research:** Linear programming problems, basic solution, basic feasible solution and optimal solution. Graphical method and simplex method of solution, Duality, Transportation and assignment problems.

Analysis of steady state and transient solution for queueing system with poisson arrivals and exponential service time.

Deterministic replacement models, sequencing problem with two machines and n jobs, 3 machines and n jobs (special case).

10. **Mathematical Modeling**

(a) Difference and differential equation growth models: Single species population models, Population growth an age structure model. The spread of technological innovation.

(b) Higher order linear models - A Model for the detection of diabetes.

(c) Nonlinear population growth models: prey- predator models, Epidemic growth models.

(d) An Application in environment: Urban wastes water management planning models.

(e) Models from political science: Proportional representation (cumulative and comparison voting) models.

11. **Partial differential equations:** Curves and surfaces in three dimensions, formulation of partial differential equations, solutions of equations, solutions of equation of type  $dx/P=dy/Q=dz/R$ ; orthogonal trajectories, Pfaffian differential equations, partial differential equations of the first order, solution by Cauchy's method of characteristics, Charpit's method of solution, linear partial differential equations of the second order with constant coefficients, equations of vibrating string, heat equation, Laplace equations.

12. **Probability:** Notion of probability: Random experiment, Sample space, axioms of probability, Elementary properties of probability, equally likely outcome problems.

Random variables: Concept, cumulative distribution function, discrete and continuous random variables, expectations, mean, variance, moment generating function.

Discrete distribution: Binomial, geometric, poisson.

Continuous distribution: Uniform, Exponential, Normal, Conditional probability, and conditional expectation, Bayes theorem, independence, computing expectation by conditioning.

Bivariate random variables: Joint distribution, Joint and Conditional distributions.

Functions of random variables: Sum of random variables, the law of large number and central limit theorem, approximation of distributions.

- 13. Mechanics and fluid dynamics:** Generalised co-ordinates, holonomic and non-holonomic systems D'Alembert's principle and Lagrange's equation, Hamilton equations, moment of inertia, motion of rigid bodies in two dimensions.

Equation of continuity, Euler's equations of motion for inviscid flow, stream-lines, path of a particle, potential flow. Two dimensional and axisymmetric motion, sources and sinks, vortex motion, flow past a cylinder and a sphere, method of images, Navier-Stokes equation, for a viscous fluid.

- 14. Discrete Mathematics:** Introduction to graph theory: graphs and degree sum theorem, connected graph, bi-partite graphs, trees, Eulerian and Hamiltonian graph, plane graph and Euler's theorem, planar graphs, 5-color theorem, marriage theorem.

- 15. Logic :** Logical connectives negation, quantifiers, compound statement, Truth table, Tautologies, Boolean algebra- Lattices, geometrical lattices and algebraic structures, duality, distributive and complemented lattices, boolean lattices and boolean algebras, boolean functions and expressions, design and implementation of digital networks, switching circuits.



## SUBJECT : COMMERCE

### 1. Accounting, Auditing and taxation

- a) **Accounting as a financial information system**- Impact of behavioral sciences-Methods of accounting of changing price levels with particulars reference to current Purchasing Power (CPP) accounting Advanced problems of company accounts- Amalgamation absorption and reconstruction of companies- Accounting of holding companies-Valuation of shares and goodwill. Controllership functions-property control legal and management.
- b) **Important provisions of the Income Tax Act. 1961**- Definition – charge of Income tax – Exemptions Depreciation and Investment allowance-Simple problems of computation of income under the various heads and determination of assessable income – Income tax authorities.
- c) **Nature and functions of Cost Accounting** – Cost classification – Techniques of segregating semi-variable costs into fixed and variable components – Job costing – FIFO and weighted average methods or calculating equivalent units of production – Reconciliation of cost and financial accounts – Marginal Costing – Cost-volume- profit relationship; Algebraic formulae and graphical representation-Shut-down point-Techniques of cost control and cost reduction-Budgetary control-flexible Budget – Standard costing and variance analysis responsibility accounting-Bases of charging overheads and their inherent fallacy costing for pricing decisions .
- d) **Significance of the attest function**- Programming the audit-works-Valuation and verification of assets, fixed, wasting and current assets – Verification of liabilities – Audit of limited companies – appointment status, power, duties and liabilities of the auditor – Auditor’s report-Audit of share capital and transfer of shares – Special point in the audit of banking and insurance companies.

### 2. BUSINESS FINANCE AND FINANCIAL INSTITUTIONS.

- a) **Concept and scope of Financial Management**: Financial goals of corporations – Capital budgeting; Rules of the thumb and Discounted cash flow approaches – Incorporating uncertainty in investment decisions – Designing an optimal capital structure – Weighted average cost of capital and the controversy surrounding the Modigliani and miller model, sources – of raising short-term, intermediate and long-term finance – Role of public and convertible debentures – Norms and guidelines regarding debt-equity ratios, - Determinants of an optimal dividend policy-optimizing models of James E.walter and John Lintner-Forms of dividend payment – Structure of working capital and the variable affecting the level of difference of components – Cash flow approach of forecasting working capital needs – Profiles of working capital in Indian industries – Credit management and credit policy – Consideration to tax in relation to financial planning and cash flow statements.
- b) **Organisation and deficiencies of Indian money Market structure of assets and liabilities of commercial banks** – Achievements and failures of nationalisation – Regional rural banks –

Recommendations of the Tandon (P.L.) study group on following of bank credit, 1976 and their revision by the chore (K.B.), committee, 1979 – An assessment of the monetary and credit policies of the Reserve bank of India – Constituents of the Indian Capital Market – Functions and working of All India term Financial institutions (IDBI, IFCI, ICICI, and IRCI) – Investment policies of the Life Insurance corporation of India and the Unit Trust of India – Present state of stock exchanges and their regulation.

- c) **Provision of the Negotiable Instruments Act, 1881.**
- d) **Crossings and endorsements with particular reference to statutory protection to the paying and collecting bankers** – Salient Provision of the Banking Regulation Act, 1949 with regard to chartering, supervision and regulation of banks.

### 3. **Organization Theory and Industrial Relations.**

#### a) **ORGANISATION THEORY:**

- i) **Nature and concept of organization:** Organization goals Primary and secondary goals Single and Multiple goals, ends – means chain-Displacement, succession, expansion and multiplication of goals – Formal organization: Type, Structure-Line and Staff, functional matrix, and project – Informal organization – functions and limitations.
- ii) **Evolution of organisation theory:** (classical, Neo-classical and system approach – Bureaucracy Nature and basis of power, sources of power, power structure and politics-Organisation behaviour as a dynamic system: technical social and power systems interrelations and interactions – Perception-Status system: Theoretical and empirical foundations of Maslow, Megergore, Horzberg, Likert, Vroom, porter and Lawler, Odam and Human Models of motivation. Morale and productivity- Leadership; Theories and styles- Management of Conflicts in organization – Transactional Analysis – Significance of culture to organisatons. Limits of rationality simon- March approach. Organisation change, adaptation, growth and development- Organisation control and effectiveness.

#### 4. **INDUSTRIAL RELATIONS:**

Nature and scope of industrial relations, Industrial labour in India and its commitment – Theories of unionism- Trade union movement in India – Growth and structure-Role of outside leadership- Workers education and other problems-Collective bargaining-approaches conditions, limitation and its effectiveness in Indian conditions-Workers participation in management: philosophy, rational, present day state of affairs and its future prospects.

**Prevention and settlement of industrial disputes in India:** preventive measures, settlement machinery and other measures in practice- industrial relations in public enterprises- Absenteeism and labour turn-over International Labour Organisation and India- Role of personnel department in the organization- Executive development, personnel policies, personnel audit and personnel research.

## SUBJECT : Biotechnology

### 1) Maths, Biostatistics & Computer

The set theory, properties of subset, Linear and geometric functions, Limits of functions, Derivatives of functions, The binomial theorem, Logarithm, **Differentiation**- Differentiation by first principle, derivative of the product of function, Chain rule, Implicit differentiation, Differentiation by trigonometrical transformations, Logarithmic differentiation, Differentiation of infinite series, Higher order derivatives, Parametric differentiations, Differentiation of one function with respect to another function. **Integration**- Indefinite integral: Simple Integration, Integration by substitution, Integration using trigonometric identities, Integration by parts, Special integration, Integration using partial functions. **Definite Integral**: Definite Integral by substitution. Probability calculation.

Method of sampling, confidence level, **Measurement of central tendencies**:- Mean, median, Mode and their properties. **Measurement of deviation**:- Mean deviation and standard deviation. Presentation of Biological data in tables, graphs, histogram and pie chart, **Hypothesis testing**:- t-test, chi-square test and F-test, Correlation coefficient and calculation of regression equation.

Digital and Analogue computers, Number System, Signed/Unsigned Numbers, conversion between Number bases, 1's complement and 2's complement arithmetic, **Hardware**:- Architecture of Computer- Input device, Output Device, CPU, ALU, **Memory**- Primary and secondary, Memory Hierarchy, RAM and its type, ROM and its type, Cache memory, **Software**:- Types, Application and system software, Program, Algorithm, Languages, automation, **Operating system**:- Types of operating systems, Features of Unix and Windows, Introduction to some common Application Softwares, **DBMS**:- Introduction to Word processor.

### 2) Biochemistry

Water:- Its structure & properties, Structural Biochemistry, Composition, Structure, Function & Properties of Carbohydrate, Protein, Lipid, Nucleic Acid. Metabolism- I Glycolysis, Gluconeogenesis, Glycogenesis, Glycogenolysis, TCA cycle, Oxidative phosphorylation, ETC, Pentose Phosphate Pathway, Lipid Metabolism:- $\beta$ -Oxidation of fatty acids, Metabolism- II Protein metabolism: transamination, Deamination, Urea cycle, Introduction to Enzymes, Nomenclature & Classification, Properties of enzymes and enzyme Kinetics, Mechanism of enzymatic action, Principle of catalysis (Acid base catalysis, Covalent bond catalysis, Metal ion catalysis), Factors affecting Enzyme Catalyzed reactions, Non Protein enzymes, (Ribozymes), Co-factors, Co-enzymes and Vitamins, Enzyme regulation & Applications, Regulation (Allosteric Modulation), Inhibition (Competitive, non-Competitive & Feed Back), In-vitro application of purified Enzymes in Food Industry & Beverages, Leather Industry, paper industries & textile industries, Medicines, Enzymes as diagnostic tool: ELISA. Protein Engineering: Introduction, objectives, examples (Improvement in stability of enzyme, protein engineering application of subtilisin & Insulin).

### **3) Genetics**

Mendelism & Mendelian Deviations, (Mendel's work, Laws of Heredity, Test cross & back cross, incomplete dominance & Codominance & simple problems), Interaction of genes, Supplementary gene- glume colour in cholam (*Sorghum caudatum*) Modifier Supplementary gene- Comb pattern in fowl, Complimentary gene- Flower colours in sweet pea, Multiple factors (quantitative or polygenic inheritance)- Skin colour in human being, Epistasis (Different types), Multiple allelism- Blood groups in human beings (ABO and MN system), Duplicate gene- Seed shape in Shepherd's purse, Sex determination in animals (chromosomal theory), Concepts of auto & crossing over XX-XY, XX-XO, ZY-ZZ, ZO-ZZ types, Linkage & Crossing over, coupling & repulsion Hypothesis, Linkage in Maize & *Drosophila* Mechanism of crossing over & its Importance, Chromosomal aberration, General account of structural aberration, (Duplication, Deletion, translocation, Inversion), Numerical aberrations & polyploidy, Cytoplasmic

inheritance, Endosymbiotic Theory, Mitochondrial and Chloroplast Genome, Plastid inheritance in *Mirabilis*, petite characters in Yeast, Mutations, Types- spontaneous & induced mutation, Mutagens - Physical & chemical Mutation at molecular level, Mutations for economic benefit of man, Human Genetics- Karyo- type in man, Evolution of Sex-Chromosome in man Inherited Disorder allosomal- Klinefilter's syndrome & Turner's syndrome, Autosomal- Down's syndrome (non disjunction) & Cri du chat syndrome, Population Genetics- Hardy Weinberg Law, Calculating gene frequency.

#### **4) Microbiology**

Introduction and Scope of Microbiology, Definition and history of microbiology, contributions of Antony van Leeuwenhoek, Louis Pasteur, Robert Koch, Importance and scope of Microbiology as a modern Science, Microscopy, Construction and working principles of different types of microscopes- Compound, Dark field, Phase contrast, Fluorescence and Electron (Scanning and Transmission) Confocal Microscopy, 3-D imaging, Microbial Techniques:- A). Sterilization: Principles and Applications of (a). Physical methods, Autoclave, Hot air oven, Seitz filter, Sintered glass filter and membrane filter (b). Chemical methods: Alcohol, Aldehydes, Phenols, Halogens and Gaseous age (c). Radiation method: UV rays and Gamma rays, (B). Media Preparation: Nutrient agar/Broth, Mc Conkey agar, PDA Laminar airflow and Planting techniques, (C). Stains and staining Techniques: Principles of staining, Types of stains- simple stains structural stains and Differential stains, acid fast stain, Negative stain, Microbial Taxonomy:- Concept of microbial species and strains, classification of bacteria based on- morphology (shape and flagella), respiration, nutrition & replica plating technique, Bacteria- Ultrastructure of bacterial cell (both Gram positive and Gram negative) including endospore and capsule, microbial growth, growth Curve, Condition effecting growth, Bacterial Reproduction:- (Gene transfer in Bacteria) Transformation, Conjugation & Transduction, General Account of Viruses and Bacteria, Viruses:- Structure of  $\lambda$  phase, M13, Plant Viruses-CauMV (Cauliflower mosaic viruses) Animal viruses- Hepatitis B, Mycoplasma (PPLO), Eukaryotic microorganisms-

General characteristics of fungi, algae and protozoa, Microbes in extreme environment:- Mesophile, alkalophile, thermophile, Pathogenic Microorganisms (causative agents and symptoms only) Bacterial diseases of man-Tetanus, Tuberculosis, Pneumonia and Cholera, viral diseases: Hapatitis, Polio, SARS, AIDS(HIV), Antimicrobial Compounds (Antibiotics and antiviral compounds)

## **5) Cell Biology**

Cell as a basic unit of living systems, Precellular evolution: artificial creation of "cells", Discovery of cell, The cell theory, Difference between Plant Cell and Animal Cell, Ultra Structure of Prokaryotic and Eukaryotic Cell, Membrane structure and function, Structure of model membrane, Lipid bilayer & membrane protein, Diffusion, Osmosis, cell wall, Structure and Function of cell organelles- Endoplasmic reticulum, Golgi complex, Ribosomes, Lysosomes, Peroxisomes, Nucleus, Vacuole, Cytoskeletal structures, Energy conversion organelles:- Chloroplast and Mitochondria, Chromosomes- Discovery, Ultra Structure- folded fiber and nucleosome models, Morphology and structural organization- Centromere, Euchromatin and Hetrochromatin, Karyotyping. Special types of chromosomes- Salivary gland and Lamp brush Chromosomes, B-Chromosomes. Cell cycle, mitosis and meiosis, Communication:- Cell junctions, cell adhesion molecules, Substrate Adhesion molecules, signal molecule and Signal Transduction

## **6) Molecular Biology**

Structure & functions of DNA and RNA, Waston and Crick model of DNA, other forms of DNA (A&Z), Structure of Prokaryotic & Eukaryotic genes, DNA replication- Prokaryotic & Eukaryotic Enzymes and proteins involved in replication, Theta model and rolling circle model, DNA repair- Causes and mechanisms (Photo reactivation, excision repair, mismatch repair, SOS repair), Recombination in prokaryotes & eukaryotes- Transformation, Conjugation & Transduction, Site specific recombination, Models for homologous recombination Insertion elements and Transposons, transcription in Prokaryotes & Eukaryotes- Mechanism, promoters and RNA polymerase, transcription factors, Messenger RNA processing and

Editing, Splicing Post transcriptional modification of eukaryotic mRNA, Translation, Genetic code, Mechanism of translation in Prokaryotes & Eukaryotes. Gene expression- Regulation of gene expression, Gene expression in protozoan parasite, Gene expression in yeast, Gene expression in mitochondria and chloroplast, Regulation of gene expression in prokaryotes (Operon concept- Lac and Trp), Regulation of gene expression in eukaryotes- transcriptional activation, Environment and gene expression- penetrance and expressivity, Expression of genes in twins effect of temperature and light, Oncology:- Oncogenes, Tumor suppressor gene, Metastasis & Apoptosis, Brief introduction & History of Human Genome Project.

## **7) Immunology**

Historical perspective, Introduction to Immunology and Immunity (Innate, Acquired, Active, Passive, Humoral, cell mediated Immunity, Immune system in plants), Organs of Immune system and their function, Haematopoiesis, Cells of Immune system and their Function, Antigens:- Types, properties, haptens, adjuvants, epitops and factor influencing antigenicity, antigen processing and presentation. Antibodies (Immunoglobulins):- Types, structure, properties and functions of immunoglobulins, MHC molecules: Structure and mechanism of action, Plantibodies, Complement system:- Classical, lectin and alternative pathway, Opsonization, ADCC, Antigen- Antibody Interaction: Precipitin reaction, Agglutination reaction, Cross reactivity, Avidity, In-vitro test: Precipitation, Immunodiffusion, Immunoelectrophoresis, Coomb's Test, ELISA, RIA, Hypersensitivity reaction, Effector mechanism, Immunity to infectious diseases (Bacterial, Viral) Vaccines.

## **8) Genetic Engineering**

What is gene cloning and importance of genetic engineering Restriction endonucleases- Types, source and nomenclature, Plasmids and, Genomic DNA, handling of DNA, RNA, cDNA and gene library, Cloning vectors- E.coli vector:- pBR322, PUC8, λPhage, cosmids, Yeast vector:- YIP, YRP, YEP, YAC, Animal vector :- SV40, Vaccinia, Plant vector:- Ti Plasmid,

Insect vector:-Baculovirus, Purification of DNA from bacterial, plant and animal cells, Manipulation of purified DNA, The range of DNA manipulative enzymes-Nucleases, Ligases, Polymerases, Linker and adaptor, DNA modifying enzymes, Topoisomerases, Introduction of DNA into living cells- Transformation and transfection techniques, Biolistics, Microprojectiles, Electroporation, Microinjection, Application of gene cloning and DNA analysis in research- Studying gene location and function, DNA sequencing- Enzymatic and chemical method, Introduction to Genomics, proteomics, Transcriptome, proteome, Metagenomics, Reverse genomics, Metabolomics. Application of gene cloning and DNA analysis in Biotechnology- Production of heterologous proteins- Insulin, HGH, tPA, RDT/Molecular biology techniques- Electrophoretic techniques, Polymerase chain reaction, site directed mutagenesis, Blotting techniques- Southern, Western and Northern blot.

## **9) Animal Biotechnology**

Scope of animal tissue culture, History of development of cell cultures, Basic Equipment in Cell culture: CO<sub>2</sub> Incubator, Laminar Flow Cabinets, Liquid Nitrogen Storage. Culture media- Natural media: plasma clot, biological fluids extract Importance of serum in media, Chemically defined media, Growth and Cell Metabolism during Culture. Primary culture, disaggregation of tissue, isolation of tissue, enzymatic disaggregation and mechanical disaggregation, Anchorage dependence of growth. Non anchorage dependent cells, Secondary culture: Transformed animal cells and Cell lines, Transfection of animal cell lines, Selectable markers- Methotrexate, PALA, HAT selection, antibiotic resistance, Growth factors promoting proliferation of animal cells (EGF, FGF, PDGF, IL-1, IL-2 HGF, erythropoietin), Application of animal cell culture for studies on gene expression, Production of vaccines in animal cells, Production and application of monoclonal antibodies, Special Secondary metabolite/Products-Insulin & Interferon, Transgenic animals:- Techniques and application of transgenic mice and sheep.

## **10) Plant Biotechnology**



Introduction to in vitro methods, Terms and definitions, Basic requirements for in vitro methods, Types of culture media, Role of plant growth regulators, Historical development of plant tissue culture, Role of plant tissue culture in agriculture and pharmaceutical companies, Clonal Multiplication (micropropagation) of elite species- Axillary bud, shoot tip and meristem culture, Organogenesis and Somatic Embryogenesis and their practical applications, Ovary and ovule culture, in vitro pollination and fertilization, Embryo Culture and its applications, Endosperm culture and production of triploids, Production of haploids and their applications, Single cell suspension cultures and their applications in selection of variants, Secondary metabolites, Somaclonal variations and characterization of Somaclonal variants and its applications, Introduction to protoplast isolation- principle and applications, various steps in the regeneration of protoplast, Various methods for fusing protoplasts, Somatic hybridization- an introduction, uses of markers for selection of hybrid cells, cybrids, Transgenic plants- Techniques of transformation- agrobacterium mediated transformation, tumefaciens, rhizogenes, Transformation by other methods (physical)- microprojectile and electroporation etc. Bt Cotton, Golden rice.

## **11) Biophysics, Instrumentation and Bioinformatics**

Concept of thermodynamics:- comparison of 1st and 2nd Law of Thermodynamics, Comparison of living and non living system as a thermodynamics, Primary events of Photosynthesis, Strategies of light reception in microbes, plants and animals, spectrophotometry and Colorimetry- Lambert-Beer's Law, Weak interactions in Biological system, Biophysics of neuron, Physical and Radioactive techniques applied to find out molecular structure: X-ray crystallography, UV-vis, fluorescence, measure of radio activity GM counters, scintillation counting, separation methods :- Electrophoresis and Chromatography, Introduction to Nanotechnology, Introduction to Bioinformatics- primary, secondary and Genome data base, Sequence alignment- global Alignment, Local Alignment and BLAST and FASTA pairwise.

## **12) Environmental Biotechnology**

Scope of Environmental Biotechnology, Renewable and Non Renewable resources of energy, Conventional fuels and their environmental impact, Firewood, Plant and Animal waste, Coal and Gas, Modern Fuels and their environmental impact, Methanogenic bacteria and Biogas, Beneficial role of Biogas, Microbial Hydrogen Production, Petroplants & Biodiesel-Introduction, History, Advantages & Limitations,

**Biotechnology in waste management**-solid waste management and industrial effluents in food, petroleum and pesticide industry.

**Biofertilizers**- Role of symbiotic and asymbiotic nitrogen fixing bacteria in the enrichment of soil VAM, BGA and Azolla, Vermicomposting.**Biopesticides**- Biological control of Insects swarming agricultural fields, Environmental monitoring, Bio indicators, Biosensors, Ames Test, **Bioleaching**- Enrichment of ores by micro-organisms (gold, copper and Uranium).

### **13) EDP & IRP**

**Introduction to Entrepreneurship**; Identification of Business opportunity, Project formulation and Project report, Market survey and research, Financial Institution in the development of industrial units and Financial incentives,

**Biotechnology and intellectual property rights**- patents, Trade secret, Copyright, Trademark, Plant Breeder's Right and farmer's Right (PPVFR), Choice of Intellectual property & Plant genetic resources (PGR).

**Biosafety**-Levels of Biosafety, Application of biosafety, Release of Genetically Modified Organisms.

**Bioethics**- Need of Bioethics, Human genome project and ethical issues.

### **14) Industrial Biotechnology**

**Introduction & Scope of Industrial Biotechnology, Food Biotechnology**: Microbial production of food- Fermented food (Cheese, Yogurt, Sauerkraut), Sweetener, & food additives SCP & Production of edible Mushroom.

**Bioreactors, (different types)**- STR, Air-Lift Fermenters, Packed Bead and fluidized bed Reactors, **Conversion of Sugar to Ethanol**,

**Gasohol Experiment**, Bioremediation- Type- In situ & Ex Situ Bioremediation, Advantages & Limitations, **Biodegradation of Pesticides & Role** of genetically engineered organisms in **degradation** of Petroleum products.

**Phytoremediation:** Degradation of heavy metals by phytoremediation (Biosorption), Ecofriendly textile through application of Biotechnology.

## **SUBJECT : Environmental Science**

### **The Multi-disciplinary nature of environmental studies**

**Man, Environment and Society:** Individual's rights and responsibilities towards clean environment Environmental ethics and moral, Approach of Vivekanand and Mahatma Gandhi to wards youth, women and social developments, Throw-away society ethics, sustainable earth society ethis, ethical guidelines environment, Hunting and gathering society, agricultural society, industrial society, knowledge society, Environmental movements and peoples participation scope and objective environmental movements like chipko, Tehri Dam, Narmada Dam, Silent Vally-Role of Tribal people, women and NGOs in Environmental protection.

**Social Issues and the Environment-**From Unsustainable to Sustainable development-Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns, Case studies- Environment ethics: Issues and possible solutions. Climate change, Global warming, acid rain, ozone layer depletion nuclear accidents and holocaust, Case studies, Waste land reclamation-Consumerism and waste products, Environment Protection Act, Air (Prevention and control of Pollution) Act, Water (Prevention and control of Pollution) Act, Willdife protection act, Forest Conservation Act, issues involved in enforcement of environmental legislating-Public awareness.

**Human Population and Environment** Population growth, variation among nations, population explosion family welfare Programme, Programme, Environment and human Health, Human rights, Value Education, HIV/AIDS, Women and child welfare, Role of Information Technology in Environment and human health case studies IPR.

**Enviromental pollution :**Definition Causes, effects and control measures of : Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear hazards. Solid waste Management, Cuases, effects and control measures of urban and industrial wastes, role of an indivisual in prevention of pollution- Pollution case studies, disaster

Management: Floods, Earthquake, Cyclone and land slides. **Natural Resources** Renewable and non-Renewable resources **Natural resources** and associated problems, **Forest resources**, Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people, **Water resources**: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems, Mineral resources, Use and exploitation, environmental effect of extracting and using mineral resources, case studies, **Food resources**, World food problems, changes caused by agriculture and overgrazing effects of modern agriculture, **fertilizerpesticide** problems, water logging, salinity, case studies, Energy resources, Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources, **Case studies, Land resources**, Land as a resource, land degradation, man induced landslides, soil erosion and desertification, Role of individual in conservation of natural resources, Equitable use of resources for sustainable lifestyles, **Ecosystems**, Concept of an ecosystem, Structure and function of an ecosystem producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, webs and ecological pyramids introduction, types, characteristic features structure and function of the Forest Ecosystem, Grassland ecosystem. Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

**Bio diversity and its Conservation**: Introduction, Definition, Genetic species and ecosystem diversity biogeographical classification of India, Value of Bio-diversity at global, National and local levels, India as a mega-diversity nation, Hotspots of Bio-diversity, Threats to Bio-diversity habitat loss, poaching of wildlife, man/wildlife conflicts-endangered and endemic species of India-conservation of Bio-diversity, In-situ and Ex-situ conservation of Biodiversity.

## **SUBJECT: BACHELOR OF COMPUTER APPLICATION**

**Basic Physics and Electronics :** Basic units and measurements, different properties of matter, properties of light, Laser and its types, photo electricity, sound and its properties. Band theory of solids, Electric Field and Potential, condenser, Optical fiber, resistors, capacitors, inductors, different cables and connectors, different types of displays, Integrated circuits, amplifiers, feedback amplifiers, oscillators, Wave shaping circuits, multivibrators, different types of filters and timers.

**Fundamentals of Computer:** Components of computer, types of memory, concepts of cache memory, SDRAM, DDR I, DDRII, DDRIII, BIOS basics, storage devices and its interfacing, SMPS, USB features, cables and connectors, Working with windows and Linux operating System, GUI Based Editing, Spreadsheets, Tables & Presentations, Application Using MS Office 2000 or higher & Open Office.Org, different file formats, multimedia tools, Inventory control systems, real time and financial transaction terminals, data analysis, data warehouse, data mining, impact of computer on society, social responsibilities, applications of IT, ethics and information technology, Cyber Law, firewall, virus, worms, diagnostic software, Pc Diagnostic, Testing and Maintenance.

**C Programming and Data Structure:** Algorithm, complexity study of differential algorithms, different searching and sorting techniques, stacks , queues, linked lists, trees, graphs , hash functions, different data types, operators, decision making and loops, arrays, function, structures, pointers, file handling techniques.

**Object oriented programming and JAVA:** Objects, classes, constructors, destructors, Inheritance, polymorphism, file handling, Interfaces, packages, multithreading, Applet basics, stream classes, Abstract Window Toolkit, URL, Swing, Servlet, different UML diagrams.

**Internet and Web Programming:** Internet basics, equipment required for Internet connection, Sending & receiving Emails, Browsing the WWW, creating own Email Account, Internet Information search, Internet chatting, Social sites handling, dashboard management, HTML- Components, Tags, Lists, URL Tables, frames and forms, style sheets, Java Scripts, ASP.Net objects and components.

**Operating System and Computer Security :** Different types of operating system, structure, system call, process management, scheduling techniques, file management, memory management, Interrupt handling mechanisms, Security trends, different threats, attacks and its types, biometrics, cryptography, VLAN, IP security, VPN, email security, Intrusion detection system, operating system security, Web security.

**Database Management System:** Basic concepts, Data models, client-server architecture, different keys, SQL queries, Normalization, query processing, deadlock handling, security and authorization.

**Microprocessor Programming:** Microprocessor evolution, different Intel microprocessors, features of Intel 8086 microprocessor, different instruction formats, Instruction set, addressing modes.

**Analog and Digital Communication:** Different modulation techniques and its types, transmission lines, antennas, radio receivers, wave propagation, different multiplexing and access techniques, spread spectrum, different coding techniques, channels.

**Data Communication and Computer Networks :** Components for data communication, Radio communication, Cellular (Mobile) Telephone – Band in Cellular Telephony, Calls Using Mobile Phones, Transmitting & receiving operations, modern wireless communication system, Computer networks, benefits, types, features, topology, different guided and unguided transmission media, different microwave components, optical fiber and satellite communication, TCP/IP protocol suits, IP Addressing and subnet masking, remote network access, active directory, new developments.

## SUBJECT : ZOOLOGY

**A general survey**, Classification and relationship of the various phyla.

**Protozoa**: Study of the structure, bionomics and life history of paramoecium, Monocystis, malarial parasite, Trypanosoma and Leishmania.

Locomotion, nutrition and reproduction in protozoa.

**Porifera** : Canal system, skeleton and reproduction.

**Coelenterata**: Structure and life history of Obelia and Aurelia, polymorphism in hydrozoa, coral formation, metagenesis, phylogenetic relationship of Cnidaria & Acnidaria.

**Helminths**: Structure and life history of planaria, Fasciola, Taenia & Ascaris. Parasitic adaptation, Helminths in relation to man.

**Annelida** : Nereis, earthworm and leech: coelom & metamerism: modes of life in polychaetes.

**Arthropoda**: Pulex Scorpion, Cockroach, larval forms and parasitism in Crustacea, mouth part vision and respiration in arthropods, social life and metamorphosis in insects. Importance of peripatus.

**Mollusca**, unio Pila, Oyster culture and pearl formation, cephalopods, Torsion and Detorsion in Gastropoda.

**Echinodermata**: General organization, larval forms and affinities of Echinodermata.

General organization and characters, outline classification and inter-relationship of protochordata, pisces, Amphibia, Reptilia, Aves and mammalia.

Neoteny and retrogressive metamorphosis.

A general study of comparative account of the various systems of vertebrates.

**Pisces** : Locomotion, migration and respiration in fishes: structure and affinities Dipnoi

**Amphibia**: Origin of Amphibia; distribution, anatomical peculiarities and affinities of urodela and Apoda parental Care.

**Reptiles**: Origin of Reptiles; adaptive radiation in reptiles. Fossil reptiles; poisonous & non poisonous snakes of India; poison apparatus of snake.

**Aves**: Origin of birds; flightless birds; aerial adaptation and migration of birds.



Origin of mammals; homologies of ear ossicles in mammals; dentition and phylogenetic relations of protothria and Mehtatheria. Endocrine glands (Pituitary, thyroid, Parathyroid, Adrenal, Pancreas, Gonads).

Comparative anatomy of various system of vertebrates (Integument, Heart, Aortic, Arches, Kidney, Brain)

**Environment** : Abiotic factors and their role; Biotic factors – Intra and inter-specific relations. Biogeochemical Cycles, green house effect, ozone depletion, Eco logical succession, Biomes ecotones.

**Animal** : Organisation at population and community levels, ecological successions.

**Ecosystem**: Concept, components, fundamental operation, energy flow, biogeo-chemical cycles food chain and trophic levels.

Adaptation in fresh water, marine and terrestrial habitats.

Pollution in air, water and land.

Wild life in India and its conservation.

Sustainable production in agriculture, Integrated Pest manager.

### **Ethology-**

General survey of various types of animal behaviour.

Role of hormones and pheromones in behavior.

Biological clock, seasonal rhythms, tidal, seasonal and circadian rhythm.

Neuro-endocrine control of behaviour.

Methods of studying animals behaviour.

### **Biostatistics-**

Methods of sampling, frequency distribution and measures of central tendency. Standard deviation, standard error and standard deviation, correlation and regression and chi-square and f-test, student t-test.

### **Economics Zoology-**

Parasitism, commensalism & host parasite relationship.

Parasitic protozoans, helminths and insects of man and domestic animals.

Insect pests of crops and stored products.

Beneficial insects.

Pisciculture and induced breeding, Apiculture, sericulture, Lac culture, pearl culture, prawn culture.

### **Cell Biology Genetics, Evolution & Systematics.**

**Cell Biology-** Structure and function of cell and cytoplasmic constituents; structure of nucleus, Plasma membrane, mitochondria golgibodies, endo-plasmic reticulum and ribosomes, cell division; mitotic spindle and chromosome movements and meiosis.

**Genetics-** Gene structure and function; Watson- Crick model of DNA, replication of DNA Genetic code; protein synthesis cell differentiation; sexchromosomes and sex determination.

Mendelian laws of inheritance recombinations, linkage and linkage maps, multiple, alleles; mutation (natural and induced), mutation and evolution, meiosis, chromosome number and from, structural rearrangements; polyploidy; cytoplasmic inheritance, regulation of gene expression in Prokaryotes and eukaryotes; biochemical genetics, elements of human genetics; normal and abnormal karyotypes; genes and diseases. Eugenics, DNA- finger printing.

**Evolution and Systematic-** Origin of life, history of evolutionary thought Lamarck and his works. Darwin and his works, sources and nature of organic variation, Natural selection, hardy-weinberg law, cryptic and warning colouration mimicry; Isolation mechanisms and their role. Insular fauna. Concept of species and sub- species, principles of classification, phylogeny of horse, elephant, camel, origin and evolution of man, principles and theories of continental distribution of animals, zoogeographical realms of the world.

**Bio-Chemistry, Physiology and Embryology-** Biochemistry: Structure of carbohydrates, lipids, aminoacids, proteins, and nueleic acids, glycolysis and krebs cycle, oxidation and reduction, oxidative phosphorylation, energy conservation and release, ATP, cyclic AMP, saturated and unsaturated fatty acids, cholesterol, streroid, hormones; Types of enzymes, mechanism of enzyme action, immunoglobulius and immunity, vitamins and coenzymes; Hormone, their classification, biosynthesis & functions.

**Physiology with special reference to mammals;** composition of blood, blood groups in man coagulation, oxygen and carbondioxide transport, hemoglobin, breathing and its regulation; nephron and urine formation, acid-base balance and homeostasis, temperature regulation in man, mechanism of conduction along axon and across synapes, neurotransmitters, vision, hearing and other receptors; types of muscles, ultra structures and mechanism of contraction of skeltal, muscle; role of salivary gland, liver, pancreas, and intestinal glands, indigestion, absorption of degested food, nutrition and balanced diot of man mechanism of action of steroid and peptide hormones, role of hypo-thalamus, pituitary thyroid, parathyroid, pancreas, adrenal, testis, ovary and pineal organs and

their inter-relationships, physiology of reproduction in humans, hormonal control of development in man and insects, pheromones in insects.

**Embryology:** Gametogenesis, fertilization, types of eggs, cleavage, development upto gastrulating in branchiostoma, frog and chick; Fate maps of frog and chick; Metamorphosis in frog; Formation and fate of extra embryonic membranes in chick; Types of placenta in mammals, function of placenta in mammals; organisers. Regeneration, genetic control of development. Organogenesis of central nervous system, sense organs heart and kidney of vertebrate embryos. Aging and its implication in relation to man. Invasiveness of placenta, in vitro fertilization, embryo transfer, cloning.

## विषय: भू-विज्ञान (Geology)

**सामान्य भू-विज्ञान (General Geology)** —भूगति विज्ञान से सम्बद्ध ऊर्जा की गतिविधि, भूमि का उद्गम और अन्तस्थ, भूमि के विभिन्न विधि और काल द्वारा चट्टानों की तिथि निर्धारण। ज्वालामुखी के कारण और उत्पत्ति, ज्वालामुखी मेखलाएँ भूचाल ज्वालामुखी मेखलाओं से संबद्धकरण और भू-विज्ञानिक प्रभाव तथा फैलाव। भूद्रीणी तथा उनका वर्गीकरण द्वीप-द्वीपचापों, संभीर सागर खाइयों तथा मध्य-महासागरीय कटक समस्थितिक पर्वतों-प्रकार और उद्गम महाद्वीप बहान का संक्षिप्त विचार, महाद्वीपों तथा सागरों की उत्पत्ति, वायु तरंगों और भू-वैज्ञानिक समस्याओं से इसका लगाव।

**भू-आकृति विज्ञान (Geomorphology)** —प्रारंभिक सिद्धांत तथा महत्त्व। भू-आकृति और प्रक्रिया तथा पेरामीटर, भू-आकृतिक चक्रों तथा उनके प्रति पादन उनमुक्ति गुण, स्थलाकृति संरचनाओं और अश्म विज्ञान से इनका संबंध बड़ी भू-आकृतियाँ। अपवहनता भारतीय उपमहाद्वीप के भू-प्राकृतिक गुण। छोटानागपुर पठार के भू-आकृतिक गुण।

**संरचनात्मक भू-विज्ञान (Structural Geology)** —दबाव तथा भार दीर्घवृत्तज तथा चट्टान विरूपण। वलन और प्रशन का मैकनिकस लाइनर और प्लानर संरचनाएँ और उत्पत्तिमूलक महत्त्व। पेट्रीफिब्रिक विश्लेषण और इसका भू-वैज्ञानिक समस्याओं से मानचित्रीय प्रतिवेदन और लगाव। भारत का विवर्तनिकी ढाँचा।

**जीवाश्म विज्ञान (Palaeontology)** —सूक्ष्म तथा सूक्ष्म-जीवाशय, जीवाश्म का सुरक्षण और उपयोगिता नाम पद्धति के वर्गीकरण का सामान्य विचार। स्नायाविक उद्भव और इस पर पुरातात्विकी अध्ययन का प्रभाव।

आकृति विज्ञान ब्रडिवोडस, विवाल्बस गैस्ट्रीपोंडस, अम्मोनाइडम विल्लीवाइट्स एचिनोइडस तथा कोरलस की विकासवादी प्रवृत्ति का भू-वैज्ञानिक इतिहास सहित वर्गीकरण।

पृष्ठावंशियों के प्रधान समूह तथा उनके आकृति गुण। गुणों से पृष्ठावंश जीवन दिनोसर, सिवालिक पृष्ठावंश जीवन दिनोसर, सिवालिक पृष्ठावंश। अश्वों, हाथियों तथा मानव का विस्तृत अध्ययन। गॉडवान प्लोरा और इनके महत्त्व।

**स्तरिकी (Stratigraphy)** —स्तरिकी के सिद्धांत। स्तरीय वर्गीकरण तथा नाम पद्धति। स्तरिकीय मानक माप, भारतीय उपमहाद्वीप के विभिन्न भू-वैज्ञानिकों पद्धति का विस्तृत अध्ययन, भारतीय आकृति विज्ञान की सीमा समस्याएँ। विभिन्न भू-वैज्ञानिक पद्धतियों की उनके प्रकार क्षेत्र में स्तरिकी की रूप

रेखा। भारतीय उपमहाद्वीप को भूतकाल की अवधि। संक्षिप्त जलवायु और आग्नेय क्रियाकलापों का अध्ययन। पूरा भौगोलिक पुनर्निर्माण।

**स्फट रूपिकी (Crystallography)** —स्फटात्मक तथा अस्फटात्मक तत्त्व विशेष गुण प्रवास समिति। समिति की 32 श्रेणियों में स्फटी का वर्गीकरण स्फट रूपिकी संकेतना की अंतर्राष्ट्रीय पद्धति, स्फट समिति का विज्ञान करने के लिए त्रिविम परियोजनाएँ। यमलन तथा यमन—जनन विधियाँ। स्फट अधियमितताएँ। स्फट अध्ययन के लिए एक्स किरणों का उपयोग।

**प्रकाशीय खनिज विज्ञान (Optical Mineralogy)** —प्रकाश के सामान्य सिद्धान्त, समदेशिक और अनिसीट्रीपिजम दृष्टि सूचिका की धारण, नकर्वन्ता, व्यतिकरण रंग तथा निर्वापण स्फटों में दृष्टि में दिगविन्यास, विश्लेषण अतिरिक्त दृष्टि।

**खनिज विज्ञान (Mineralogy)** —क्राइस्टल रसायन के तत्व बंधक के प्रकार। आयोनी ऐडीसहन्वय संख्या, हर्सोनोकियुम पालीनोर्जित तथा सूडोनियोकिवल सिलीकैट का संरचनात्मक वर्गीकरण। चट्टान बनाने वाले खनिजों का विस्तृत अध्ययन, उनका भौतिक, रासायनिक तथा प्रकाशीय गुण तथा उनके प्रयोग, यदि कोई हो, इन खनिजों के उत्पादों के परिवर्तनों का अध्ययन।

**सैलविज्ञान (Petrology)** —मैगमा, इसका प्रजनन, स्वभाव तथा संयोजन। बाइनेरी तथा टसेरी पद्धति का साधारण फेज का डायग्राम तथा उनका महत्त्व वोबिन प्रतिक्रिया सिद्धान्त, मैग्नेमर्टिक विभेदीकरण आत्मयात्करण। बनावट तथा संरचना ओर उनकी पाषाण, उत्पत्ति, महत्त्व, आग्नेय चट्टानों का वर्गीकरण। भारत के महत्त्वपूर्ण चट्टान टाइप की पैटीग्राफी तथा पैग्रोजनेसिस, ग्रेचाइटस तथा ग्रेनाइटस कार्नोकइटस तथा कार्मोकाइटस, उक्कन वसलटस, तलछट चट्टानों के बनावट की प्रक्रियाएँ, डावजेनेसिस तथा लिथिफिकेशन बनावट तथा संरचना और इसका महत्त्व आग्नेय चट्टानों का वर्गीकरण कार्लस्टक तथा बिना कलस्टिक। भारी खनिज और उसका महत्त्व। जमाव पर्यावरण के आरम्भिक सिद्धान्त। आग्नेय का अग्रभाग तथा उत्पत्ति स्थान सामान्य चट्टान प्रकारों के शिलालेख।

रूपान्तरण का परिवर्तन, रूपान्तरण के प्रकार, रूपान्तरिक गैड, मखला तथा अग्रभाग। ए. सी. एफ., ए. के. एफ. तथा ए. एफ. एम. आकृति। चट्टानों के रूपान्तरण की बनावट, संरचना तथा नामांकरण महत्त्वपूर्ण चट्टानों को शिला शैल जनन।

**आर्थिक भू-विज्ञान (Economic Geology)** —कच्चे धातु का सिद्धान्त, धातु खनिज तथा विधातु, कच्चे धातु को गतिविधि, खनिज संग्रहों की बनावट की प्रक्रियाएँ, कच्चे धातु का वर्गीकरण, कच्चे धातु संग्रहज्ञान का नियंत्रण, मटालीजिनिक इपीह, महत्त्वपूर्ण धातु संबंधी बिना धातु सम्बन्धी संग्रह, तेल

तथा प्राकृतिक गैस, क्षेत्र भारत के कोयला क्षेत्र। भारत की खनिज संपदा खनिज अर्थ, राष्ट्रीय खनिज नीति खनिजों की सुरक्षा तथा उपयोगिता।

**प्रयुक्त भू-विज्ञान (Applied Geology)** –आशाजनक और यन्त्र कला प्रधानताएँ। खनन विज्ञान की प्रधान पद्धति नमुना कच्चा धातु भण्डारण तथा लाभ, अभियांत्रिक कार्यों में भू-विज्ञान का प्रयोग।

मृदा तथा धुलद जल-भू-विज्ञान। झारखण्ड के भूमिगत जल प्रदेश। भू-वैज्ञानिक गवेषण में वायु संबंधी चित्रों का प्रयोग।

## **SUBJECT: BACHELOR OF BUSINESS ADMINISTRATION**

### **1. BUSINESS ECONOMICS**

**Meaning, Nature,** Scope and significance of Business economics, **Law of demand & supply,** Elasticity of Demand and its measurement, Method of Demand forecasting, Concept of Production Function, Break-even Analysis, **Consumer Behavior,** Utility approach, Law of diminishing marginal utility law of equimarginal utility, Indifference curves approach, Revealed Preference **Theory, Short run and Long run cost curves,** concept of total average and marginal revenue, Relationship between average revenue and marginal revenue, Price determination & firm equilibrium in short run & Long run under perfect, oligopoly, monopoly, monopolistic competition.

### **2. PRINCIPLE OF MANAGEMENT**

**Concepts and Nature of Management :** Meaning, Characteristics- management as science or an art, management as a profession, diversity management, management as process, Management and Administration, levels of Management, skill of manager, Roles of a manager, Significance of management, Limitations of management, Business environment and its interaction with management, **Management Theory:** Approaches to management - Classical Neo classical and modern contributions to management thought - Taylor and Scientific theory Fayol and Administrative theory of Mayo and Hawthorne Experiments, **Planning:** Meaning, Process, Types, Principles, Limitations, Strategic Planning: meaning and process, MBO-Meaning, process and requirement for implementation, Planning premises - meaning and types, Forecasting-meaning and techniques, **Organizing :** Organization : Meaning, Process, Principles, Organization structure: Determinates and forms: Line, functional, line staff project, matrix and committees, Formal and Informal Organization, Span of Control- Meaning and factors influencing. Authority, Responsible and Accountability, Delegation: Meaning, Process, Principles, Centralization and Decentralization: Meaning, Degree of decentralization, Difference between delegation and decentralization, **Staffing:** Definition, factors affecting Staffing-

The External and Internal Environment Identification of Job Requirement, Job Design, Recruitment, Selection (process and laminations of Selection Process), Leadership-Definition, Leadership Characteristics, **Controlling** : Meaning, Steps Types, Techniques, Significance, and Limitations, Meaning of Motivation, introduction to theories of motivation.

### 3. **FINANCIAL ACCOUNTING**

**Introduction To Accounting:** Definition, scope, limitations, objectives, Book keeping, Double Entry System, rule of debit and credit and its users **Conceptual Frame Work:** Accounting Concepts, Principles and Conventions, Accounting Standards-concept, objectives and benefits, **Recording Process:** Rules of Debit, Journal, Ledger and Trial Balance and Errors in Trial Balance, **Final Account with adjustments** - Trading Account, Profit & Loss/A/c and Balance Sheet, **Cash Book:** Meaning, Advantages/disadvantages and its Types, **Depreciation:** Meaning, need, Importance and methods: straight: line method and written down value method.

### 4. **RESERCH METHODOLOGY**

**Introduction to Research Methodology** - Meaning of Research, Significance, objective, motivation in Research, Types of Research, Concept of Hypothesis formulation, **Meaning of Research Design**, Need and Features of a good Design, Important concepts relating to Research design, Different research designs, **Sample Design-** Steps in Sampling Design, Characteristics of a good sample design, different types of sample design-probablistic and nonprobablistic, random sampling, **Method of Data Collection-** Primary data, Secondary data collection of data through- Questionnaire and interview schedule, Difference between questionnaire and interview schedule, Case study method, **Interpretation of Data and Report writing-Meaning** and technique of interpretation, graphical representation of Data, Significance of Report Writing, Layout of Research report.

### 5. **INTRODUCATION TO MARKETING MANAGEMENT**

Nature & scope of marketing management, the core concept of marketing, marketing concept & selling concept, the marketing environment-Elements of



Micro & environment, **Marketing segmentation** : Concept of Target Market, **Product Management** : Product forms, concept of product line & Product- mix, **Concept of Product Life Cycle** & strategies for managing different stages in the PLC, **Pricing decisions**: overview of pricing process, **Marketing Planning** - The strategic Planning Process, Concepts of SBU, BCG Matrix, **Product Differentiation**, Concept of Positioning & competitive advantage, Physical distribution; channel design, management decisions, channel conflicts.

## 6. INTRODUCTION TO FINANCIAL MANAGEMENT

**Financial Management**- meaning, nature, scope, financial goal, Wealth Maximization, Objectives , **Capital Budgeting**- Nature of Investment decisions, Investing evaluation criteria, Net present value, Internal rate of return, Comparison between NPV and IRR, **Cost of Capital**- Meaning and significance of cost, Cost of borrowed capital, cost of Preference capital, cost of equity share capital, WACC, **Capital structure**- steps in financial planning, capitalization, designing of capital structure, optimum capital structure, **The concept of leverages**- Degree of operating leverage, significance of operating leverage, Financial leverage, Impact of different leverage on profit, combined financial and operating leverage, **Working Capital and its role**-Operating Cycle, factors determining the size of working capital, estimating working capital requirements.

## 7. MANAGEMENT INFORMATION SYSTEM

**Concept of information** : Classification of Information, value of information, information & MIS, **Concepts, role importance of Management Information Systems**, MIS & decision making concepts, Herbert Simon Model, Concept & Philosophy of Information, Concept of Systems Analysis & Design (SAD) Planning, designing & implementation of MIS, The Concept of DBMS & RDBMS, Introduction of Enterprise Management System.

## 8. ENTREPRENEURSHIP AND SMALL BUSINESS

**Definition & concept of Entrepreneurship**, classification & types, nature & important entrepreneurs, Entrepreneurship & small business; Entrepreneurship & its environment & problem, **Choice of business**: Size of a business unit, optimum

firm, representative firm, **Entrepreneurship development**-role of EDI's, NIESBUD, NSIC and DIC's In promoting entrepreneurs: the entrepreneurial process, Entrepreneurial decision making, **Entrepreneurship & Innovation** in product, service and organization, Sources of innovation, Innovation Process, Innovation versus Invention, **Preparing projects** - process, project writing, Sources of Finance for small business.

## 9. **BUSINESS LAW**

Nature, Meaning and Significance of Law, Society, State and Rule of Law, Sources of business Laws in India, **Contract Act-1872**- meaning and essentials of a valid contract; offer and acceptance, capacity of Parties, free consent, legality of object, consideration, void agreements, Contingent contract, Discharge of contract, quasi contract, remedies for breach of contract, Indemnity and Guarantee, Bailment and Pledge, Agency, **Indian Partnership Act-1932**: Definition and nature of Partnership, Registration of Firm incoming and Outgoing partners, Dissolution of Firms, **Negotiable Instruments Act-1881** Definition and nature of Partnership, **Registration of Firm** Incoming and Outgoing partners, Dissolution of Firms, **Negotiable Instruments Act-1881** :- Definition and Characters of Negotiable instrument, Promissory notes, Bills of Exchange and Cheques, Parties to Negotiable instrument, Dishonor of a Negotiable Instrument.

## 10. **ENVIRONMENTAL STUDIES AND ETHICS**

**The multi-disciplinary nature of environmental studies**-Definition, Scope and importance, need for public awareness, Man Environment and Society, Individual's rights and responsibilities towards clean environment, environmental ethics and ethical guideline for environmental management approach of Vivekanand and Mahatma Gandhi towards youth, women and social developments, Environmental movements and people's participation Scope and objective of environmental movements like Chipko, Tehri Dam, Narmada Dam, and Silent Valley, Role of Tribal people, women, and NGOs in Environmental protection with special reference to Jharkhand, Social issues and the environment, From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed

management , Resettlement and rehabilitation of people's problems and concerns, Environmental issues possible solutions, Climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and holocaust, Wasteland reclamation, Consumerism and waste products, Environmental Protection Act-Prevention and control of Air and Water pollution, Wildlife Protection Act, forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness, Human population and environment, Population growth, variation among nations Population explosion, Family Welfare programme, Effect of pollution of human health, Human rights Value Education, Hiv/AIDS, Women and child welfare, Role of information technology in Environment and human health, IPR.

## 11. **BANKING CONCEPTS & PRACTICES**

**Basic concepts of different types of banking system**, an overview of India banking systems, Evolution of commercial banks, Meaning & Meaning & definition of Banking- features, Classifications, **Financial institution**- IDBI, IFCI, SIDBI, EXIM Bank, SFC, RBI- its importance, Objective, Function, **Definition of customer to commercial banks**, feature of contractual customer relationship customer orientation, IMF- Objective, importance, **Recent regulations of commercial banks**, Debit card and Credit card, Commercial banks & credit creation, Role of NABARD in agriculture.

## 12. **HUMAN RESOURCE PALNNING**

**Nature and Scope of HRM**: Meaning, concept, definition, objective, function, evaluation of HRM, difference between HRM & PM, HRP- Definition, objective importance, process of HRP, **Deigning & Developing HR System**: factors influencing Hr forecast, forecasting labor-demand and supply , Job analysis, Job evacuation, **Recruitment and selection**: Meaning, definition, source and process of recruitment, selection: Meaning, concepts selection process, methods of selection, tests & interview, **Human Resource Development**: Meaning concept, definition, objective, importance & steps in training programme, types of training- on the job and off the Job training, difference between training and development,

**Performance appraisal:** Meaning, benefits, methods of performance appraisal system, Job enlargement, Job enrichment, transfer promotion.

### 13. RETAIL MANAGEMENT AND SERVICE MARKETING

**Introduction,** overview, understanding retail customers, **Retail Strategy-** Financial requirement; site location and site evaluation, **merchandise Management-** Assortment, Purchasing, Pricing, Promotion mix, **Managing Retail Store-**Store Management, Layout Customer Service, **Rise and Growth of Service Sector,** Seven P's of Marketing Mix- Product, Price, Place, Promotion, Evidence, **Marketing Service-** Difficulties and Challenges, Marketing of Production and Service, Aligning Strategy - Service Design and standards, Delivering and Performance Service, Managing service promises.

### 14. SECURITIES & PORTFOLIO MANAGEMENT

**Meaning and Concept** of Securities & Securities market -Bonds, Stocks and Convertible securities, Market trading arrangements, Organized securities markets over the counter, Efficient Markets, regulations of securities markets, **Risk & Return** - Risk Classification; systematic & unsystematic risk. **A Brief understanding of methods of measurement of risk** - standard deviation, variance, regression equations correlation co-efficient, probability Distribution and statistical methods, Bond analysis, bond selection, common stock analysis, earning analysis, Technical analysis, fundamental analysis, efficient market theory.

### 15. SALES & ADVERTISING MANAGEMENT

Personal Selling-meaning, importance, limitations, objective difference between personal selling & Salesmanship, **Sales management:** Definition, objective, attributes of good sales manager, role of a sales manager, **Sales Budget:** Meaning, objectives, factors, importance, steps Sales forecasting-meaning, objectives factors, steps importance, Recruitment, selection & training of salesmen, remuneration of sales person, **Advertising:** 5M's meaning definition characteristics, origin, objective, function, distinguished from publicity, Types,

kinds, classification of advertising, Media of advertising things considered while selecting a media, Measurement of advertisement effectiveness.

## 16. INDUSTRIAL RELATIONS

**Industrial Relations** : Meaning, objective, function, scope of industrial relations, **Industrial Relation Trends**: Salient trends in the industrial relations, issues in the country, **Collective Bargaining** : Meaning, definition, scope, concepts, importance, types of Collective Bargaining, process of Collective Bargaining, essential for Collective Bargaining, **Workers Participation in Management**: Concept, objective of PM, levels of participation, WPM Schemes of 1975, joint management council, **Grievance and Discipline**: Meaning, definition, scope need and importance of Grievance Handling, Grievance Handling procedure, disciplinary action- domestic inquiry, charge sheet.

## 17. ENVIRONMENTAL STUDIES AND ETHICS

Environment Pollution, **Definition, Elementary idea of causes and control measures of** Air, pollution, water pollution, Soil pollution, Marine Pollution, Noise Pollution, Thermal pollution, Nuclear hazards, **Solid waste management** : Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, **Disaster management**: Floods, Earthquakes, Cyclones and Landslides 10, **Natural Resources**: Renewable and Non-Renewable resources, Natural resources and associated problems, **Forest resources**: Use and over exploitation- deforestation, timber extraction, mining, **water resources**: Use and over utilization of surface and ground water, water harvesting, floods drought, conflict over water, dams - benefits and problems, **Mineral resources**: Use and exploitation, environment effect of extracting and using mineral resources, **Food resources**: World food problems, changes caused by agriculture and overgrazing effect of modern agriculture, fertilizer, pesticide problem, water logging, salinity, **Energy resources**: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, **Land resources**: Land as resource, land degradation, man induced landslides, soil erosion and desertification, Sustainable development, **Ecosystems**: Brief knowledge of ecosystem- structure and function of an ecosystem producers, consumers and decomposers, Energy flow in an

ecosystem, Food chains and food webs, ecological pyramids, **Introduction , types, characteristic features, structure and function, of the following ecosystems:** Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystem (ponds, streams, lakes rivers), Brief knowledge of biodiversity and its conservation Introduction, Definition, Bio geographical classification of India, **Value of biodiversity** : consumptive use, productive use, social ethical, aesthetic, optional values, Biodiversity at global, national and local levels, India as a mega biodiversity nation- hotspots of biodiversity, Threats o biodiversity, habitat loss, poaching of wildlife, man Wildlife conflict, Conservation of biodiversity, in-situ and ex-situ conservation of biodiversity.

## 18. **BUSINESS ETHICS**

**Introduction, Ethics-** meaning & concept, conflict between self interest & morality, dilemmas, Corporate Governance & Business Ethics, sustainability & reasons for sustainability, corporate governance & good company, Corporate Governance & the social responsibility of business, corporate governance & environment Responsibility of business, **Code of Ethics-** Meaning & Nature, conveying code for performance expectation, Ethical Issues & Dilemmas in the Place, Employee rights & duties, Organizational misconduct & Discrimination & prejudicial practices, Ethics & social responsibility in the market place, Ethics in Finance , marketing strategy, Ethical implication of technology .

## 19. **PROJECT MANAGEMENT**

Generation & screening of project ideas, **Feasibility study of project** - Marketing Analysis, Technical analysis , financial analysis, **Project cash flows-** Incremental principle, Long run funds principle, Exclusion of financing costs principle, **Project appraisal criteria-** NPV, IRR, PAY BACK PERIOD, Network techniques for project management, Development of project work, PERT & CPM Model, Network system, Project review & administration.

## 20. **INTERNATIONAL MARKETING**

**Concept, Scope & nature of international marketing**, Distinction between international marketing & domestic marketing, Documents required in foreign trade, **International institutions**: World Bank, IMF, WTO, Free trade zones, Customer union, Concept of Credit & Non credit risk in International marketing, Distribution channels, Types of Tariff & non tariff: Barriers to international trade, Introduction to international market, Selection & product policy in International marketing, Pricing strategies for International marketing, Distribution channels, Export- Import policy of India, Role of export promotion councils.

## 21. LABOUR LEGISLATION

**The factory act 1948**: Objective, Scope and coverage, Approval, Licensing and registration, Inspecting staff, Provisions: safety, Health and welfare, Working Hours- annual leave with wages, periodical returns, Employment of women, **The trade union act 1926**: Objective, Scope and coverage, Meaning of trade union, Membership of unions, Obligation of registered trade unions, Right if registered trade union, **Industrial disputes act 1947**: Meaning of industrial dispute, Procedure, Powers and duties of authorities- works committee, Grievance settlement, Conciliation, Court of inquiry, Voluntary arbitration, Labour court and tribunals, Strikes and lockouts, **The workman compensation act 1923**: Objective, Scope and coverage, Factors and elements of compensation, **Payment of wages act 1936**: Objective, Scope and coverage, Fixation of wages periods, Time and mode of payments.

## 22. INTERNATIONAL FINANCE

**International Finance**- Nature, Scope, Importance of study, an overview of International Finance, **International Trade and Finance**- Modes, Balance of Payments, Current Account transactions, Official reserve account, Capital Account transaction, Domestic and foreign exchange market, International currency market, **Exchange Rate Mechanism**- Exchange Rate quotation, Exchange rate determination in spot market, Factors influencing exchange rate, Exchange rate theories- Purchasing power parity, Method of forecasting Exchanging Rate, **International Financing Decision**- Overview of International Financial Market,

Instruments, Cost of Capital financial Structure, **Export-Import, Producers and Documentation-** Terms of Export- Import order, Letter of Credit, Bills of Lading; Bills of Exchange, RBI's role as exchange control authority.

### 23. **CONSUMER BEHAVIOUR**

**Introduction:** Concepts, Need for the study of consumer behavior (CB), **Individual Determinants of Behavior-** Personality, Perception, Attitude (Attitudinal models), Learning, Motivation, **Group influence on Consumer behavior** - Social Class, Social groups, Opinion Leaders, Culture, Sub Culture, Cultural relevance to Marketing Decisions, Characteristics of culture, Cultural Values. Cultural Changes, Cross Cultural understandings, Family: Role & Structure, Family life Cycle, Purchasing decisions, Changing role of families, **Group Influencers:** Types of groups, Consumer relevant groups, Reference groups & consumer conformity, Family buying decision, Making, Influence of social class & social status on buying behavior, Concept of opinion leadership, Profile of opinion leader, Consumer behavior and marketing strategy, Model of consumer decision making (Schiffman & Kanuk), Models of Consumer behavior, Howard- Seth Model, Seth's Family Decision- Making Model, Health Model.

### 24. **ORGANIZATIONAL DEVELOPMENT**

**Introduction to Organizational Development-** Concept and Characteristics of OD, History of Organization Development, Values, Assumptions and beliefs in ODA model for OD, Organization Renewal, Models and Theories of Planned change, Applied Behavioral Science, Action research, **Managing the OD process-**Diagnosis, OD Interventions, Phases of OD Programs, A model of Managing Change, **GD Intervention-** Meaning of OD intervention, Classifying OD interventions, Need for OD interventions, **Developing High Performance in Teams-**Team Intervention, Team and work Groups: cross- functional teams, A Gestalt approach to team building, Team building Techniques and exercises, Intercultural Development and Third party peacemaking interventions, **Comprehensive GD Interventions-** Beckhard's Confrontation Meeting, Stream Analysis, Survey Feedback, Grid Organization Development, Stein's Cultural Analysis, Self Managed teams, Work



Redesign, MBO and Appraisal, Quality circles, Total Quality Management, T-Groups, Johari Window model, Transactional Analysis, Career Life Planning Intervention, Stress Management.

## विषय : कृषि (AGRICULTURE)

परिस्थिति विज्ञान और मानव के लिये उसकी प्रासंगिकता, प्राकृतिक संसाधन, उनका प्रबंधन तथा संरक्षण। फसलों के उत्पादन और वितरण के कारक तत्व—भौतिक और सामाजिक वातावरण, फसल वृद्धि में जलवायु तत्वों का प्रभाव, फसल क्रम पर वातावरण सूचक के रूप में परिवर्तनशील वातावरण का प्रभाव। फसल, पशु और मानव पर प्रदूषित वातावरण का प्रभाव और सम्बन्धित खतरे।

**झारखण्ड के कृषि—** जलवायु क्षेत्र, देश के विभिन्न कृषि—जलवायु क्षेत्रों में फसल क्रम। झारखण्ड में फसल क्रम में परिवर्तन पर अधिक पैदावार वाली और अल्पकालीन किस्मों का प्रभाव। बहुफसलीय प्रणाली, मिश्रित फसल प्रणाली, अनुपद और अन्तर फसल प्रणाली की संकल्पना तथा खाद्य उत्पादन में उनका महत्व। देश के विभिन्न क्षेत्रों में खरीफ और रबी मौसमों में मुख्य अनाज, दलहन, तेलहन, रेशा, शर्करा तथा व्यावसायिक फसलों के उत्पादन की सवेष्टन रीतियों/झारखण्ड की मुख्य मसाला फसलों—मिर्चा, अदरक, हल्दी और धनियाँ।

वनों के प्रसार/सामाजिक वानिकी, कृषि वानिकी एवं प्राकृतिक वन—जैसे वन—रोपण की विभिन्न विधियों की मुख्य विशेषताएँ, संभावना और प्रचार।

**खर पतवार—** उनकी विशेषताएँ, प्रसारण तथा विभिन्न फसलों के साथ सहवास, गुणन, समन्वित खर—पतवार नियंत्रण, संवर्धनिक, जैविक तथा रासायनिक।

**मृदा—** निर्माण की प्रक्रिया तथा कारक, भारतीय मृदाओं का वर्गीकरण आधुनिक अवधारणा सहित, झारखण्ड की मृदा के प्रमुख प्रकार, मृदाओं के खनिज तथा कार्बनिक संरचनात्मक तत्व तथा मृदा की उत्पादकता बनाए रखने में उनकी भूमिका। समस्यात्मक मृदाएँ—भारत में उनका विस्तार तथा वितरण, मृदा की लवणता, क्षारीयता और आम्लीयता की समस्या तथा उनका प्रबंधन/मृदा और पौधों के आवश्यक पोषक तथा अन्य लाभकारी तत्व, मिट्टी में उनके वितरण, क्रिया और आवर्तन को प्रभावित करने वाले कारक। सहजीवी तथा असहजीवी नेत्रजन स्थिरिकरण, मृदा उर्वरता के सिद्धांत तथा उचित उर्वरक प्रयोग के लिए उसका मूल्यांकन, जैविक उर्वरक, झारखण्ड की टाल, दिया और चौर भूमि की समस्या तथा ऐसी स्थिति में फसल प्रणाली।

जल विभाजन के आधार पर मृदा संरक्षण योजना, पहाड़ी, पद—पहाड़ी तथा घाटी जमीनों में अपरदन और अप्रवाह की संभावना, उनको प्रभावित करने वाली क्रियाएँ और कारक। वारानी कृषि और उससे सम्बन्धित समस्याएँ। वर्षा प्रधान कृषि क्षेत्रों में उत्पादन में स्थिरता लाने की तकनीक।

सस्य उत्पादन से सम्बन्धित जल उपयोग क्षमता, सिंचाई क्रम में आधारभूत, सिंचाई जल के अप्रवाह हानि को कम करने की विधियाँ। जलाक्रांति भूमि से जल निकास। झारखण्ड के कृषि विकास में विभिन्न कमान्ड क्षेत्र विकास एजेंसी की भूमिका।

**कृषि क्षेत्र प्रबंध विषय**, क्षेत्र, महत्व तथा विशेषताएँ। कृषि क्षेत्र आयोजन और बजट, विभिन्न प्रकार की कृषि प्रणालियों की अर्थव्यवस्था।

**कृषि निविष्टों** और उत्पादों का विपणन और मूल्य, निर्धारण, मूल्य उतार-चढ़ाव, कृषि प्रणाली के प्रकार और प्रभावित करने वाले कारक। झारखण्ड के कृषि विकास में सहकारी विपणन और ऋण की भूमिका।

**झारखण्ड में विगत दो दशकों में कृषि उत्पादन की रूपरेखा**। झारखण्ड में भूमि की सुधार गति और कृषि और उत्पादकता पर उनका प्रभाव।

**कृषि प्रसार, महत्व तथा भूमिका**, कृषि प्रसार कार्यक्रमों के मूल्यांकन की विधि: महत्त्वपूर्ण प्रसार विधियाँ और प्रसार साधन, ग्रामीण नेतृत्व, सामाजिक आर्थिक सर्वेक्षण और बड़े, छोटे, सीमांत कृषकों भूमिहीनों की एवं श्रमिकों की स्थिति। कृषि यंत्रीकरण तथा ग्रामीण रोजगार और कृषि उत्पादन में इसकी भूमिका। कृषि प्रसार कार्यकर्ताओं के लिए प्रशिक्षण कार्यक्रम, कृषि विज्ञान केन्द्र, प्रसार में गैर-सरकारी संगठनों की भूमिका।

**झारखण्ड में कृषि अनुसंधान और शिक्षा प्रणाली की उत्पत्ति और विकास।**

**मुख्य फसलों** के सुधार में पौधा प्रजनन के सिद्धांतों का उपयोग, स्व और पर-परागित फसलों की प्रजनन विधियाँ। भूमिका, चयन, संकरीकरण, हेटरोसिस तथा उसका दोहन, नर-नपुंसकता और स्वअसंगिता, उत्परिवर्तन और बहुगणित का प्रजनन में भूमिका, जैव तकनीकी और ऊतक कल्चर की कृषि में उपयोग।

**आनुवंशिकता और विभिन्नता**, मेंडेल का आनुवंशिकता नियम, गुणसूत्री आनुवंशिकता के सिद्धांत, कोशिश द्रव्यी वंशागति, लिंग प्रभावित तथा लिंग सीमित गुण। स्वायत और प्रेरित उत्परिवर्तन, मात्रात्मक गुण।

**झारखण्ड की मुख्य फसलों** की प्रमुख अनुशासित किस्में/फसलों का उद्गम और भंगीकरण खेतों में लगनेवाले मुख्य प्रभेदों तथा उनसे सम्बन्धित प्रजातियों की आकारगत विभिन्नता के स्वरूप, सस्य सुधार के कारक और इनमें विभिन्नता का उपयोग।

**बीज, प्रौद्योगिकी तथा इसका महत्व**, फसली बीजों का उत्पादन, संसाधन परीक्षण, उन्नत बीजों के उत्पादन, संसाधन और विपणन में राष्ट्रीय और बीज निगमों की भूमिका। पादप और कृषि विज्ञान में इसका महत्व, जीव द्रव्य का गुण, भौतिक और रासायनिक संगठन, अंतःशोषण, पृष्ठतनाव, विसरण और परासरण। जल का अवशेष और स्थानांतरण, वाध्योत्सर्जन और जल की मितव्ययिता।

**प्रकिञ्चव और पादप रंजक**, प्रकाश संश्लेषण-आधुनिक संकल्पनाएँ और इन क्रियाओं को प्रभावित करनेवाले कारक, आक्सी और अनाक्सी श्वसन।

**वृद्धि और विकास**, दीप्तकालिता और वसन्तीरण, हॉरमोर और अन्य पादप नियामक— इनकी कार्य विधि और कृषि में महत्त्व।

**झारखण्ड के प्रमुख फलों, पौधों और सब्जियों की फसलों** के लिए अपेक्षित जलवायु और इनकी खेती संवेष्टिता प्रथा समूह और इसका वैज्ञानिकी आधार, फलों और सब्जियों को संभालने और बेचने की समस्याएँ, परिरक्षण की मुख्य विधियाँ, फलों और सब्जियों के मुख्य उत्पाद। प्राथमिक तकनीक तथा इनके यंत्र। मानव पोषण में फलों और सब्जियों की भूमिका, द्रव्य और पुष्पवर्धन अलंकृत पौधों के वर्धन को मिलाकर। बाग-बगीचों के अभिकल्पन और रचना विन्यास।

**झारखण्ड के फसलों**, सब्जी, फल का टिकावों और रोपी पौधों की बीमारियों और रेशमकीट, उनके कारक और नियंत्रण विधियाँ। पादप रोगों के कारक और उनके वर्गीकरण, रोग नियंत्रण के सिद्धांत जिसमें बहिष्कारण, निर्मूलन प्रतिरक्षीकरण, और संरक्षण शामिल है। कीट और बीमारियों का जैविक नियंत्रण।

**कीट एवं बीमारियों का समन्वित प्रबंध**, कीटनाशी और उनके सूत्र। पादप संरक्षण यंत्र, उनकी सावधानी और अनुरक्षण। अनाज और दलहन के भंडार में नाशक कीट, भंडार गोदामों की स्वच्छता, परिक्षण और सुधार उपाय। कीटनाशी उपयोग के खतरे और सुरक्षा उपाय। झारखण्ड में लाभदायक कीट के पालन की स्थिति और क्षेत्र, मधुमक्खी, रेशम कीट लाह कीट। झारखण्ड में धान मछली की खेती।

**झारखण्ड में लगातार बाढ़ और सूखे की आपदा और आकस्मिक फसल योजना**, सामान्यतया खाद्यान्न उत्पादन और उपभोग की पवृत्तियाँ, झारखण्ड में विशेष रूप से राष्ट्रीय और अन्तराष्ट्रीय खाद्य नीतियाँ, भंडारण, वितरण, संसाधन और उत्पादन में अवरोध, राष्ट्रीय आहार पद्धति से खाद्य उत्पादन का सम्बन्ध, कैलोरी और प्रोटीन की कमी।