

**PLANT MORPHOLOGY AND ANATOMY**

*Scheme of examination:*

*MM: 35*

1. In Semester End Examination the candidate has to answer five questions in all. Each question will be of 7 marks. Candidate has to answer all questions in the main answer book only.
2. Q. No. 1 (objective/short answer type) will be compulsory having 14 questions (half mark each) covering entire syllabus.
3. Each paper is divided in four units. There will be two questions from each unit. Student has to answer one question from each unit.

**UNIT – I**

The basic body plan of flowering plants – modular type of growth. Diversity of plant forms in annuals, biennials and perennials; convergence of evolution of tree habit in gymnosperms, monocotyledons and dicotyledons; trees – largest and longest lived plants. Simple and complex permanent tissues, secretory tissues, tissue systems.

**UNIT – II**

The shoot system: The shoot apical meristem and its histological organization; vascularization of primary shoot in monocotyledons and dicotyledons; formation of internodes; branching pattern; monopodial and sympodial growth; canopy architecture; cambium and its functions; formation of secondary xylem; a general account of wood structure in relation to conduction of water and minerals; characteristics of growth rings; sapwood and heartwood; secondary phloem – structure and function; periderm. Anomalous secondary growth.

**UNIT – III**

The leaf: origin, development, arrangement and diversity in size and shape. Stomata – structure and types, stomatal index. Vascularization of

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**CELL BIOLOGY AND PLANT BIOCHEMISTRY**

*Scheme of examination:*

MM: 35

1. In Semester End Examination the candidate has to answer five questions in all. Each question will be of 7 marks. Candidate has to answer all questions in the main answer book only.
2. Q. No. 1 (objective/short answer type) will be compulsory having 14 questions (half mark each) covering entire syllabus.
3. Each paper is divided in four units. There will be two questions from each unit. Student has to answer one question from each unit.

**UNIT – I**

**Cell Biology** - Tools and techniques used in cell study; ultrastructure and functions of different cell organelles of eukaryotes and prokaryotes (cell wall, plasma membrane, nucleus, mitochondria, chloroplast, ribosomes, peroxisomes, golgi bodies etc.).

Cell divisions: cell cycle, mitosis phases, structure and functions of spindle apparatus; anaphasic chromosomes movement; Meiosis: phases, synaptonemal complex formation and fate of chiasmata and significance of crossing over.

**UNIT – II**

Chromosome organization: eukaryotic and prokaryotic, Chromosomes – morphology; centromere, telomere; specialized types of chromosomes (sex chromosomes, lampbrush chromosomes, polytene chromosomes).

Chromosomal aberrations (Deletion, Duplication, Translocation and Inversion); Aneuploidy and polyploidy.

**UNIT – III**

**Biomolecules:-**

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Carbohydrates: Importance, nomenclature, classification, structure and function of mono-, di- and polysaccharides, their properties, glycosidic linkages and glycoproteins.

Lipids: Importance of fatty acids (Saturated and unsaturated), biosynthesis (alpha and beta oxidation and synthesis).

Secondary metabolites: Concept of Secondary metabolites, classification and significance of Secondary metabolites with special reference to flavonoides, alkaloids and steroids.

#### UNIT – IV

Proteins: Importance of amino acids, structure, electrochemical properties, peptide bonds, chemical bonds and nomenclature, structure and classification of proteins, protein synthesis, physical and chemical properties, protein changes during seed germination, seedling and senescence.

Enzymes: Discovery, nomenclature, EC number, characteristics of enzymes, enzyme kinetics, mechanism of action, Km value, active sites, holoenzyme, apoenzyme, coenzyme and factors, multienzyme system, regulation of enzyme activity.

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कन्याश्रम विभाग  
राजस्थान विश्वविद्यालय, जयपुर

## GENETICS AND PLANT BREEDING

*Scheme of examination:*

*MM: 35*

1. In Semester End Examination the candidate has to answer five questions in all. Each question will be of 7 marks. Candidate has to answer all questions in the main answer book only.
2. Q. No. 1 (objective/short answer type) will be compulsory having 14 questions (half mark each) covering entire syllabus.
3. Each paper is divided in four units. There will be two questions from each unit. Student has to answer one question from each unit.

### UNIT – I

Experimental basis for DNA as genetic material; nucleic acids: DNA and RNA-their structures, types, replication and functions; RNA Primers, Okazaki-fragments, ideas about polymerase; exons and introns; DNA-Protein interactions, Nucleosome models; Structure of Gene; Regulation of gene expression in prokaryotes and eukaryotes; genetic code :triplet codes their characteristics and significance.

### UNIT II

Genetic inheritance: Mendel's laws of inheritance and their exceptions; allelic (complete dominance, co-dominance and incomplete dominance, lethality) and non-allelic interactions (complementary genes, epistasis and duplicate genes), linkage and crossing over. Elementary ideas of chromosome mapping.

### UNIT III

Cytoplasmic inheritance- maternal influence, shell coiling in snails, Kappa particles in *Paramecium*. Multiple allelism: characteristics; ABO blood groups in men. Multiple gene inheritance: characteristics; plant height,


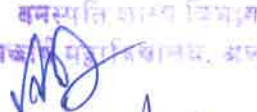

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**PLANT PHYSIOLOGY AND METABOLISM**

*Scheme of examination:*

MM: 35

1. In Semester End Examination the candidate has to answer five questions in all. Each question will be of 7 marks. Candidate has to answer all questions in the main answer book only.
2. Q. No. 1 (objective/short answer type) will be compulsory having 14 questions (half mark each) covering entire syllabus.
3. Each paper is divided in four units. There will be two questions from each unit. Student has to answer one question from each unit.

**UNIT – I****Water relations:**

**Water:** structure, physicochemical properties, importance to plant life, concept of water potential. Absorption of water and Transport of water: Ascent of sap, Mechanism of process: Transpiration, Guttation, stomatal movement, limiting factors.

**Mineral Nutrition:** Essential micro and macro nutrients; their uptake, factors affecting, hydroponics and nutrient requirement, deficiency and toxicity symptoms.

**Transport of organic substances:** Mechanism of phloem transport, factors regulating the translocations of nutrients.

**UNIT II**

**Photosynthesis:** Photosynthetic apparatus, photochemistry, pigments, light reaction, photo system I & II, Z scheme, photophosphorylation, C<sub>3</sub> Calvin cycle, C<sub>4</sub> cycle, photorespiration, Crassulacean acid metabolism and factors affecting the photosynthesis.

**UNIT III**

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**Respiration:** ATP-the biological energy currency, aerobic and anaerobic respiration, Krebs's cycle, electron transport system, oxidative phosphorylation, Pentose phosphate pathway, respiratory inhibitors and factors affecting the process.

**Nitrogen Metabolism:** Biological  $N_2$  fixation by free living organism, symbiotic  $N_2$  fixation, root nodules, nitrogenase and ammonium assimilation.

#### UNIT IV

**Phases of growth and development:** Seed dormancy and germination, plant movement, senescence and Biological clock- their regulatory factors.

Photoperiodism & vernalisation; Physiology and mechanism of action, concept of florigen and phytochrome.

Plant hormones : auxins, gibberellins, cytokinins, ethylene and growth retardants; discovery, bioassay & physiology.

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राजस्थान विश्वविद्यालय  
जयपुर



**REAL ANALYSIS**

Scheme of examination:

**MM: 35**

*Note: In all five questions are to be answered. First question will be short answer type, compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit.*

**UNIT - I**

Real number as complete ordered field, properties of continuous functions on closed intervals

**UNIT - II**

Limit point, Bolzano-weierstrass theorem, Closed and Open sets, Union and Intersection of such sets. Concept of compactness. Heine-Borel theorem. Connected sets. Properties of derivable functions, Darboux's and Rolle's theorem.

**UNIT - III**

Real sequences- Limit and Convergence of a sequence, Monotonic sequences.

**UNIT - IV**

Cauchy's sequence, Subsequence, cauchy's general principle of convergence. Notion of limit and continuity for functions of two variables

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**DIFFERENTIAL EQUATIONS**

Scheme of examination: **MM: 35**

*Note: In all five questions are to be answered. First question will be short answer type, compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit.*

**UNIT - I**

Degree and order of a differential equation. Equations of first order and first degree. Equations in which the variables are separable. Homogeneous equations and equations reducible to homogeneous form.

**UNIT - II**

Linear equations and equations reducible to linear form. Exact differential equations and equations which can be made exact. First order but higher degree differential equations solvable for x, y and p.

**UNIT - III**

Clairaut's form and singular solutions with extraneous Loci. Linear differential equations with constant coefficients. Complimentary function and particular integral.

**UNIT - IV**

Homogenous linear differential equations, Exact linear differential equations of nth order.

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**NUMERICAL ANALYSIS**

Scheme of examination: **MM: 35**

*Note: In all five questions are to be answered. First question will be short answer type, compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit.*

**UNIT - I**

Differences. Relation between differences and derivatives. Differences of a polynomial. *Factorial function.*

**UNIT - II**

~~Factorial function~~, Newton's formulae for forward and backward interpolation. Divided differences. Newton's divided difference, Interpolation formula. Lagrange's interpolation formula.

**UNIT - III**

Central differences. Gauss's, Stirling's and Bessel's interpolation formulae. Numerical Differentiation. Derivatives from interpolation formulae.

**UNIT - IV**

Numerical integration, Newton-Cote's formula, Trapezoidal rule, Simpson's one-third, Simpson's three-eighth and Gauss's quadrature formulae.

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**REAL ANALYSIS AND METRIC SPACES**

*Scheme of examination:* MM: 35

*Note: In all five questions are to be answered. First question will be short answer type, compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit.*

**UNIT – I**

Riemann integration - Lower and Upper Riemann integrals, Riemann integrability, Mean value theorem of integral calculus, Fundamental theorem of integral calculus.

**UNIT II**

Sequence and series of functions – Point wise and Uniform convergence, Cauchy's criterion, Weierstrass M-test, Abel's test, Dirichlet's test for uniform convergence of series of functions, Uniform convergence and Continuity of series of functions, Term by term differentiation and integration. Metric space - Definition and examples.

**UNIT III**

Metric space, definition & simple properties of open and closed sets, Interior and Closure of a set, Limit point of a set. Subspace of a metric space, Product space.

**UNIT IV**

Continuous mappings, Sequence in a metric space, Cauchy sequence. Complete metric space, Baire's theorem, Compact sets and Compact spaces, Connected metric spaces.

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**DIFFERENTIAL EQUATIONS - II**

*Scheme of examination:*

*MM: 35*

*Note: In all five questions are to be answered. First question will be short answer type, compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit.*

**UNIT – I**

Linear differential equations of second order. Linear independence of solutions. Solution by transformation of the equation by changing the dependent variable/the independent variable, Factorization of operators.

**UNIT II**

Method of variation of parameters, Method of undetermined coefficients. Partial differential equations of the first order. Lagrange's linear equation. Charpit's general method of solution.

**UNIT III**

Simultaneous differential equations. Existence and uniqueness theorem.

**UNIT IV**

Homogeneous and non-homogeneous linear partial differential equations with constant coefficients. Equations reducible to equations with constant coefficients.

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**NUMERICAL ANALYSIS – II & VECTOR CALCULUS**

*Scheme of examination:*

*MM: 22*

*Note: In all five questions are to be answered. First question will be short answer type, compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit.*

**UNIT – I**

Numerical solution of algebraic and transcendental equations. Bisection method, Regula-Falsi method, Method of iteration, Newton-Raphson method.

**UNIT II**

Gauss elimination and Iterative methods (Jacobi and Gauss Seidal) for solving system of linear algebraic simultaneous equations. Solutions of ordinary differential equations of first order with initial and boundary conditions using Picard's and modified Euler's method.

**UNIT III**

Runge – Kutta Method, Scalar point function. Vector point function. Differentiation and integration of vector point functions. Directional derivative.

**UNIT IV**

Gradient, Divergence, Curl and identities involving three operators. Gauss divergence theorems, Green's and Stokes theorems (without proof) their application.

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**STATISTICAL AND THERMODYNAMICAL PHYSICS – I**

*Scheme of examination:*

*MM: 23*

- 1. In all five questions are to be answered. There shall be two questions from each unit. A student has to answer one question from each unit. Fifth question will be compulsory and will cover the entire syllabus.*

**UNIT-I**

**First law of Thermodynamics:** Microstates of the system Thermal interaction, Thermal insulation, Adiabatic interaction and Enthalpy, Concept of temperature and Zeroth law of Thermodynamics, idea of temperature scales, thermodynamical parameter  $\beta$ , distribution of energy, first law of thermodynamics.

**UNIT-II**

**Second law of Thermodynamics and Heat Engines:** Second law of thermodynamics (Different statements and their equivalence). System in contact with a heat reservoir (Canonical distribution). Partition function. Reversible and irreversible processes,. Heat engines, Carnot cycle, Carnot's ideal Engine and Refrigerator. Thermodynamical scale as an absolute scale.

**UNIT-III**

**General Thermodynamics Interactions:** Dependence of number of states on External parameters, General relations in equilibrium, equilibrium conditions. Infinitesimal quasistatic process, entropy of an ideal gas, equilibrium of an isolated system, equilibrium of system in contact with a reservoir (Gibb's free energy).

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## UNIT-IV

**Thermodynamic Relation:** Equilibrium between phases, Clausius Clapeyron equation. Triple point, vapour pressure in equilibrium with a liquid or solid, equilibrium condition for a system of fixed volume in contact with heat reservoir (Helmoholtz free energy). Deduction of Maxwell's relation and their applications.

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**OPTICS – I**

*Scheme of examination:*

*MM: 23*

- 1. In all five questions are to be answered. There shall be two questions from each unit. A student has to answer one question from each unit. Fifth question will be compulsory and will cover the entire syllabus.*

**UNIT-I**

**Elements of Geometrical Optics:** Fermat's principle, laws of reflection and refraction from Fermat's principle, Refraction at a spherical surface, Linear and lateral magnifications, Refraction through a thick lens. Focal lengths of thick and thin lenses. Combination of two lenses. Cardinal points.

**UNIT-II**

**Interference:** Superposition of waves from two point sources, necessity of coherence, Concept of spatial and temporal coherence. Effective size of a point source. Shape of interference fringes. Intensity distribution in space. Interference by division of amplitude, Interference in thin films. Colours of thin films in transmitted and reflected light.

**UNIT-III**

**Application of Interference:** Newton's Rings. Michelson's interferometer, Fringes of different shapes with Michelson's interferometer, Determination of wave length with Michelson's interferometer. Determination of refractive index by Newton's ring and Michelson interferometer.

**UNIT-IV**

**Laser and Holography:** Spontaneous and stimulated emission, Einstein's coefficient, Energy density of radiation as a result of stimulated emission

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and absorption, Population inversion, Methods of optical pumping, energy level schemes and working of He-Ne, Ruby and CO<sub>2</sub> laser. Basic concept of Holography, construction of hologram and reconstruction of the images.

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**ELECTRONICS – I**

*Scheme of examination:*

MM: 24

- 1. In all five questions are to be answered. There shall be two questions from each unit. A student has to answer one question from each unit. Fifth question will be compulsory and will cover the entire syllabus.*

**UNIT-I**

**Circuit Analysis:** Network's – some important definition, loop and nodal equations based on DC and AC circuit.

Kirchhof's Laws. Four terminal network Ampere-Volt conventions, open, close and Hybrid parameter of any four terminal network.

Network Theorems: Superposition. Thevenin, Norton and Reciprocity, Compensation, Maximum power transfer.

**UNIT-II**

**Semiconductor and Semiconductor diodes:** Energy band in solids. Intrinsic and extrinsic semiconductors, charge densities in N and P materials. Conduction by drift and diffusion of charge. P-N junction diode equation, capacitance effect. P-N junction and Zener Diode and their I-V characteristics.

**UNIT-III**

**Rectifiers and Power supplies:** Diode as a rectifier, Half-wave full wave and Bridge rectifiers, calculation of ripple factor, efficiency and regulation.

**Filters:** Series Inductor, Shunt Capacitor, L-Section and  $\pi$ -section filters,

**Voltage regulation:** Voltage regulation and voltage stabilization by Zener diode. Voltage multiplier.

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## UNIT-IV

**Transistor and Transistor Amplifiers:** Notation and volt ampere characteristics for bipolar junction transistors. Concept of load line and operating point, Hybrid parameter, CB, CE, CC configurations. Analysis of transistor amplifiers using hybrid parameters and its gain, frequency response. Stability factors, various types of bias circuits for thermal bias stability, Fixed bias, collector to base feed back bias and four resistor bias.





**STATISTICAL AND THERMODYNAMICAL PHYSICS - II**

*Scheme of examination:*

*MM: 23*

- 1. In all five questions are to be answered. There shall be two questions from each unit. A student has to answer one question from each unit. Fifth question will be compulsory and will cover the entire syllabus.*

**UNIT-I**

Production of low temperatures and applications: Joule Thompson expansion and J-T coefficients for ideal as well as Vander Wall's gas, porous plug experiment. Temperature inversion, regenerative cooling and cooling by Adiabatic expansion and demagnetization, liquid Helium, He-I and He-II, Super fluidity, refrigeration through Helium dilution quest for absolute zero, Nernst heat theorem.

**UNIT II**

**The Distribution of Molecular Velocities :** The distribution of molecular velocities, most probable, average and RMS velocities, the energy distribution function, effusion of molecular beam, experimental verification of Maxwell velocity distribution, The principle of equipartition of energy. Mean free path, distribution of free paths.

Transport phenomenon; coefficients of viscosity. Thermal conductivity. Diffusion and their interrelation.

**UNIT III**

**Classical Statistics:** Validity of classical approximation, phase space, Micro and Macro State, Thermodynamical probability, Relation between

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entropy and thermodynamical probability, The monoatomic ideal gas, the barometric equation, specific heat capacity of diatomic gas, specific heat capacity of solids.

#### UNIT IV

**Quantum Statistics:** Black body radiation and failure of classical statistics.

Postulates of quantum statistics, indistinguishability, wave function, exchange degeneracy, a priori-probability. Bose Einstein's Statistics and its distribution function. Planck's distribution function and radiation formula, Fermi-Dirac statistics and its distribution function, Contact potential. Thermionic emission, specific heat anomaly of metals, nuclear spin statistics (para and ortho hydrogen).

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**OPTICS - II**

*Scheme of examination:*

*MM: 23*

1. *In all five questions are to be answered. There shall be two questions from each unit. A student has to answer one question from each unit. Fifth question will be compulsory and will cover the entire syllabus.*

**UNIT-I**

**Diffraction:** Fresnel's class of diffraction: Fresnel's assumptions, Half period zones, Zone Plate, phase reversal zone plate diffraction by a circular aperture, straight edge, a thin wire and rectangular slit. Cornu's spiral to study Fresnel's diffraction.

**UNIT II**

**Fraunhofer class of diffraction:** Fraunhofer diffraction by single slit and a circular aperture, Fraunhofer diffraction by N parallel slits with two slits as an application, Missing order, Plane diffraction grating, Dispersion by a grating, Rayleigh's criterion of resolution, Resolving power of grating.

**UNIT III**

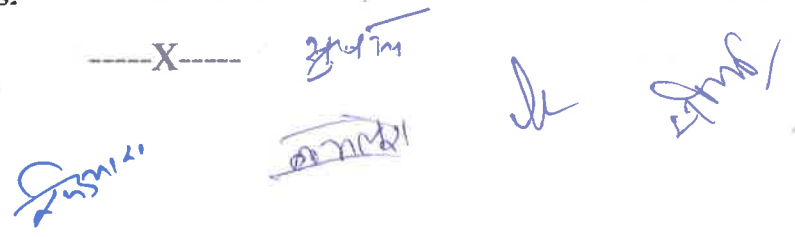
**Polarization:** Plane electromagnetic waves E and B of linearly, circularly and elliptically polarized electromagnetic waves. Reflection and refraction of plane EM Waves at a plane dielectric surface, Boundary conditions, Derivation of Fresnel's relation. Polarisation by reflection. Propagation of EM wave in an anisotropic media.

**UNIT IV**

**Double refraction and optical activity:** Huygen's Theory of Double Refraction using Fresnel Ellipsoidal Surfaces (no mathematical derivation), Production and Analysis of Plane Polarized, Circularly and elliptically

polarized light, Quarter and half wave plates. Specific Rotation. Bi-quartz  
and half shade polarimeters.

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**ELECTRONICS - II**

*Scheme of examination:*

*MM: 24*

- 1. In all five questions are to be answered. There shall be two questions from each unit. A student has to answer one question from each unit. Fifth question will be compulsory and will cover the entire syllabus.*

**UNIT-I**

**Amplifier with Feed Back:** Concept of feed back, Positive and negative feed back. Voltage and current feed back circuits. Advantage of negative feed back. Stabilization of gain, effect of negative feed back on output and input resistance, reduction of nonlinear distortion, effect on gain - frequency response.

**UNIT II**

**Oscillators :** Criterion for self excited and self sustained oscillations, circuit requirement for build up of oscillations, Basic transistor oscillator circuit and its analysis Colpitt's and Hartely oscillators, R.C. Oscillators, Crystal oscillators and its advantages.

**UNIT III**

**Field Effect transistor: Junction** Field effect transistors (JFET) Metal Oxide Semiconductor Field Effect Transistor (MOSFET), circuit symbols, biasing, volt-ampere characteristics, Source follower operation of JEFT, FET as variable voltage resister.

**UNIT IV**

**Digital Circuits:** Binary number system, Binary arithmetic. Logic fundamental AND, OR, NOT, NOR, NAND, XOR. Boolean algebra,

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UNIT

Simplification of Boolean expressions. De Morgan's theorems. Positive and negative logic. Logic gate realization using DTL and TTL.

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**MAMMALIAN PHYSIOLOGY**

*Scheme of examination:*

**MM: 35**

1. *In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.*

**UNIT – I**

**Nutrition & Digestion**

Nature of Food stuff, Digestive enzymes & their action in alimentary canal, Hormonal control of digestion, Absorption

**UNIT - II**

**Circulation**

Composition & Function of Blood and lymph, Blood clotting mechanism, Cardiac cycle, Heart beat, blood pressure, Angina pectoris, Myocardial infarction, E.C.G

**UNIT - III**

**Respiration**

Mechanism & control of Breathing, Gaseous exchange in tissues, Transportation of oxygen and carbon di oxide in blood, Mechanism & regulation of respiration

**Excretion**

Structure & Function of Kidney, Mechanism of urine formation, Hormonal regulation of water & electrolyte balance

**UNIT - IV**

**Nervous system**

Structure of neurons, Origin and propagation of nerve impulse, Synaptic transmission, Reflex action & reflex arc

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## Muscular system

Structure & types of muscle, Mechanism of skeletal muscle contraction

## UNIT - V

## Endocrine System

Endocrine glands and their Hormones, Mechanism of Hormone action, Role of hypothalamus, Role of hormones in Reproduction, Pregnancy & Lactation



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**BIOTECHNOLOGY AND IMMUNOLOGY**

*Scheme of examination:*

**MM: 35**

1. *In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.*

**UNIT - I**

Definition, History, scope and application of biotechnology, Major areas of biotechnology.

Vectors for gene transfer (plasmids and phages).

Protoplast fusion in prokaryotes and eukaryotes.

Recombinant DNA technology

**UNIT - II**

Applications of genetic engineering, hazards and regulations.

Transgenic animals, their uses in biotechnology

Brief account of cloning, its advantages and disadvantages.

Biotechnology in Medicine (outline idea only) : P.C.R., Antibiotics. Vaccines.

**UNIT - III**

Hybridoma technology, Monoclonal antibodies and their applications

Food, drink and dairy Biotechnology (outline idea only) : Fermented food production : dairy products, alcoholic beverages, food preservation.

Scope of biotechnology based industries.

**UNIT - IV**

**Immunity:** Innate & acquired immunity, Antigen : Antigenicity of molecules,

haptens. Immunoglobulins: Structure and functions, Antigen-antibody reactions:

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

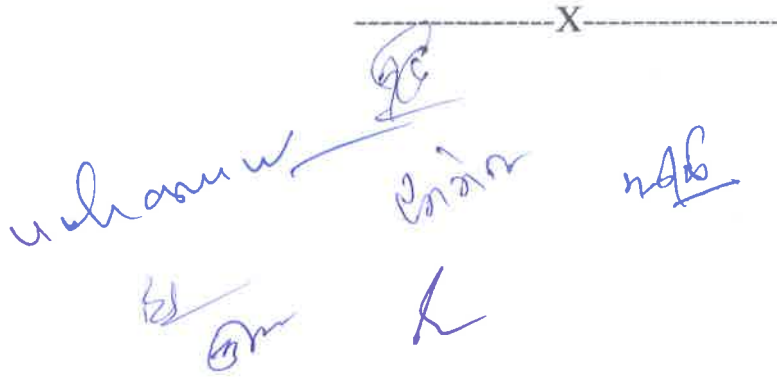
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## UNIT - V

Mechanism of humoral & cell mediated immune response.

Complement and its action

AIDS



प्रभासा  
प्राणी विज्ञान विभाग  
राजध्वं महाविद्यालय, अहमदाबाद

**BIOCHEMISTRY**

*Scheme of examination:*

**MM: 35**

1. In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

**UNIT – I**

**Carbohydrates:** Classification & Structure, Metabolism- Oxidation of glucose through glycolysis, Kreb's cycle & oxidative phosphorylation, Interconversion of glycogen and glucose in liver

**UNIT II**

**Lipids:** Classification & structure. Metabolism- Beta-oxidative pathway of fatty acids

Biosynthesis of Triglycerides.

**UNIT III**

**Proteins-** Classification & structural properties, Amino acids & peptides- Properties & structure, Metabolism- Transformation of amino acids, Deamination, Transamination, Decarboxylation, Synthesis of Urea (Ornithine cycle)

**UNIT IV**

pH and Buffers, Nature of chemical bonding,

**Enzymes:** Classification & Characteristics of enzymes. Michaelis-Menten Equation.

**UNIT V**

**Biochemical techniques** (Brief account): Chromatography, Colorimetry & pH Meter, Vitamins, Fat soluble and water soluble vitamins.

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**MICROBIOLOGY***Scheme of examination:***MM: 35**

1. *In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.*

**UNIT – I**

Brief introduction to the history of Microbiology: Work of Anton Van Leeuwenhoek, Work of Louis Pasteur, John Tyndall, Robert Koch & Jenner  
 Prokaryota(Bacteria): Size, shape & pattern of Arrangement  
 Structural Organization—Slime layer (Capsule), Cell envelope, Cytoplasmic membrane (Inner membrane), Cell wall (Outer membrane) of gram-ve & gram +ve bacteria, Mesosomes; Cytoplasmic organization, Cell projections- Flagella & pili

**UNIT II**

Virus (Lytic & Lysogenic cycles)  
 Genetic material of bacteria: Chromosomes, Plasmids,  
 Replication of bacterial DNA

**UNIT III**

Reproduction in Bacteria: Asexual reproduction: Binary fission, budding, Endospore formation & cyst formation, Sexual reproduction: Conjugation, Transduction & Bacterial recombination.

Microbial nutrition culture of Bacteria

- Carbon & energy source
- Nitrogen & minerals
- Organic growth factors
- Microbial growth
- Environmental factors: Temperature, pH

**UNIT IV**

Bacterial of medical importance:

Gram +ve:

- Cocci : Staphylococci, Streptococci

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 प्रभार  
 प्राणी विज्ञान विभाग  
 राजर्षि महाराजिदायक, अलाहाबाद

• Bacilli: Diphtheria, Tetanus

Gram -ve:

• Cocci: Gonorrhoea, Meningitis

• Bacilli: Diarrhoea

## UNIT V

Mycobacteria: Tuberculosis

Hepatitis (with emphasis on B type)

The causative agents, Transmission, Pathogenicity, Laboratory, Diagnosis, Treatment & Prevention



Dr. Anam  
प्रभारिता  
ग्रामी विज्ञान विभाग  
महाराष्ट्र महाविद्यालय, अहमदनगर



Inorganic Chemistry

*Scheme of examination:*

*MM: 52*

*1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.*

**UNIT – I**

Coordination Chemistry

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

**UNIT – II**

Magnetic Properties of Transition Metal Complexes

Type of magnetic behavior, methods of determination magnetic susceptibility, spin-only formula, L-S coupling, correlation of  $U_s$  and  $U_{eff}$  values, orbital contribution of magnetic moments, application of magnetic moment data for 3d metal complexes.

**UNIT – III**

Theories of coordination compounds

Valence bond theory of transition metal complexes, limitation of valence bond theory, crystal field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal field parameters, jahn-Teller effect.

**UNIT – IV**

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

**UNIT – V**

Electronic spectra of transition metal complexes

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

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Organic Chemistry

*Scheme of examination:*

MM: 52

1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

**UNIT – I**

Alcohols: Classification and nomenclature. Monohydric alcohols: primary, secondary & tertiary alcohols, method of preparation, hydrogen bonding, acidic nature, reactions of alcohols. Dihydric: alcohols-nomenclature, method of formation chemical reaction of vicinal glycerol oxidative cleavage[ $\text{Pb}(\text{OAc})_4$ ] and  $\text{HIO}_4$  and pinacol-pinacolone rearrangement. Trihydric alcohols-nomenclature and method of formation, chemical reaction of glycerol.

**UNIT – II**

Phenols: Nomenclature, Structure and bonding, preparations of phenols, physical properties and acidic character, comparative acidic strength of alcohols and phenols, resonance stabilization of phenoxide ion reaction of phenols, mechanism of fries rearrangement claisen rearrangement, gatterman synthesis, Hauben-Hoesch reaction. Laderer-Manases reaction and reimertieman reaction. Laderer-Manases reaction and reimertieman reaction.

**UNIT – III**

Ethers and Epoxides: Nomenclature of ethers and method of their formation, physical properties, chemical reaction cleavage and autoxidation, Ziesel's method, crown ethers. Synthesis of epoxides, acid and base catalyzed ring opening epoxides, orientation of epoxides ring opening reaction of grignard and organolithium reagent with epoxides.

**UNIT – IV**

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Aldehydes and Ketones – I: Nomenclature and structure of the carbonyl group. Synthesis of Aldehydes and Ketones with particular reference to formaldehyde, acetaldehyde, acetone, benzaldehyde, acetophenone and benzophenone, physical properties, reactivity. Mechanism of nucleophilic addition to carbonyl group. Condensation with ammonia and its derivatives, benzoin aldol, perkin, Knoevenagel condensation, Wittig reaction, Mannich reaction and Cannizzaro's reaction. Use of acetyls as protecting group, oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, MPV, Clemmensen, Wolff-Kishner,  $\text{LiAlH}_4$  and  $\text{NaBH}_4$  reductions, halogenation of enolizable ketones.

#### UNIT – V

Aldehydes and Ketones – II: An introduction to  $\alpha$ ,  $\beta$ -unsaturated aldehydes and ketones, preparation and properties of acrolein, crotonaldehyde and vinyl methyl ketone, Michael reaction.

Acidity of  $\alpha$  – hydrogen, alkylation of diethyl malonate & ethyl acetoacetate (EAA) synthesis of EAA: the Claisen condensation, keto – enol tautomerism of EAA, synthetic importance of diethyl malonate and ethyl acetoacetate, alkylation & acylation of enamines.

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Physical Chemistry

*Scheme of examination:*

MM: 52

1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

**UNIT – I**

**Electrochemistry**

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

Kohlrouseh's law and its application in determination of

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

**UNIT – II**

Interionic attraction theory, quantitative treatment of theory of strong electrolytes, verification of the Debye Huckel Onsagar equation, conductometric titration.

(b) Transference number and their determination by (I) Hitoff's method (2) Moving boundary method, Abnormal transference numbers, factors affecting the transport number.

**UNIT – III**

**Thermodynamics-I:** Limitation of first law of thermodynamics, spontaneous processes, second law of thermodynamics carnot cycle, Kelvin scale of temperature, Concept of entropy. Entropy change for an

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ideal gas, entropy change for physical transformation, Entropy of mixing, physical significance of entropy.

#### UNIT – IV

**Thermodynamics – II:** Free energy and work function. Criteria of chemical equilibrium Gibb's Helmholtz equation. Third law of thermodynamics and determination of absolute entropies, effect of temperature on free energy and enthalpy, maxwell's thermodynamic relations.

#### UNIT – V

**Spectroscopy:** Electromagnetic radiations and wave parameters, interaction of electromagnetic radiations with matter. Ultraviolet and visible spectroscopy having absorption interaction, chromophores and auxochromes, bathochromic and hypsochromic shift determination of wavelength ( $\lambda_{max}$ ) and molar extinction coefficient of compound, electronic transition, colours in complexes, applications of uv-visible spectroscopy.

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Analytical Chemistry

*Scheme of examination:*

MM: 52

*1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.*

**UNIT – I**

**Chromatography:** principle of adsorption and partition chromatography, techniques and applications of column, paper and thin layer chromatography, electrophoresis and its applications in separation of amino acids and cations.

**UNIT – II**

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

**UNIT – III**

**Coductometric titration:** The basis of coductometric titrations, apparatus and measurement. Application of coductometric titrations. High frequency titrations, advantages of the techniques, some examples of high frequency titrations.

**UNIT – IV**

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

**UNIT – V**

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

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**Inorganic Chemistry**

*Scheme of examination:*

*MM: 52*

- 1. In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.*

**UNIT – I**

**Thermodynamic and kinetic aspects of Metal complex:** A brief outline of thermodynamic stability of metal complexes and factors affecting the stability substitution reactions of square planar complexes.

**UNIT II**

**Chemistry of Lanthanide elements:** General study, Chemistry of separation of Np, Pu and Am from U, electronic configuration. Oxidation states magnetic properties, Complexation behaviour, comparison of lanthanides and actinides, super heavy elements.

**UNIT III**

**Oxidation and reduction:** Redox potential data and their analysis, redox stability in water, frost, Latimer and Pourbaix diagrams, principals involved in the extraction of the elements.

**UNIT IV**

**Acids and bases:** Arrhenius, Bronsted-Lowery, the Lux-Flood, solvent system and Lewis concept of acids and bases, Classification of acids and bases as hard and soft, Pearson's HSAB concept, acid-base strength and hardness and softness symbiosis, theoretical basis of hardness and softness, Electronegativity and hardness and softness.

**UNIT V**

**Nonaqueous solvents:** Physical properties of solvent, types of solvents and their general characteristics, reaction in non-aqueous solvents with reference to liquid  $\text{NH}_3$  and liquid  $\text{SO}_2$ .

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Organic Chemistry

*Scheme of examination:*

MM: 52

1. In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

**UNIT – I**

**Carboxylic Acids – I:** Nomenclature structure and bonding, physical properties, acidity of carboxylic acids, effects of substitution on acid strength, comparison of acidity with phenols preparation of carboxylic acids, reactions of carboxylic acids, Hell-Volhard-Zelinsky reaction, synthesis of acid chlorides, esters and amides, reduction of carboxylic acids, mechanism of decarboxylation.

Aromatic carboxylic acids: synthesis and reaction of Benzoic acid Salicylic acid, Pthalic acid and Cinnamic acid.

**UNIT – II**

**Carboxylic Acids – II:** Method of formation and chemical reactions of  $\alpha$ ,  $\beta$  and  $\gamma$  hydroxyl acids. Malic, tartaric and citric acids. Method of formation and chemical reactions of unsaturated monocarboxylic acids, dicarboxylic acids. Method of formation and effect of heat and dehydrating agents.

**UNIT – III**

**Carboxylic Acid derivatives:** Structure and nomenclature of acid chlorides, esters, amides (urea) and acid anhydrides relative stability of acyl derivatives physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.

Preparation of carboxylic acid derivatives, chemical reaction mechanism of esterification and hydrolysis (acidic and basic).

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Fats, oil and detergents: natural fats, edible and industrial oil, vegetable origin common fatty acids, glycerides, hydrogenation of unsaturated oil, saponification value, iodine value, acid value soaps, synthetic detergents, alkyl and aryl sulphonates.

#### UNIT – IV

**Organic compounds of Nitrogen:** Preparation of nitroalkanes chemical reaction of nitroalkanes mechanism of nucleophilic. Substitution in nitroalkanes and their reduction in acid neutral and alkaline media. Picric acid structure and nomenclature of amines, physical properties, stereochemistry of amines, separation of a mixture of primary, secondary and tertiary amines, structural features affecting basicity of amines, amine salt and phase-transfer catalysts. Preparation of alkyl and aryl amines (reduction of nitro compounds & nitriles). Reductive amination of aldehydic and ketonic compounds Gabrielphthalimide reaction. Hofmann bromamide reaction. Reaction of amines. Aryl diazonium salts, preparation and synthetic transformations, azo coupling diazomethane.

#### UNIT – V

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

Note: Mechanism of reactions should be studied where possible.

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Physical Chemistry

Scheme of examination: MM: 52

1. In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

**UNIT – I**

Spectroscopy: IR Spectroscopy, conditions of IR Spectroscopy, modes of vibrations in diatomic, linear and non-linear polyatomic molecules, force constant and its significance. Applications of infrared spectroscopy in elucidation of structure of molecules.

**UNIT II**

Quantum Chemistry – I: Quantum theory of radiations, photoelectric effect and Compton effect. Limitations of Bohr models, Heisenberg uncertainty principle, wave nature of electron, De Broglie wave equation and its experimental verification, operator and their applications.

**UNIT III**

Quantum Chemistry – II: Sinusoidal wave motion, derivation of Schrodinger's wave equation, physical significance of  $\psi$  (psi) and  $\psi^2$  (psi)<sup>2</sup> eigenvalue and eigen functions Characteristics of wave function. Normalization and orthogonality of wave functions solution of Schrodinger wave equation particle in one dimensional box.

**UNIT IV**

Photochemistry – I: Absorption of light Grothus Draper law, Einstein's law of photo chemical equivalence quantum yield of photochemical reactions. Reasons for high and low quantum yield of photochemical reactions. Primary and secondary process, chain reaction between  $H_2 +$

Br<sub>2</sub>

**UNIT V**

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Further down, "col 01" is written.

Photochemistry – II: Photochemical reaction such as (1)  $H_2 + Cl_2$  reaction  
(2) photolysis of ammonia (3) hydrolysis of mono chloroacetic acid.

Consequences of light absorption – phosphorescence fluorescence,  
chemiluminescence & photosensitization.

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Cl<sub>2</sub>

Cl<sub>2</sub>

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Analytical Chemistry

*Scheme of examination:*

*MM: 52*

- 1. In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.*

**UNIT – I**

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

**UNIT II**

**Atomic emission and atomic absorption spectrometry: Elementary theory instrumentation. Nebulization, flames and flame temperatures interferences flame spectrometric techniques.**

**UNIT III**

**Flame emission and atomic flame emission and spectrography: Spectroscopic instrument for emission spectroscopic analysis qualitative and quantitative spectrographic analysis quantitative spectrographic analysis of (a) a non ferrous alloy (b) a complex organic mixture.**

**UNIT IV**

**Thermal analysis: Thermogravimetry (TG), instrumentation, thermometric titration, applications.**

**UNIT V**

**Differential thermal analysis and differential scanning calorimetry instrumentation.**

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