# KCET 2025 PCMB Syllabus
# PHYSICS -CLASS XI (THEORY)

## Unit I: Units and Measurements

**Need for measurement:** Units of measurement; systems of units; SI units, fundamental and derived units. Significant figures.

Dimensions of physical quantities, Dimensional formulae and equations, dimensional analysis and its applications.

## Unit II: Kinematics

Frame of reference, Motion in a straight line: speed and velocity. Uniform and non-uniform motion, instantaneous speed and velocity. Uniformly accelerated motion, velocity-time graph and position-time graph, relations for uniformly accelerated motion (graphical treatment).

Elementary concepts of differentiation and integration for describing motion.

Scalar and vector quantities: Position and displacement vectors, general vectors and notation, equality of vectors, multiplication of vectors by a real number, addition and subtraction of vectors.

Unit vectors, Resolution of a vector in a plane-rectangular components. Scalar and vector products of vectors. Motion in a plane. Cases of uniform velocity and uniform acceleration-projectile motion, uniform circular motion.

## Unit III: Laws of Motion

Intuitive concept of force. Inertia. Newton's first law of motion; momentum and Newton's second law of motion, impulse; Newton's third law of motion. Law of conservation of linear momentum and its applications.

Equilibrium of concurrent forces, common forces in mechanics, Static and kinetic friction, laws of friction, rolling friction, methods of reducing friction.

Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on level circular road, vehicle on banked road).

## Unit IV: Work Energy and Power

Work done by a constant force and a variable force; kinetic energy, work-energy theorem, power. Notion of potential energy, potential energy of a spring, conservative forces; conservation of mechanical energy (kinetic and potential energies); non-conservative forces; motion in a vertical circle, elastic and inelastic collisions in one and two dimensions.

## Unit V: Motion of System of Particles and Rigid Body

Centre of mass of a two-particle system, momentum conservation and motion of centre of mass. Centre of mass of rigid bodies.

Moment of a force (torque). Angular momentum, conservation of angular momentum with some examples.

Equilibrium of rigid bodies, rigid body rotation and equation of rotational motion, comparison of linear and rotational motions; moment of inertia, radius of gyration, moment of inertia of some regular bodies about specific axes (no derivation).

## Unit VI: Gravitation

Kepler's laws of planetary motion. The universal law of gravitation and gravitational constant. Acceleration due to gravity and its variation with altitude and depth.

Gravitational potential energy; gravitational potential, escape velocity, Earth satellites – orbital velocity and time period of a satellite, energy of an orbiting satellites.

## Unit VII: Properties of Bulk Matter

Stress-strain relationship, Hooke's law, stress-strain curve), Young's modulus, bulk modulus, shear modulus of rigidty, Poisson's ratio; elastic energy. Applications of elastic behaviour of materials.

Pressure due to a fluid column, Pascal's law and its applications (hydraulic lift & hydraulic brakes). Fluid Dynamics-Equation of continuity,

**Viscosity:** Stokes' law, terminal velocity, streamline and turbulent flow. Bernoulli's theorem and its applications.

**Surface tension:** Surface energy, angle of contact, excess of pressure, application of surface tension ideas to drops, bubbles and capillary rise.

Thermal properties of matter. Heat and temperature, ideal gas equation and absolute temperature, thermal expansion; thermal expansion of solids, liquids and gases. Specific heat capacity: $C_P$, $C_v$, calorimetry; change of state-latent heat.

Heat transfer-conduction and thermal conductivity, convection and radiation. Qualitative ideas of Black Body Radiation, Wein's displacement law, Stefan-Boltzmann's law and Newton's law of cooling.

## Unit VIII: Thermodynamics

Thermal equilibrium and definition of temperature (zeroth law of Thermodynamics). Heat, work and internal energy. First law of thermodynamics. Specific heat capacity, thermo dynamic state variables and equation of state, thermodynamic processes-Isothermal and adiabatic processes.

**Second law of thermo dynamics:**

Reversible and irreversible processes. Carnot engine.

## Unit IX: Behavior of Perfect Gas and Kinetic Theory

Equation of state of a perfect gas.

*Kinetic theory of gases:* Assumptions, concept of pressure. Kinetic energy and temperature; *rms* speed of gas molecules; degrees of freedom, law of equipartition of energy (statement only) and application to specific heat capacities of gases and solids; concept of mean free path.

## Unit X: Oscillations and Waves

Periodic motion-period, frequency, displacement as a function of time: Periodic functions. Simple harmonic motion (SHM) and its equation; phase; oscillations of a spring-restoring force and force constant; energy in SHM – kinetic and potential energies; simple pendulum-derivation of expression for its time period.

Wave motion: Longitudinal and transverse waves, speed of wave motion. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics. Beats.

**Reference books:**

1. A Text book of Physics Part – 1 for class XI (Latest revised edition of NCERT text book)
2. A Text book of Physics Part - 2 for class XI (Latest revised edition of NCERT text book)

# PHYSICS CLASS XII (THEORY)

## Unit I: Eletrostatics

Electric charges and their basic properties. Coulomb's law-force between two point charges, forces between multiple charges; superposition principle and continuous and continuous charge distribution.

Electric field: electric field due to a point charge, electric field lines; electric dipole, electric field due to a dipole; torque on a dipole in a uniform electric field.

Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside). Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of charges and of electric dipole in an electrostatic field.

Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarisation, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor (no derivation).

## Unit II: Current Electricity

Electric current, flow of electric charges in a metallic conductor, drift velocity and mobility, and their relation with electric current; Ohm's law, electrical resistance, V-I characteristics (linear and non-linear, electrical energy and power, electrical resistivity and conductivity, temperature dependence of resistance.

Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel. Kirchhoff's laws and its simple applications. Wheatstone bridge

## Unit III: Magnetic Effects of Current and Magnetism

Concept of magnetic field, Oersted's experiment. Biot-Savart's law and its application to current carrying circular loop.

Ampere's law and its applications to infinitely long straight wire and solenoid. Force on a moving charge in uniform magnetic and electric fields.

Force on a current-carrying conductor in a uniform magnetic field. Force between two parallel current-carrying conductors – definition of ampere. Torque experienced by a current loop in a magnetic field; moving coil galvanometer-its current sensitivity and conversion to ammeter and voltmeter.

Current loop as a magnetic dipole and its magnetic dipole moment. Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; bar magnet as an equivalent solenoid (only expression). Magnetic field lines; dipole in a uniform magnetic field, Gauss's law in magnetism. Magnetization and magnetic intensity.

Dia- para-and ferro – magnetic substances, with examples.

## Unit IV: Electromagnetic Induction and Alternating Currents

Electromagnetic induction, Faraday's law, induced and current; Lenz's Law, motional emf. Self and mutual inductance. AC generator.

Alternating currents, peak and rms value of alternating current/voltage; AC applied to a resistor, an inductor and a capacitor, reactance and impedance; LCR series circuit, resonance; power in AC circuits, wattles current. Transformer

## Unit V: Electromagnetic Waves

Need for displacement current. Electromagnetic waves and their characteristics (qualitative ideas only). Transverse nature of electromagnetic waves.

Electromagnetic spectrum (ratio waves, microwaves, infrared, visible, ultraviolet, x-rays, gamma rays) including elementary facts about their uses.

## Unit VI: Optics

Reflection of light, spherical mirrors, mirror formula. Refraction of light, total internal reflection and its applications, optical fibres, refraction at spherical surfaces, lenses, lens-maker's formula. Magnification, power of a lens, combination of thin lenses in contact. Refraction of light through a prism.

***Optical instruments**:* Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers.

***Wave optics*:** Wave front and Huygens' Principle, Proof of laws of reflection and refraction using Huygen's principle. Interference, Young's double hole experiment, coherent sources and sustained interference of light. Diffraction due to a single slit,Polarisation, plane polarized light; uses of Polaroids.

## Unit VII: Dual Nature of Matter and Radiation

Photoelectric effect, Hertx and Lenard's observations; Einstein's photoelectric equation-particle nature of light. Matter waves – wave nature of particles, de Broglie relation.

## Unit VIII: Atoms and Nuclei

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum. De Broglie explanation of Bohr's second postulate.

Composition and size of nucleus, atomic masses, isotopes, isobars, nucleus forces. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number. Radioactivity (only tyes of radioactive decay). Nuclear fission and fusion.

## Unit IX: Electronic Devices

Energy bands in solids (qualitative ideas only), conductors, insulators and semiconductors; semiconductor: intrinsic and extrinsic semiconductors, semiconductor diode, I-V characteristics in forward and reverse bias, diode as a rectifier.

# CHEMISTRY CLASS XI

## Unit I: Some Basic Concepts of Chemistry:

*General Introduction:* Importance and scope of chemistry.
Historical approach to particulate nature of matter, laws of chemical combination, Dalton's atomic theory: concept of elements, atoms and molecules.
Atomic and molecular masses. Mole concept and molar mass; percentage composition and empirical and molecular formula; chemical reactions, stoichiometry and calculations based on stoichiometry.

## Unit II: Structure of Atom:

Discovery of electron, proton and neutron; atomic number, isotopes and isobars. Thomson's model and its limitations, Rutherford's model and its limitations, Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle, concept of orbitals, quantum numbers, shapes of s, p and d orbitals, rules for filling electrons in orbitals- Aufbau principle, Pauli exclusion principle and Hund's rule, electronic configuration of atoms, stability of half-filled and completely filled orbitals.

## Unit III: Classification of Elements and Periodicity in Properties:

Significance of classification, brief history of the development of periodic table, modern periodic law and the present form of periodic table, periodic trends in properties of elements – atomic radii, ionic radii, inert gas radii, ionization enthalpy, electron gain enthalpy, electronegativity, valence Nomenclature of elements with atomic number greater than 100.

## Unit IV: Chemical Bonding and Molecular Structure:

Valence electrons, ionic bond, covalent bond, bond parameters, Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization involving s, p and d orbitals and shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only). Hydrogen bond.

## Unit V: Thermodynamics:

Concepts of system, types of systems, surroundings, work, heat, energy, extensive and intensive properties, state functions.
**First law of thermodynamics** – internal energy and enthalpy, heat capacity and specific heat, measurement of $\Delta U$ and $\Delta$ H, Hess's law of constant heat summation, enthalpy of: bond dissociation, combustion, formation, atomization, sublimation, phase transition, ionization. Solution and dilution.
Introduction of entropy as a state function, Second law of thermodynamics, Gibbs energy changes for spontaneous and non-spontaneous process, criteria for equilibrium.
Third law of thermodynamics – Brief introduction.

## Unit VI: Equilibrium:

Equilibrium in physical and chemical process, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium – Le Chatelier's principle;

Ionic equilibrium – ionization of acids and bases, strong and weak electrolytes, degree of ionization, ionization of polybasic acids, acid strength, concept of pH, Hydrolysis of salts (elementary idea), buffer solutions, Henderson equation, solubility product, common ion effect (with illustrative examples).

## Unit VII : Redox Reactions:

Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions in terms of loss and gain of electron and change in oxidation numbers, applications of redox reactions.

## Unit VIII: Organic Chemistry – Some Basic Principles and Techniques:

**General introduction:** methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds.

Electronic displacements in a covalent bond: inductive effect, electromeric effect, resonance and hyper conjugation.

Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbonions; electrophiles and nucleophiles, types of organic reactions.

## Unit IX: Hydrocarbons:

**Classification of hydrocarbons:**

**Alphatic Hydrocarbons:**

*Alkanes* – Nomenclature, structure of double bond (ethane), geometrical isomerism, physical properties, methods of preparation; chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markovnikov's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition.

Alkynes – Nomenclature, structure of triple bond (ethyne), physical properties, methods of preparation, chemical reactions: acidic character of alkynes, addition reaction of –hydrogen, halogens, hydrogen halides and water.

Aromatic hydrocarbons – Introduction IUPAC nomenclature; Benzene resonance, aromaticity; chemical properties: mechanism of electrophilic substitution – nitration sulphonation, halogenations, Friedel Craft's alkylation and acylation; directive influence of functional group in mono-substituted benzene; carcinogenicity and toxicity.

# CHEMISTRY CLASS XII

## Unit I: Solutions:

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties – relative lowering of vapour pressure, Raoult's law. Elevation of B.P., depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass, Vant Hoff factor.

## Unit II: Electrochemistry:

Redox reactions; conductance in electrolytic solutions, specific and molar conductivity variations of conductivity with concentration, Kohlrausch's Law, electrolysis and laws of electrolysis (elementary idea), dry cell – electrolytic cells and Galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Nemst equation and its application to chemical cells. Relation between Gibbs energy change and EMF of a cell, fuel cells; corrosion.

## Unit III: Chemical Kinetics:

Rate of a reaction (average and instantaneous), factors affecting rates of reaction: concentration, temperature, catalyst; order and molecuarity of a reaction; rate law and specific rate constant, integrated rate equations and half life (only for zero and first order reactions); concept of collision theory (elementary idea, no mathematical treatment). Activation energy, Arrhenius equation.

## Unit IV: d and f Block Elements

General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals – metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property. Magnetic properties, interstitial compounds, alloy formation. Preparation and properties of $K_2Cr_2O_7$ and $KMnO_4$.

*Lanthanoids* – electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction and its consequenes.

*Actinoids* – Electronic configuration, oxidation states and comparison with lanthenoids.

## Unit V: Coordination Compounds

Coordination compounds – Introduction, ligands, coordinatin number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds, bonding, Werner;s theory VBT, CFT, isomerism (structural and sterco) importance of coordination compounds (in qualitative analysis, extraction of metals and biological systems).

## Unit VI: Haloalkanes and Haloarenes

*Haloalkanes*: Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions. Optical rotation.
*Haloarenes:* Nature of C-X bond, substitution reactions (directive influence of halogen for monosubstituted compounds only).

## Unit VII: Alcohols, Phenols and Ethers

Alcohols: Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only); identification of primary, secondary and tertiary alcohols; mechanism of dehydration, uses, with special reference to methanol and ethanol.

*Phenols*: Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols.

*Ethers*: Nomenclature, methods of preparation, physical and chemical properties, uses.

## Unit VIII: Aldehydes, Ketones and Carboxylic Acids

Aldehydes and Ketones: Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, and mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes; uses.
Carboxylic Acids: Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

## Unit IX: Organic Compounds Containing Nitrogen

*Amines:* Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary secdondary and tertiary amines.

*Cyanides and Isocyanides* – will be mentioned at relevant places in context.
*Diazonium salts:* Preparation, chemical reactions and importance in synthetic organic chemistry.

## Unit X: Biomolecules:

*Carbohydrates* – Classification (aldoses and ketoses), monosaccharidc (glucose and fructose). D-L configuration, oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen): importance.

Proteins-Elementary idea of – amino acids, peptide bond, polypeptides, proteins, primary structure, secondary structure, tertiary structure and quatemary structure (qualitative idea only), denaturation of proteins; enzymes.

**Hormones – Elementary idea (excluding structure).**

*Vitamins* – Classification and functions.
*Nucleic Acids:* DNA and RNA

# MATHEMATICS: CLASS XI

## UNIT I: SETS AND FUNCTIONS

### 1. SETS

Sets and their representations. Empty set. Finite and Infinite sets. Equal sets. Subsets. Subsets of a set of real numbers especially intervals (with notations). Universal set. Venn diagrams. Union and Intersection of sets. Difference of sets. Complements of a set, Properties of Complement sets.

### 2. Relations & Functions

Ordered pairs, Cartesian product of sets. Number of elements in the Cartesian product of two finites sets. Cartesian product of the reals with itself (up to R × R × R). Definition of Relation, Pictorial diagrams, domain, co-domain and range of a relation. Functions as a special kind of relation from one set to another. Pictorial representation of a function, Domain, Co-domain and Range of a function. Real valued function of a real variable, domain and range of these functions. Constant, identify, polynomial, rational, modulus, signum and greatest integer functions with their graphs. Sum, difference, product and quotients of functions.

### 3. Trigonometric Functions

Positive and Negative angles, Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity $sin^2x + cos^2x = 1$, for all x.

Signs of trigonometric functions and sketch of their graphs. Expressing sin $(x \neq y)$ and cos $(x \neq y)$ in terms of sinx, siny, cosx & cosy. Deducing identities like following:

tan $(x \pm y) = \frac{tanx \pm tany}{1 \mp tanxtany}$; $cot(x \pm y) = \frac{cotxcoty \mp 1}{coty \pm cotx}$

sinx + siny = 2 sin $\left(\frac{x+y}{2}\right) cos\left(\frac{x-y}{2}\right)$; $cosx + cosy = 2cos\left(\frac{x+y}{2}\right) cos\left(\frac{x-y}{2}\right)$,

sinx + siny = 2 cos $\left(\frac{x+y}{2}\right) cos\left(\frac{x-y}{2}\right)$; $cosx + cosy = 2sin\left(\frac{x+y}{2}\right) sin\left(\frac{x-y}{2}\right)$,

Identities related to sin 2x, cos2x, tan2x, sin3x, cos 3x and tan 3x.

## Unit II: ALGEBRA

### 1. Complex Numbers and Quadratic Equations

Need for complex numbers, especially $\sqrt{-1}$, to be motivated by inability to solve every quadratic equation. Brief description of algebraic properties of complex numbers. Argand plane.

### 2. Linear Inequalities

Linear inequalities. Algebraic solution of linear inequalities in one variable and their representation on the number line.

### 3. Permutations and Combinations.

Fundamental principle of counting. Factorial $n$. Permutations and combinations, derivation of formulae and their connections, simple applications.

### 4. Binomial Theorem

Statement and proof of the bionomial theorem for positive integral indices. Pascal's triangle. Simple applications.

### 5. Sequence and Series

Sequence, Series. Arithmetic Mean (A.M.), Geometric Progression (G.P.), general term of a G.P., sum of n terms of a G.P., Arithmetic and Geometric series, infinite G.P. and its sum, geometric mean (G.M.). Relation between A.M. and G.M.

## UNIT III: COORDINATE GEOMETRY

**1. Straight Lines.**
Brief recall of 2-D from earlier classes, Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, two-point form, intercepts from. Distance of a point from a line.

**2. Conic Sections.**
Sections of a cone: Circles, ellipse, parabola, hyperbola, a point, a straight line and pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

**3. Introduction to Three-dimensional Geometry.**
Coordinate Axes and Coordinate planes in three-dimensions. Coordinates of a point. Distance between two points.

## UNIT IV: CALCULUS

**1. Limits and Derivatives**
Dervative introduced as rate of change both as that of distance function and geometrically, intuitive idea of limit, Definition of derivative, relates it to slope of tangent of the curve. Derivative of sum, product, quotient of functions. Derivative of polynomials and trigonometric functions.

## UNIT V: STATISTICS AND PROBABILITY

**1. Statistics**
**Measure of dispersion:** Mean deviation, Variance and Standard deviation of ungrouped/grouped data.

**2. Probability**
Events: Occurrence of events, ‘not’, ‘and’ & ‘or’ events, exhaustive events, mutually exclusive events. Axiomatic (set theoretic) probability, connections with the theories of earlier classes. Probability of an event, probability of ‘not’, ‘and’, & ‘or’ events.

# MATHEMATICS: CLASS XII

## UNIT I: RELATION AND FUNCTIONS

### 1. Relations and Functions

Types of relations: Reflexive, symmetric, transitive and equivalence relations. One to one and onto functions.

### 2. Inverse Trigonometric Functions

Definition, range, domain, principal value branches. Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions.

## UNIT II: ALGEBRA

### 1. Matrices

Concept, notation, order, equality, types of matrices, zero matrix, transpose of a matrix, symmetric and skew symmetric matrices. Addition, multiplication and scalar multiplication of matrices, simple properties of addition, multiplication and scalar multiplication Non-commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Invertible matrices and proof of the uniquencess of inverse, if it exists (Here all matrices will have real entries).

### 2. Determinants

Determinant of a square matrix (up to $3 \times 3$ matrices), minors, cofactors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

## UNIT III: CALCULUS

### 1. CONTINUITY AND DIFFERENTIABILITY

Continuity and Differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit function. Concepts of exponential, logarithmic functions. Derivatives of $log_e x$ and $e^x$. Logarithmic differentiation. Derivative of functions expressed in parametric forms. Second order derivatives.

### 2. Application of Derivatives

Applications of derivatives: Rate of change, increasing/decreasing functions, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principle and understanding of the subject as well as real-life situations).

### 3. Integrals

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, only simple integrals of the type-

$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{ax^2 + bx + c},$

$\int \frac{(px+q)dx}{ax^2+bx+c}, \int \frac{(px+q)dx}{\sqrt{ax^2+bx+c}}, \int \sqrt{a^2 \pm x^2}dx, \int \sqrt{x^2 - a^2}dx$ to be evaluated.

Definite Integral. Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

**4. Application of Integrals**

Applications in finding the area under simple curves, especially lines, arcs of circles/parabolas/ellipses (in standard form only).

**5. Differential Equations**

Definition, order and degree, general and particular solutions of a differential equation. Solution of differential equations by method of separation of variables, homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type –

$\frac{dy}{dx} + Py = Q$ where P and Q are function of x or constant.

$\frac{dx}{dy} + Px = Q$, where P and Q are function of y or constant.

## UNIT IV: VECTORS AND THREE –DIMENSIONAL GEOMETRY

**1. Vectors**

Vectors and scalars, magnitude and direction of a vector. Direction cosines/ratios of vectors. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors.

**2. Three-dimensional Geometry**

Direction cosines/direction ratios of a line joining two points. Cartesian and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Angle between two lines.

## UNIT V : LINEAR PROGRAMMING

Introduction , related terminology such as constraints, objective function, optimization, graphical method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

## UNIT VI: PROBABLITY

Multiplication theorem on probability. Conditional probability, independent events, total probability, Bayes' theorem.

# BIOLOGY CLASS XI

## I. Diversity in the Living World

**Chapter -1: The Living world: Biodiversity;** Need for classification, Taxonomy & Systematics; Binomial nomenclature; Concept of species and taxonomical hierarchy.

**Chapter -2: Biological Classification:** Three domain of life, five kingdom classification; Salient features and classification of Monera; Protista and Fungi into major groups; Lichens; Viruses and Viroids.

**Chapter -3: Plant Kingdom:** Salient Features and Classification of plants into major groups – Algae, Bryophytes, Pteriodphytes and Gymnosperms.

**Chapter-4: Animal Kingdom:** Salient features and classification of animals –non chordate up to phyla level and chordate up to classes level (3 to 5 salient features and at least two examples).

## II. Structural Organization in Plants and Animals

**Chapter -5: Morphology of Flowering Plants:** Morphology and functions of different parts of flowering plants –Root, stem, leaf, inflorescence –cymose and racemose, flower, fruit and seed (To be dealt along with the relevant practical of the Practical syllabus). Semi-technical description of a typical flowering plant; Family Solanaceae features and its economic importance.

**Chapter -6: Anatomy of Flowering Plants:** Tissue systems; Anatomy of Root, stem and leaf (Dicotyledonous and Monocotyledonous plants).

**Chapter-7: Structural Organisation in Animals:** Morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of frog. (Brief account only).

## III. Cell Structure and Functions

**Chapter -8: Cell:** The Unit of Life-Cell theory and cell as the basic unit of life: Structure of prokaryotic and eukaryotic cell; Plant cell and animal cell; Cell envelope, cell membrane, cell wall; Cell organelles-structure and function; Endomembrane system-endoplasmic reticulum, Golgibodies, lysosomes, vacuoles; mitochondria, ribosome, plastids, microbodies; Cytoskeleton, cilia, flagella, centrioles (ultra structure & function); Nucleus-nuclear membrane, chromatin, nucleolus.

**Chapter-9: Biomolecules:** Chemical constituents of living cells; structure and function of proteins, carbohydrates, lipids, nucleic acids; Enzymes-Types, properties, enzyme action.

**Chapter-10:** Cell Cycle and Cell division: Cell cycle, mitosis, meiosis and their significance.

## IV. Plant Physiology

**Chapter -11: Photosynthesis in Higher Plants:** Photosynthesis as a means of Autotrophic nutrition; Where does photosynthesis take place, How many pigments are involved in Photosynthesis (Elementary idea); Photochemical and biosynthetic phases of photosynthesis; Cyclic and non-cyclic photophosphorylation; Chemiosmotic hypothesis; Photorespiration; $C_3$ and $C_4$ pathways; Factors affecting photosynthesis.

**Chapter -12: Respiration in Plants:** Exchange of gases; Cellular respiration – glycolysis, fermentation (anaerobic), TCA cycle and electron transport system (aerobic); Energy relations-Number of ATP molecules generated; Amphibolic pathways; Respiratory quotient.

**Chapter – 13: Plant Growth and Development:** Seed germination; Phases of plant growth and plant growth rate; Conditions of growth; Differentiation, dedifferentiation and redifferentiation; Sequence of developmental process in a plant cell; Growth regulators – auxin, gibberellins, cytokinin, ethylene and ABA.

## V. Human Physiology

**Chapter-14:** Breathing and Exchange of Gases: Respiratory organs in animals (recall only); Respiratory system in humans; Mechanism of breathing and its regulation in humans – Exchange of gases, transport of gases and regulation of respiration, Respiratory volumes; Disorders related to respiration –Asthma, Emphysema, Occupatinal respiratory disorders.

**Chapter -15:** Body Fluids and Circulation: Composition of blood, blood groups, coagulation of blood; Composition of lymph and its function; Human circulatory system – Structure of human heart and blood vessels; Cardiac cycle, cardiac output, ECG; Double circulation; Regulation of cardiac activity; Disorders of circulatory system-Hypertension, Coronary artery disease, Angina pectoris, Heart failure.

**Chapter-16:** Excretory Products and their Elimination: Modes of excretion –Ammonotelism, ureotelism, uricotelism; Human excretory system-structure and function; Urine formation, Osmoregulation; Regulation of kidney function – Renin-angiotensin, Atraial Natriuretic Factor, ADH and Diabetes insipidus, Role of other organs in excretion; Disorders-Uraemia, Renal failure, Renal calculi, Nephritis; Dialysis and artificial kidney.

**Chapter-17:** Locomotion and Movement: Types of movement- ciliary, flagellar, muscular; Skeletal muscle – contractile proteins and muscle contraction, Sketetal system and its functions (To be dealt with the relevant practical of Practical syllabus); Joints; Disorders of muscular and skeletal system-Myasthenia gravis, Tetany, Muscular dystrophy, Arthiritis, Osteoporosis, Gout.

**Chapter-18:** Neural Control and Coordination: Neuron and nerves; Nervous system in humans central nervous system, peripheral nervous system and visceral nervous system; Generation and conduction of nerve impulse.

**Chapter – 19:** Chemical Coordination and Integration: Endocrine glands and hormones; Human endocrine system- Hypothalmus, Pituitary, Pineal, Thyroid, Parathyroid, Adrenal, Pancreas, Gonads; Mechanism of hormone action (Elementary Idea); Role of hormones as messengers and regulators, Hypo-and hyperactivity and related disorders (Common disorders e.g. Dwarfism, Acromegaly, Cretinism, goiter, exopthalmic goiter, diabetes, Addison's disease).
Important: Diseases related to all the human physiology systems to be taught in brief.

# BIOLOGY CLASS XII

## I. Reproduction

**Chapter -1:** Sexual Reproduction in Flowering Plants: Flower structure; Development of male and female gametophytes; Pollination – types, agentices and examples, Outbreeding devices; Pollen Pistil interaction; Double fertilization; Post fertilization events Development of endosperm and embryo, Development of seed and formation of fruit; Special modes – apomixes, pathenocarpy, polyembryony; Significance of seed and fruit formation.

**Chapter-2:** Human Reproduction: Male and female reproductive systems; Microscopic anatomy of testis and ovary; Gametogenesis – spermatogenesis & oogenesis; Mernstrual cycle; Fertilisation, embryo development upto blastocyst formation, implantation; Pregnancy and placenta formation (Elementary idea); Parturition (Elementary idea); Lactation (Elementary idea).

**Chapter – 3:** Reproductive Health: Need for reproductive health and prevention of sexually transmitted diseases (STD); Birth control – Need and Methods, Contraception and Medical Termination of Pregnancy (MTP); Amniocentesis; Infertility and assisted reproductive technologies – IVF, ZIFT, GIFT (Elementary idea for general awareness).

## II. Genetics and Evolution

**Chapter – 4:** Principles of Inheritance and Variation: Mendelism Inheritance; Deviations from Mendelism Incomplete dominance, Co-dominance, Multiple allels and Inheritance of blood groups, Pleiotropy; Elementary idea of polygenic inheritance; Chromosome theory of inheritance; Chromosomes and genes; Sex determination – In humans, birds, honey bee; Linkage and crossing over, Mendelian disorders in humans – Sex linked inheritance (Haemophilia and Colour blindness) and Autosome linked inheritance (Sickle cell anaemia, Pheynylketonuria and Thalassemia); Chromosomal disorders in humans (Down's syndrome, Tumer's and Klinefelter's syndromes).

**Chapter -5:** Molecular Basis of Inheritance Search for genetic material and DNA as genetic material; Xtructure of DNA and RNA; DNA packing, DNA replication, Central dogma; Transcription, genetic code translation; Gene expression and regulation – Lac Operon; Genome and human genome project; DNA fingerprinting.

**Chapter -6:** Evolution: Origin of life; Biological evolution and evidences for biological evolution (Paleontological, comparative anatomy, embryology and molecular evidence); Darwin's contribution, Modern Synthetic theory of Evolution; Mechanism of evolution – Variation (Mutation and Recombination) and Natural Selection with examples, types of natural selection; Gene flow and genetic drift; Hardy – Weinberg's principle; Adaptive Radiation; Human evolution.

## III.Biology in Human Welfare

**Chapter – 7:** Human Health and Disease: Pathogens; parasites causing human diseases (Malaria, Filariasis, Asariasis, Typhoid, Pneumonia, common cold, amoebiasis, ring worm); Basic concepts of immunology – vaccines; Cancer, HIV and AIDs; Adolescence, drug and alcohol abuse.

**Chapter -8:** Microbes in Human Welfare in household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers.

## IV. Biotechnology and its Application

**Chapter-9:** Biotechnology: Principle and Processes: Genetic engineering (Recombinant DNA technology).

**Chapter-10:** Biotechnology and its Applications: Application of Biotechnology in health and agriculture; Human insulin and vaccine production, gene therapy; Genetically modified organisms-Bt crops; Transgenic Animals; Biosafety issues-Biopiracy and patents.

## V. Ecology and Environment

**Chapter -11:**Organisms and Populations: Population- Population attributes-Growth, birth rate, death rate, age distribution; Population interactions 0mutualism, competition, predation, parasitism and commensalism.

**Chapter -12:** Ecosystem: Patterns, components, productivity and decomposition, Energy flow; Pyramids of number, biomass and energy.

**Chapter -13:** Biodiversity and Conservation: Concept of Biodiversity; Patterns of Biodiversity; Importance of Biodiversity; Loss of Biodiversity; Biodiversity conservation; Hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, National parks and sanctuaries.