

**ENTRANCE  
SYLLABUS  
2026-27  
FOR  
B.PHARM  
AND  
D.PHARM**

# PHYSICS

## I - Electrostatics

Electric Charges and Fields 26 Periods Electric charges, Conservation of charge, Coulomb's law-force between two- point charges, forces between multiple charges; superposition principle 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 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).

## II - Electrostatic Potential and Capacitance

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 two-point charges and of electric dipole in an electrostatic field.

Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarization, 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, formulae only).

Current Electricity 18 Periods Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current; Ohm's law, 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 rules, Wheatstone bridge.

Moving Charges and Magnetism Concept of magnetic field, Oersted's experiment. Biot - Savart law and its application to current carrying circular loop. Ampere's law and its applications to infinitely long straight wire. Straight solenoid (only qualitative treatment), 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 uniform magnetic field; Current loop as a magnetic dipole and its magnetic dipole moment, moving coil galvanometer- its current sensitivity and conversion to ammeter and voltmeter.

## III - Magnetism and Matter

Bar magnet, bar magnet as an equivalent solenoid (qualitative treatment only), magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis (qualitative treatment only), torque on a magnetic dipole (bar magnet) in a uniform magnetic field (qualitative treatment only), magnetic field lines. Magnetic properties of materials- Para-, dia- and ferro - magnetic substances with examples, Magnetization of materials, effect of temperature on magnetic properties.

## IV - Electromagnetic Induction and Alternating Currents

Electromagnetic Induction Electromagnetic induction; Faraday's laws, induced EMF and current; Lenz's Law, Self and mutual induction.

## **V - Alternating Current**

Alternating currents, peak and RMS value of alternating current/voltage; reactance and impedance; LCR series circuit (phasors only), resonance, power in AC circuits, power factor, wattless current. AC generator, Transformer.

## **VI - Electromagnetic waves**

Electromagnetic Waves Basic idea of displacement current, Electromagnetic waves, their characteristics, their transverse nature (qualitative idea only). Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses.

## **VII - Optics**

Ray Optics and Optical Instruments 30 Periods Ray Optics: Reflection of light, spherical mirrors, mirror formula, refraction of light, total internal reflection and optical fibers, refraction at spherical surfaces, lenses, thin lens formula, 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 optics: Wave front and Huygen's principle, reflection and refraction of plane wave at a plane surface using wave fronts. Proof of laws of reflection and refraction using Huygen's principle. Interference, Young's double slit experiment and expression for fringe width (No derivation final expression only), coherent sources and sustained interference of light, diffraction due to a single slit, width of central maxima (qualitative treatment only).

## **VIII - Dual Nature of Radiation and Matter**

Dual Nature of Radiation and Matter 08 Periods Dual nature of radiation, Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation-particle nature of light. Experimental study of photoelectric effect Matter waves-wave nature of particles, de-Broglie relation.

## **IX - Atoms and Nuclei**

Atoms Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model of hydrogen atom, Expression for radius of nth possible orbit, velocity and energy of electron in nth orbit, hydrogen line spectra (qualitative treatment only).

Nuclei Composition and size of nucleus, nuclear force Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission, nuclear fusion.

## **X - Electronic Devices**

Semiconductor Electronics: Materials, Devices and Simple Circuits Energy bands in conductors, semiconductors and insulators (qualitative ideas only) Intrinsic and extrinsic semiconductors- p and n type, p-n junction Semiconductor diode - I-V characteristics in forward and reverse bias, application of junction diode -diode as a rectifier.

## CHEMISTRY

**I - Solutions** 10 Periods Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, Raoult's law, colligative properties - relative lowering of vapour pressure, elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass, Van't Hoff factor.

**II - Electrochemistry** 12 Periods Redox reactions, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, Relation between Gibbs energy change and EMF of a cell, conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's Law, electrolysis and law of electrolysis (elementary idea), dry cell-electrolytic cells and Galvanic cells, lead accumulator, fuel cells, corrosion.

**III - Chemical Kinetics** 10 Periods Rate of a reaction (Average and instantaneous), factors affecting rate of reaction: concentration, temperature, catalyst; order and molecularity 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.

**IV- d and f Block Elements** 12 Periods 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 consequences. Actinoids - Electronic configuration, oxidation states and comparison with lanthanoids.

**V - Coordination Compounds** 12 Periods Coordination compounds - Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds. Bonding, Werner's theory, VBT, and CFT; structure and stereoisomerism, importance of coordination compounds (in qualitative analysis, extraction of metals and biological system).

**VI - Haloalkanes and Haloarenes.** 10 Periods Haloalkanes: Nomenclature, nature of C–X bond, physical and chemical properties, optical rotation mechanism of substitution reactions. Haloarenes: Nature of C–X bond, substitution reactions (Directive influence of halogen in monosubstituted compounds only). Uses and environmental effects of - dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.

**VII - Alcohols, Phenols and Ethers** 10 Periods 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.

**VIII - Aldehydes, Ketones and Carboxylic Acids** 10 Periods Aldehydes and Ketones: Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, mechanism of

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

**IX - Amines** 10 Periods Amines: Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines. Diazonium salts: Preparation, chemical reactions and importance in synthetic organic chemistry.

**X - Biomolecules** 12 Periods Carbohydrates - Classification (aldoses and ketoses), monosaccharides (glucose and fructose), D-L configuration oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen); Importance of carbohydrates. Proteins -Elementary idea of - amino acids, peptide bond, polypeptides, proteins, structure of proteins - primary, secondary, tertiary structure and quaternary structures (qualitative idea only), denaturation of proteins; enzymes. Hormones - Elementary idea excluding structure. Vitamins - Classification and functions. Nucleic Acids: DNA and RNA.

## BIOLOGY

**I – Reproduction:** Sexual Reproduction in Flowering Plants Flower structure; development of male and female gametophytes; pollination - types, agencies and examples; out breeding devices; pollen-pistil interaction; double fertilization; post fertilization events - development of endosperm and embryo, development of seed and formation of fruit; special modes- apomixis, parthenocarpy, polyembryony; Significance of seed dispersal and fruit formation.

Human Reproduction Male and female reproductive systems; microscopic anatomy of testis and ovary; gametogenesis -spermatogenesis and oogenesis; menstrual cycle; fertilisation, embryo development upto blastocyst formation, implantation; pregnancy and placenta formation (elementary idea); parturition (elementary idea); lactation (elementary idea).

Reproductive Health Need for reproductive health and prevention of Sexually Transmitted Diseases (STDs); 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:** Principles of Inheritance and Variation Heredity and variation: Mendelian inheritance; deviations from Mendelism – incomplete dominance, co-dominance, multiple alleles and inheritance of blood groups, pleiotropy; elementary idea of polygenic inheritance; chromosome theory of inheritance; chromosomes and genes; Sex determination - in humans, birds and honey bee; linkage and crossing over; sex linked inheritance - haemophilia, colour blindness; Mendelian disorders in humans - thalassemia; chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

Molecular Basis of Inheritance Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central Dogma; transcription, genetic code, translation; gene expression and regulation - lac operon; Genome, Human and rice genome projects; DNA fingerprinting.

Evolution Origin of life; biological evolution and evidences for biological evolution (paleontology, comparative anatomy, embryology and molecular evidences); 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 and Human Welfare:** Human Health and Diseases Pathogens; parasites causing human diseases (malaria, dengue, chikungunya, filariasis, ascariasis, typhoid, pneumonia, common cold, amoebiasis, ring worm) and their control; Basic concepts of immunology - vaccines; cancer, HIV and AIDS; Adolescence - drug and alcohol abuse.

Microbes in Human Welfare Microbes in food processing, industrial production, sewage treatment, energy generation and microbes as bio-control agents and bio-fertilizers. Antibiotics; production and judicious use.

**IV - Biotechnology and its Applications:** Biotechnology - Principles and Processes Genetic Engineering (Recombinant DNA Technology).

Biotechnology and its Applications Application of biotechnology in health and agriculture: Human insulin and vaccine production, stem cell technology, gene therapy; genetically modified organisms - Bt crops; transgenic animals; biosafety issues, biopiracy and patents.

**V - Ecology and Environment:** Organisms and Populations Population interactions - mutualism, competition, predation, parasitism; population attributes - growth, birth rate and death rate, age distribution. (Topics excluded: Organism and its Environment, Major Abiotic Factors, Responses to Abiotic Factors, Adaptations)

Ecosystem Ecosystems: Patterns, components; productivity and decomposition; energy flow; pyramids of number, biomass, energy (Topics excluded: Ecological Succession and Nutrient Cycles).

Biodiversity and its Conservation Biodiversity-Concept, patterns, importance; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, Sacred Groves, biosphere reserves, national parks, wildlife, sanctuaries and Ramsar sites.

## MATHEMATICS

**I - Relations and Functions:** Types of relations: reflexive, symmetric, transitive and equivalence relations. One to one and onto functions.

**Inverse Trigonometric Functions** Definition, range, domain, principal value branch. Graphs of inverse trigonometric functions.

### II - Algebra

**Matrices :** Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operations on matrices: Addition and multiplication and multiplication with a scalar. 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 uniqueness of inverse, if it exists; (Here all matrices will have real entries).

**Determinants:** Determinant of a square matrix (up to 3 x 3 matrices), minors, co-factors 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.

### III - Calculus

**Continuity and Differentiability :** Continuity and differentiability, chain rule, derivative of inverse trigonometric functions, *Like*  $\sin^{-1} x, \cos^{-1} x$  and  $\tan^{-1} x$ , derivative of implicit functions. Concept of exponential and logarithmic functions. Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives.

**Applications of Derivatives:** Applications of derivatives: rate of change of quantities, 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 principles and understanding of the subject as well as real life situations).

**Integrals:** Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, Evaluation of simple integrals of the following types and problems based on them.

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

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

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

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

$$\frac{dy}{dx} + py = q, \text{ where } p \text{ and } q \text{ are functions of } x \text{ or constants.}$$

$$\frac{dx}{dy} + px = q, \text{ where } p \text{ and } q \text{ are functions of } y \text{ or constants.}$$

#### **IV - Vectors and Three-Dimensional Geometry**

**Vectors:** Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. 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. Definition, Geometrical Interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors.

**Three - dimensional Geometry:** Direction cosines and direction ratios of a line joining two points. Cartesian equation and vector equation of a line, skew lines, shortest distance between two lines. Angle between two lines.

**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 (bounded or unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

**VI – Probability:** Conditional probability, multiplication theorem on probability, independent events, total probability, Bayes' theorem, Random variable and its probability distribution, mean of random variable.