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PET 2026-27 Syllabus

PHYSICS

UNIT – 1 MEASUREMENT:

Units and dimensions, Fundamental and derived units, Dimensional analysis, S.I. Units.

UNIT – 2 KINEMATICS

Linear motion in one and two dimensions, Cases of uniform velocity and uniform acceleration, General relation among position and velocity, Uniform circulation motion.

UNIT – 3 FORCE AND LAWS OF MOTION:

Force and inertia, Newton"s law of motion, Conservation of momentum and energy Static and Kinetic friction, Uniform Circular motion.

UNIT – 4 WORK ENERGY AND POWER

Work done by force, energy, power, Elastic collisions, Potential energy, Gravitational potential energy and its angular conversion to kinetic energy, Potential energy of a spring.

UNIT – 5 ROTATIONAL MOTION AND MOMENT OF INERTIA

Rigid body rotation, couple, torque, angular momentum conservation of its momentum, Moment of inertia, theorems of parallel and perpendicular axis, (Moment of inertia of uniform ring, disc thin rod and cylinder only).

UNIT – 6 GRAVITATION:

Acceleration due to gravity and its variation, Universal law of gravitation, motion of satellites, escape velocity., Synchronous satellite and polar satellite.

UNIT – 7 PROPERTIES OF SOLID AND FLUIDS:

Elasticity, Hook"s law, Young"s modulus, shear and bulk modulus, surface energy and surface tension,fluid pressure, atmospheric pressure, viscosity of fluids, kinetic theory of gases, gas laws, kinetic energy and temperature.

UNIT – 8 HEAT AND THERMODYNAMICS:

Heat, Temperature, Thermometers, Specific heats at constant volume and constant pressure, Mechanical equivalent of heat isothermal and adiabatic processes.

Heat conduction in one dimension. Convection and radiation, Stefan"s law and Newton"s law of cooling, Zeroth, First and Second law of thermodynamics.

UNIT – 9 OSCILLATION:

Periodic motion, simple harmonic motion, Oscillations in spring, Laws of simple pendulum.

UNIT – 10 WAVES

Transverse and longitudinal wave motion, Speed of sound, principle of super position, progressive and stationary waves, beats and Doppler effect.

UNIT – 11 LIGHT:

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Wave nature of light, Interference, Young"s double slit experiment, velocity of light and Doppler"s effect in light, Reflection, refraction, total internal reflection, curved mirrors, Lenses, mirror and lens formulae, Dispersion in prism, absorption and emission spectra, Optical instruments. The human eye, defects of vision, magnification and resolving power of telescope and microscope.

UNIT – 12 MAGNETISM

Bar magnet, lines of force, torque on a bar magnet due to magnetic field, earth"s magnetic field, tangent galvanometer, vibration magnetometer, Paramagnetic, di magnetic and ferromagnetic substances.

UNIT – 13 ELECTROSTATICS

Coulomb"s law of electrostatics, dielectric constant, electric field and potential due to a point charge, dipole, dipole field, Guass"s law in simple geometric. Electrostatic potential, capacitance, parallel plate and spherical capacitors, capacitors in series and parallel, energy of a capacitor.

UNIT – 14 CURRENT ELECTRICITY

Electric current, Ohm"s law, Kirchiff"s laws, resistances in series and parallel, temperature dependence of resistance wheat stone bridge, and potentiometer. Measurement of voltages and currents.

UNIT – 15 EFFECT OF ELECTRIC CURRENT

Magnetic thermal and chemical effect of current, Electric power heating effects of currents, chemical effects and law of electrolysis, thermoelectricity, Biot-Savart law, Magnetic fields due to a straight wire, circular loop and solenoid. Force on a moving charge in a magnetic field (Lorentz force), Magnetic moment of a current loop, effect of a uniform magnetic field of a current loop, forces between two currents; moving galvanometer, ammeter and voltmeter.

UNIT – 16 ELECTROMAGNETIC INDUCTION AND ULTERNATING CURRENT:

Magnetic flux, Electromagnetic induction induced emf Faraday"s law, Lenz"s law, self and mutual inductance, Alternating currents impedence and reactance growth and decay of current in L-R circuit, elementary idea of dynamo and transformer.

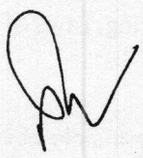
UNIT – 17 ELECTRON , PHOTON AND RADIO ACTIVITY:

'e" and 'e/m" for an electron, photon, Einstein"s photoelectric equation, photocells.

Bohr model of the atom, Hydrogen spectrum, Composition of nucleus, atomic masses and isotopes, radioactivity, laws of radio active decay, decay constant, half life and mean life, Mass-energy relation, fission, X-Ray : properties and uses.

UNIT – 18 SEMICONDUCTOR:

Elementary ideas of conductor, semi conductor and insulator, intrinsic and extrinsic semi-conductors, Diode, transistor, oscillator, digital circuit and logic gates.



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CHEMISTRY (PHYSICAL CHEMISTRY)

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UNIT – 1 ATOMIC STRUCTURE:

Constitution of nucleus: Bohr"s atom model: quantum numbers aufbau principle electronic configuration of elements (upto-Kr): De-Broglie relation, shapes of orbital.

UNIT – 2 CHEMICAL BOND

Electrovalent covalent and co-valent bonds, hybridization (sp): hydrogen bond: shapes of molecules (VSEPR theory): bond polarity resonance, Elements of VBT.

UNIT – 3 SOLUTIONS:

Modes of expressing concentrations of solutions: Types of solutions, Raoults law of colligative properties, non-ideal solution, and abnormal molecular weights.

UNIT – 4 SOLID STATE :

Crystal lattices, unit cells, Structure of ionic compounds close packed structure, Ionic radii, imperfections (Point defects) : properties of solids.

UNIT – 5 NUCLEAR CHEMISTRY:

Radio active radiations : Half-life, radioactive decay, group displacement law, structure and properties of nucleus : Nuclear reactions, disintegration series, artifical transmutation : Isotopes and their uses : Radio-carbon dating.

UNIT – 6 CHEMICAL EQUILIBRIUM:

Chemical equilibrium, Law of mass action Kp and Kc : Le Chatelier principle and its applications.

UNIT – 7 IONIC EQUILIBRIUM:

Ionic Equilibria in soloutions, Solubility product, common ion effect, theories of acids and base hydrolysis of salts : pH : buffers.

UNIT – 8 THERMOCHEMISTY AND THERMODYNAMICS:

Energy changes during a chemical reaction intrinsic energy, enthalpy; First law of thermodynamics : Hess"s law, heats of reactions; Second law of thermodynamics; entropy; free energy; spontaneity of a chemical reaction, free energy change and chemical equilibrium; free energy as energy available for useful work.

UNIT – 9 CHEMICAL KINETICS:

Rate of a reaction, factors affecting the rate, rate constant, rate expression, order of reaction, first order rate constant-expression and characteristics, Arrhenous equation.

UNIT – 10 ELECTROCHEMISTRY:

Oxidation, Oxidation number and ion-electron methods, Electrolytic conduction, Faraday"s laws: voltaic cell, electrode potentials, electromotive force, Gibb"s energy and cell potentials, Nernst equation, commercial cells, fuel cell, electrochemical theory of corrosion.

UNIT – 11 SURFACE CHEMISTRY:

Colloids and Catalysis, Adsorption, Colloids (types preparation and properties), Emulsions, Catalysis:

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Types and characteristics.

INORGANIC CHEMISTRY

UNIT – 12 PPRINCIPLES OF METALLURGICAL OPERTAIONS:

Furnaces, ore concentration, extraction, purification metallurgies of Na, Al, Fe, Cu, Ag, Zn and Pb and their properties.

UNIT – 13 CHEMICAL PERIODICITY:

s, p, d, and f-block elements, periodic Table, periodicity, atomic and ionic radii valency, ionization energy, electron affinity, electro negativity, metallic character.

UNIT – 14 COMPARATIVE STUDY OF ELEMENTS:

Comparative, study of the following families of element: (i) Alkali metals (ii) Alkaline earth metals (iii) Nitrogen family (iv) Oxygen family (v) Halogens (vi) Noble gases.

UNIT – 15 TRANSITIONS METALS:

Electronic configuration of 3rd Metal ions, oxidation states, other general characteristic properties, potassium permanganate, potassium dichromate.

UNIT – 16 CO-ORDINATION COMPOUND :

Simple nomenclature, bonding and stability, classification and bonding in organometallics.

UNIT – 17 CHEMICAL ANALYSIS:

Chemistry involved is simple inorganic qualitative analysis; calculations based on acid base titrimetry.

ORGANIC CHEMISTRY

UNIT –18 CHEMISTRY OF HYDRO CARBON:

Calculation of empirical and molecular formulae of organic compounds, Nomenclature of organic compounds, common functional groups, isomerism, Structure and shapes of alkanes, alkenes and benzene.

UNIT – 19 - Preparation, properties and uses of alkanes, alkenes and alkynes, benzene, petroleum, cracking, octane number, gasoline additives.

UNIT – 20 ORGANIC COMPOUNDS BASED ON FUNCTIONAL GROUP CONTAINING

NITROGEN: Nomenclature, methods preparation, Chemical properties, correlations of physical properties with structures and uses of Nitro, Amino, Cyana and Diazo compounds.

UNIT – 21 ORGANIC COMPOUNDS CONTAINING ORGANIC OXYGENS:

Nomenclature, methods preparation, Chemical properties, correlations of physical properties with structures and uses of ethers, aldehydes, ketones, carboxylic acids and their derivatives.

UNIT –22 CHEMISTRY IN DAILY LIFE

Polymers: Classification, method of preparation, properties and uses of polymers, Dyes: Classification, Structure of some important dyes, Chemistry of Drug: Introduction and classification, Chemotherapy, Importance of drug (Antipyretic, Antiseptic, Antibiotic, Anesthetics), Chemistry in food, cosmetics and detergents.

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UNIT – 23 BIOMOLECULES:

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Classification, Structures and biological importance of carbohydrates, amino acids, peptides, proteins and enzymes, nucleic acids and lipids.

MATHEMATICS

UNIT – 1 ALGEBRA:

Algebra of complex numbers, Graphical representation of complex numbers, modulus and argument of complex numbers, Square root of a complex number, Triangular inequality. Cube roots of unity.

Arithmetic, geometric and harmonic progression, Arithmetic geometric and harmonic means between two numbers. Sum of squares and cubes of first Natural numbers. Quadratic equations, relations between roots and coefficients, permutations and combinations, binomial Theorem (any index) exponential and logarithmic series. Determinants up to third order and their order and their elementary properties Matrices types of matrices, ad joint and inverse of matrix, elementary properties of matrices. Partial fraction. Application in solving simultaneous equations up to three variables.

UNIT – 2 TRIGONOMETRY:

Trigonometry functions and their graphs, addition and subtraction Formula involving multiple and

submultiples angles, general solutions of triangles equations, Relations between sides and angles of a triangles, Solutions of triangles, inverse; trigonometrically functions, height and distance (Simple

Problems).

UNIT – 3 CO-ORDINATE GEOMETRY OF TWO DEMENSIONS:

Rectangular Cartesian co-ordinates, Straight-line pair to straight line, distance of a point from a line

angle between two lines.

Circle, tangents and normal system of circles.

Conic section Parabola, Ellipse and Hyperbola in standard forms with elementary, properties tangents and normal.

UNIT – 4 CO-ORDINATE GEOMETRY OF THREE DIMENSIONS:

Rectangular co-ordinate system, Direction cosine and direction ratios, equation of place in standard

forms. Perpendicular distance from a point, equation of a line angle between two lines.

UNIT – 5 VECTOR ALGEBRA:

Definition of vector, addition of vectors, Components in three dimensional space, Scalar and vector

products. Triple products, Simple application in geometry and mechanics.

UNIT – 6 DIFFERENTIAL CALCULUS:

Function polynomial, rational trigonometric, logarithmic and exponential. Inverse function, Limit

continuity and differentiability of functions, differentiation of rational, trigonometric and exponential functions. Application of derivative in elementary problems in mechanics increasing and decreasing functions. Maxima and Minima of function of one variable. Roll"s theorem and mean value theorem.

UNIT – 7 INTEGRAL CALCULUS:

Integrations as the inverse process of differentiations, Integration by the parts, by substitution and by partial fraction. Definite integral, Areas under simple cures.

UNIT – 8 DIFFERENTIAL EQUATIONS:

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Formulation of differential equation, order and degree, Solutions of differential equations by separation of variable method. Homogeneous linear differential equation of first order.

UNIT – 9 STATISTICS:

Probability addition and multiplication laws, conditional probability, binomial distribution, Simple problems in correlation and regression.

UNIT – 10 NUMERICAL METHODS:

Solution of equation by the methods of bisection, false-positions and Newton-Raphson. Numerical integration by trapezoided and Simpson"s Rule.

UNIT – 11 INFORMATION TECHNOLOGY:

Basics of computer and its operations, Functional components, main parts of computer, Input devices, Output devices and Secondary storage devices, System software, Utility software, Application software.

As per the syllabus

Scheme of Examination

Subject	No. of question	Total marks
Physics	50	50
Chemistry	50	50
Mathematics	50	50
Total	150	150

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