Syllabus for CBT exam to the post of TGT (Non-Medical)

A. <u>Subjects of B.Sc (Non-Medical)</u>

- **CHEMISTRY** : Basic concepts of Chemistry, Structure of Atom, Classification of Elements & Periodicity in Properties, Chemical boding and Molecular structure, Chemical thermodynamics, Equilibrium, Redox reaction, Hydrocarbons, Solution, Electrochemistry Chemical Kinetics, d- and f- Block elements, coordination compounds, Haloalkanes and Haloarenes, Alcohols, Phenols and ethers, Aldehydes and carboxylic acids, Amines & Biomolecules.

(I) **Physical Chemistry**-Atomic and Molecular Structure; States of Matter; Gaseous State; Liquid State; Solid State. Chemical Thermodynamics; Chemical and Phase Equilibria; Solutions and Colligative Properties; Electrochemistry and Electrochemical Cells; Chemical Kinetics and Enzyme Catalysis; Adsorption and Colloidal Solutions; Molecular Spectroscopy.

(II) **Organic Chemistry-** Basic Concepts in Organic Chemistry,Stereochemistry & Conformational Analysis; Organic Reaction Mechanism and its application to synthetic chemistry; Nucleophilic Substitution Reactions; Nucleophilic Addition Reactions; Electrophilic Addition Reactions; Elimination Reactions; Name Reactions and Rearrangements; Qualitative Organic Analysis; Organic Spectroscopy (UV-Visible; IR; NMR); Basics of Natural Products and Biochemistry; Aromatic Nucleophilic and Aromatic Electrophilic Substitution Reactions; Free Radical Reactions; Heterocyclic Chemistry; Polymer chemistry.

(III) **Inorganic Chemistry-** Periodic Table and Periodic Properties; Extractions of Metals and Metallurgy; Structure of Atom; Chemical and Ionic Bonding and Geometry, Shape and Hybridization of Molecules; VSEPR and Molecular Orbital Theory; Main Group Elements (s and p-blocks), Transition Metals (d-block) and Inner-transition Elements (f-block) and their Chemistry. Bioinorganic Chemistry; Nuclear Chemistry; Analytical Chemistry; Coordination Chemistry.

- **PHYSICS**:

I. Physical world and Measurement, Kinetics, Law of Motion, Work, Energy and Power, system of Particles and Rotational Motion, Gravitational, Mechanical properties of solids & fluids, Thermal properties of Matters, Thermodynamics, Kinetics theory of Gases, Oscillations & Waves, Electrostatics, Current Elasticity, Magnetic effect of Current & Magnetism, Electromagnetic Induction and Alternating currents, Electromagnetic waves, Ray optics and Optical instruments, Wave optics, Dual nature of Radiation and Matter, Semiconductor Electronics: Materials, Devices and simple circuits.

II. Co-ordinate systems, Solid angle, space time symmeteries and conservation laws, Inertial and Non-inertial frames, Coriolis force and its applications, Central and non-central forces, Inverse square force, Michelson- Morley experiment, special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Variation of mass with velocity and mass energy equivalence, Relativistic momentum and energy.

III. Electrostatic Field and Electrostatic potential and its applications. Poisson and Laplace equations. Ohm's law, Microscopic form of Ohm's law ($J \alpha E$) and conductivity. Ampere circuital law and its applications. Hall effect, Dielectrics, parallel plate capacitor with a dielectric, dielectric constant, polarization and polarization vector, displacement vector D, Claussius - Mossotti equation, boundary conditions satisfied by E and D at the interface between two homogenous dielectrics. Diamagnetism, paramagnetic and Ferromagnetism. Maxwell's equations and its physical interpretation, Poynting vector, Poynting theorem, EM waves in conducting medium and skin depth. EM waves velocity in a conductor and anomalous dispersion.

IV. Scope of statistical physics, basic ideas about probability, distribution of four distinguishable particles in two compartments of equal sizes. Concept of macro-states, micro-states and thermodynamic probability. M-B, B-E, F-D statistics and their applications. Statistical entropy, law of increase of entropy. Reversible and irreversible processes. Thermodynamic Potentials: Enthalpy, Gibbs, Helmholtz and Internal Energy functions and Maxwell's thermodynamic relations.

V. Simple harmonic oscillator, Damped oscillator, Forced Oscillator, Coupled Oscillators and their applications. Interference: Division of wavefront and division of amplitude. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection. Interference in Thin Films, Haidinger Fringes, Fizeau Fringes. Newton's Rings and Michelson's Interferometer. Diffraction: Fraunhofer diffraction & Diffraction grating, Fresnel Diffraction: Half-period zones. Zone plate. Polarization: Unpolarized and plane polarized light, production of polarized light, Wire grid polarizer, Polaroid, Malus's law, double refraction, birefringence, Nicol Prism, quarter wave plate and half wave plate, Brewster law. Circular and elliptical polarization, production of elliptically polarized and circularly polarized light.

VI. Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves. Heisenberg uncertainty principle. Wave-particle duality. Time dependent Schrodinger equation and Time independent Schrodinger equation and their applications. Electron Angular Momentum. Space Quantization. Electron Spin and Spin Angular Momentum. Spin Magnetic Moment. Stern-Gerlach Experiment. Zeeman Effect: Normal and Anomalous Zeeman Effect. Pauli's Exclusion Principle. Symmetric and Antisymmetric Wave Functions. Fine structure. Spin orbit coupling. Total angular momentum. Spin-orbit coupling in atoms: L-S and J-J couplings.

VII. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones. Bragg's Law. Atomic and Geometrical Factor. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. T^3 law. Fermi gas, density of states, Fermi energy and Fermi velocity, electronic contribution to specific heat of metals. Kronig Penny model, Brillouin zones, effective mass of electrons and holes, metals, insulators, p and n type Semiconductors. **Superconductivity:** Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors, London's Equation and Penetration Depth. Isotope effect. cooper pairs, BCS theory.

VIII. **Junction diodes:** pn junctions, V-I characteristics, Zener diode, voltage regulation, tunnel diode, LED and LCD, Solar cell, diode as circuit element, Rectifiers: Half Wave, full wave and bridge rectifier. **Transistors:** Characteristics of a transistor in CB, CE and CC mode, α and β of BJT, common emitter amplifier. Field Effect Transistor, biasing JFET, depletion and enhancement mode, MOSFET, FET amplifier. **Amplifiers:** Small signal amplifiers: General principles of operation, classification, distortion, RC coupled amplifier, gain frequency response, input and output impedance. Feedback in amplifiers; negative feedback and stability.

IX. General Properties of Nuclei, Nuclear Models, Radioactivity decay, Nuclear Reactions, Nuclear Detectors and Accelerators**.** Classification of elementary particles and its families. Conservation Laws: energy and momentum, angular momentum, parity, Baryon number, Lepton number, Isospin, Strangeness, Gell-Mann-Nishijima Scheme, CPT theorem, parity violation in weak interactions. Particle Symmetries. Quarks Model.

- **MATHEMATICS**:

I. Sets, Relation, Functions, Trigonometric functions, Inverse Trigonometric functions, Co-ordinate geometry, Statistics.

II. Real and Complex Numbers, Quadratic Equations, Linear Inequalities, Permutations & Combinations, Binomial Theorem.

III. Arithmetic Progression, Geometric Progression, Arithmetic and Geometric means, relation between A.M. and G.M.

IV. Matrices, Algebra of Matrices and properties, Determinants, Inverse of a matrix, Applications of matrices and determinants, Solution of system of linear equations.

V. Groups, Subgroups, Lagrange's theorem, Normal subgroups, Quotient groups, Fundamental theorems on Homomorphism, Rings, Ideals, Integral domain, Fields.

VI. Vector spaces, Quotient spaces, Linear combination of vectors, Basis and dimension, Linear transformations, Rank and nullity of a linear transformation, Matrix representation of a linear transformation, Eigen values and Eigen vectors, Characteristic polynomial.

VII. Limit and Continuity, Types of discontinuities, Differentiability of functions, Successive differentiation, Leibnitz's theorem, Indeterminate forms.

VIII. Applications of derivatives, Maxima and minima, Rolle's theorem, Lagrange's Mean Value Theorem, Cauchy Mean Value Theorem, Taylor's theorem with Lagrange's and Cauchy's forms of remainder.

IX. Concavity, Convexity, Points of inflexion, Curvature, Asymptotes, Singular points, Double points, Polar coordinates.

X. Limit and continuity of functions of upto three variables, Partial differentiation, Euler's functions on homogeneous functions, Jacobian (upto three variables).

XI. Limits, Limits involving the point at infinity, continuity, Properties of complex numbers, regions in the complex plane, functions of complex variable, mappings.

XII. Derivatives of complex valued function, Cauchy-Riemann equations, Analytic functions, examples of analytic functions, Exponential function.

XIII. Methods of Integration, Fundamental Theorem of Calculus, Definite integrals. Applications of the Integrals, Area under simple curves.

XIV. Order and degree of Differential Equations, General and particular solutions of differential equation, Homogenous differential Equations, Linear differential Equations, Exact differential Equations.

XV. Wronskian, Equations of first order and higher degree solvable for x, y, p. Clairaut's form, Linear equations with constant and variable coefficients.

XVI. Simultaneous differential equations, Total differential equations, Partial differential equations of first order, Classification of second order partial differential equations into parabolic, Elliptic and hyperbolic.

XVII. Real line, Bounded sets, Sequences and series of real numbers Sequences and series of functions, Power Series.

XVIII. Order of Convergence, Bisection method, False position method, Newton's method, Secant method. Gauss-Jacobi and Gauss-Siedel methods.

XIX. Finite difference operators, Lagrange and Newton interpolation, Numerical differentiation using Newton's forward difference and backward difference method, Trapezoidal rule, Simpson's rule, Euler's method.

XX. Straight Lines, Slope, angle between two lines. Various forms of the equations of a line, Distance of a point from a line, Distance between two parallel line.

XXI. Cone, circles, ellipse, parabola, hyperbola, Coordinate axes and coordinate planes in three dimensions, Direction cosines and Direction ratios, Equation of lines in space. Angle between two lines, Distance between two points and two lines.

XXII. Vectors, Vector Algebra, Direction ratios, Direction cosines, Types of vector, Vector joining two point, Section formula, Products of upto three vectors (scalars, corss etc.), Gradient, Divergence, Curl.

XXIII. Measures of dispersion, Mean deviation, Variance, Standard deviation.

XXIV. Probability, Multiplication theorem on probability, Conditional probability, Independent events, Total probability, Baye's theorem, Partition of a sample space.

XXV. Linear Programming problems, Objective function, Optimization, Types of linear programming problems, Feasible and infeasible regions, Graphical method to solve the LPP.

B. **Subjects of 01 year B.Ed -**Childhood and Development Years, Contemporary India and Education, Language Across the Curriculum, Understanding Disciplines and Subjects, Text Reading and Reflections, Learning and Teaching, Assessment for Learning, Drama and Art in Education, Teaching of Physical Science & Mahematics, Knowledge and Curriculum, Gender, School and Society, Inclusive School, ICT in Teaching-Learning Process, Understanding the Self, Health and Physical Education, Vocational and Work Education, Education for Peace, Guidance and Counseling**.**

C. **General knowledge**: General Knowledge including General knowledge of Himachal Pradesh (10^{th} standard).

D. **Current Affairs** (10^{th} standard).

E. **Everyday Science** (10^{th} standard).

F. **Logical Reasoning** (10^{th} standard).

G. **Social Science** (10^{th} standard).

H. **General English** (10^{th} standard).

I. **General Hindi** (10^{th} standard).