SYLLABUS OF ENTRANCE TEST

Syllabus of Entrance test and other related information are given below:

- The questions in the admission Test shall be printed on the answer-booklet issued to the candidates at the commencement of the PUCAT, and the answers thereto shall be entered in the OMR sheet.
- For each course question paper shall be Multiple-choice type Questions.
- There will be no negative marking.

B. Com. (Hons.)

The question paper will contain 100 questions (Multiple Choice Questions).

Duration: 2 Hours

A.	Mathematics Upto 10th Standard	25 Questions
B.	Reasoning	25 Questions
C.	Current Affairs	50 Questions

BA LLB Integrated Programme

The admission test shall be of duration **Two hours** and shall comprise of one Paper with a maximum of **200 marks**. The paper shall be as follows:

A.	Language Comprehension (i) Hindi-10 questions (ii) Engish-20 questions	60 marks
B.	(i) Reasoning, Mental Ability-20 questions (ii) Legal Aptitude-20 questions	80 marks
C.	General A wariness and Current Affairs-30 questions	60 marks
	Total – 100 (Multiple Choice Questions)	**200 Marks**

Important: The paper of the admission Test shall have emphasis on familiarity with legal and constitutional matters.

Common Question paper will be for admission test in **MBA, MBA (E-Com.), MBA (Agri-Business), MBA (Business Economics), MBA (Finance & Control), MBA (Human Resource Development)**

The Question Paper will contain 100 questions (Multiple Choice Questions).

Duration: 2 Hrs

A.	Mathematics Upto 10th Standard	20 Questions
B.	Reasoning	20 Questions
C.	Current Affairs	10 Questions
D.	General Management	50 Questions

MA in Mass Communication

The Question Paper will contain 100 questions (Multiple Choice Questions).

Duration: 2 Hrs

A.	Journalism (BA Level Purvanchal University Syllabus) – 20 Question
B.	General Studies – 20 Question
C.	Reasoning – 20 Question
D.	General Hindi & General English – 20 Question
E.	Indian Constitution, Ancient Indian History, Indian Economy, General Geography – 20 Question

MA in Applied Psychology

The Question Paper will contain 100 questions (Multiple Choice Questions).

Duration: 2 Hrs

A.	Reasoning – 20 Question
B.	Arithmetic – 20 Question
C.	General Studies – 20 Question
D.	General English Grammar – 20 Question
E.	Psychology (Fundamental of Psychology and Human Brain Physiology) – 20 Question

Common Question paper will be for admission test in **M.Sc. Biotechnology, M.Sc. Microbiology, M.Sc. Biochemistry and M.Sc. Environmental Sciences**.

The Question Paper will contain 100 questions (Multiple Choice Questions).

Duration: 2 Hrs

A.	General Science, General Knowledge, Reasoning, General Mathematics – 25 Questions
B.	Zoology (from B.Sc. syllabus of VBS Purvanchal Univ., Jaunpur) – 25 Questions
C.	Botany (from B.Sc. syllabus of VBS Purvanchal Univ., Jaunpur) – 25 Question
D.	Chemistry (from B.Sc. syllabus of VBS Purvanchal Univ., Jaunpur) – 25 Question

Syllabus for MCA

The Question Paper will contain 100 questions (Multiple Choice Questions).

Duration: 2 Hrs

MATHEMATICS: (30 questions)

• **Set Theory:** Concept of sets – Union, Intersection, Cardinality, Elementary counting; permutations and combinations.

• **Probability and Statistics:** Basic concepts of probability theory, Averages, Dependent and independent events, frequency distributions, measures of central tendencies and dispersions.

• **Algebra**: Fundamental operations in algebra, expansions, factorization, simultaneous linear /quadratic equations, indices, logarithms, arithmetic, geometric and harmonic progressions, determinants and matrices.

• **Trigonometry:** Simple identities, trigonometric equations properties of triangles, solution of triangles, heights and distances, general solutions of trigonometric equations.

ANALYTICAL ABILITY & LOGICAL REASONING: **(30 questions)**

The questions in this section will cover logical situation and questions based on the facts given in the passage.

COMPUTER AWARENESS: (20 questions)

• **Computer Basics:** Organization of a computer, Central Processing Unit (CPU), structure of instructions in CPU, input/output devices, computer memory, and back-up devices.

• **Data Representation:** Representation of characters, integers and fractions, binary and hexadecimal representations, binary arithmetic: addition, subtraction, multiplication, division, simple arithmetic and two's complement arithmetic, floating point representation of numbers, Boolean algebra, truth tables, Venn diagrams.

GENERAL ENGLISH: (20 questions) Questions in this section will be designed to test the candidates' general understanding of the English language. There will be questions on the following topics: Comprehension, vocabulary, Basic English Grammar (like usage of correct forms of verbs, prepositions and articles), word power, synonyms and antonyms, meaning of words and phrases, technical writing.

PROF. RAJENDRA SINGH (RAJJU BHAIYA) INSTITUTE OF PHYSICAL SCIENCES FOR STUDY & RESEARCH

Common Question paper will be for admission test in **M.Sc. (Physics), M.Sc. (Mathematics), M.Sc. (Chemistry) and M.Sc. (**Applied Geology**)** in Duration of the examination is two hours. **The question paper will contain six sections: A (Physics), B (Mathematics), C (Chemistry), D (Zoology), E (Botany), F (Geology). Each section will have 50 questions (Multiple Choice). Candidate have to attempt two sections from the subjects which were in final year of his/her qualifying degree (UG) programme.**

Syllabus of Section A: Physics

The section will contain 50 questions (Multiple Choice Questions)

Mechanics: Vectors, Gradients, Divergence and curl; Gauss, Stoke's & Green's Theorems, Vectors Identities. Moment of inertia, Two particle problem reduced mass, Kepler's law, Strain and stress, Elastic moduli and relations between them, Torsion of cylinders, Bending of beams, Internal energy of a strained body. Michelson Morley experiments, Postulates of special theory of relativity, Lorentz transformations, Length contraction. Time dilation, Simultaneity in relativity theory.

Waves and Oscillations: Simple Harmonic motion, Damped Harmonic motion and Forced oscillation in mechanical & Electrical system. Resonance, sharpness of resonance. Mechanical & Electrical impedances. Ultrasonics: Production, Properties and application.

Electricity and Semiconductor Electronics: Electric field due to a dipole, polar and nonpolar dielectric materials. Polarization and displacement. Electronic, atomic, ionic and Orientation polarization, Balance and sensitivity conditions for AC Bridges. Andersons, Wien's and Robinson's Bridges. Circuit parameter, Kirchoff's law, Network's theorem, "Norton's theorem, Thevenin's theorem and Maximum power transfer theorem". Magnetic field, Rectifier Filtering by RC and LC Circuit, Regulation: Conduction in Solid: Conductor, insulator, Semiconductor, intrinsic and extrinsic semiconductor, Conductivity and Mobility. Diode Characteristics, Depletion region, break down voltage. Forward and Reverse Biasing, Zener diode: its Characteristics. NPN and PNP transistor action, its configuration, Hybrid parameter and equivalent circuit RC coupled Amplifier. Principle of feedback, Barkhausen criteria for sustained oscillation, Circuit of Hartley and Colpits Oscillator.

Thermal Physics: Thermodynamics Systems, Macroscopic and Microscopic Variables, Thermodynamical Equilibrium, Zeroth law of thermodynamics and concept of Temperature. First law of Thermodynamics. Carnot Engine and Refrigerator, , Carnot's Theorem. Clausius-Clapeyron's equation, Clausius theorem, Clausius inequality, Entropy, Second Law of thermodynamics. Maxwell's equation, Joule-Thomson effect, Inversion Temperature. Ehrenfest's equations. Maxwell-Boltzmann Law of distribution, Evaluation of R.M.S. Velocity, average and most probable speeds. Radiation as electromagnetic Waves, Emissive and absorptive powers, Black-body radiation, Stefan-Boltzmann Law, Solar constant and temperature of sun, Temperature of Non-black Bodies, Distribution of energy in the spectrum of black body radiation, Adiabatic expansion of black-body radiation, Law, Wein's displacement law, Wein's formula, Rayleigh-Jeans' law, Planck's law.

Optics: Conditions for observing interference, Interference in Michelson interferometer, thin films, Newton's Rings. Temporal and Spatial Coherence. Stimulated emission, Basic ideas about laser emission, Ruby and He-Ne laser. Fresnel diffraction by straight edge and Fraunhofer's diffraction by single slit and double slit. Theory of plane grating. Rayleigh's criterion of resolution for telescope and grating. Polarization by reflection and refraction Double refraction. Half and quarter wave plates. Production of elliptically and circularity polarized light. Babinet compensator, Nicol Prism. Optical activity. Fresnel's theory of optical rotation. Specific rotation, Biquartz and Laurent's half-shade polarimeters.

Atomic and Nuclear Physics: Bohr model and the spectra of hydrogen atoms, Frank-Hertz experiment. Characteristic and continuous X-rays, Moseley's law, Bragg's Law. Space Quantization, Vector atom model and quantum Numbers, Magnetic moment of electrons Larmor's Precession, Electron Spin, Stern-Gerlach experiment, Pauli's exclusion principle Zeeman effect, Raman effect. Particle nature of radiation, Photoelectric effect and Compton Effect. Wave nature of particles. Natural radioactivity, Law of radioactive disintegration, Detection of radiation, GM Counter and Bubble Chamber Scintillation Counter. Kinematics of nuclear reactions, Artificial nuclear transmutation, Liquid drop model and the semiempirical mass formula, Elementary theory of α – decay, β -Decay and

gama decay. Classification of Elementary Particles, Leptons, mesons and baryons and their quantum numbers, conservation Laws. Relativistic addition of velocities; variation of mass with velocity, Mass energy relation.

Quantum Mechanics: De-Broglie Waves, Davission-Germer Experiment, Wave Packets, Phase velocity and group velocity, Heisenberg's Uncertainty Principle, One dimensional Schrödinger's wave Equation. Observable and Operators, Eigen values and Eigen functions, orthonormality and completeness. Dirac Delta function. Separation of variables in Time-Dependent Schrödinger Equation. Density of state, one-dimensional Potential Barrier problems. Tunnelling through square well potential, One-dimensional Harmonic Oscillator.

Statistical Mechanics and Solid State Physics: Microscopic and Macroscopic systems, Liouville theorem and its consequences, Statistical ensembles, Postulates of quantum statistical mechanics, Crystalline amorphous and glassy state of solids, Crystal lattices, Primitive lattice cell, Miller indices, interplaner spacing, Bravais lattices, Crystal structures, Reciprocal lattices of sc, bcc, fcc diamond and hcp. Bragg's law. Free electron gas in one dimension: Energy levels and density of states, Fermi Energy, Electrical conductivity, Hall Effect. Band Theory of solids: Energy Bands; Kronig-Penny model in one dimension, Energy gap, Distinction between metal, semi-conductor and insulator, Fermi energy level.

Basic Digital Electronics: Semiconductor, BJT, Field effect transistor, MOSFET, enhancement and depletion modes, their representations, the MOS switch. Logic Circuits. AND, OR, NOT, NAND and Ex-OR operation, truth tables, their representations, Venn diagrams.

Electromagnetic theory: Electrostatics potential due to a charge distribution, Electromagneticwaves: Maxwell's Equation, pointing vector, E.M. Waves and its propagation in free space. Poynting's Theorem, Plane wave solution of Maxwell's equations in source free space and simple dielectrics, skin depth.

Syllabus of Section B: Mathematics

The section will contain 50 questions (Multiple Choice Questions)

Conic sections and related results. Straight lines and planes using vector technique, Spheres, Cones, Cylinders. Sets, Relations, Functions, real numbers and their properties. Sequences and Series of real numbers.

Ordinary differential equations of first and second order and the theories of their solutions.

Origin of first order partial differential equations (PDE), Lagrange's solution, Solutions of partial differential equations of the second order with constant coefficients.

Vector Differentiation, Gradient, Divergence and Curl, Vector Integration (Line, surface and volume integrals), Theorems of Gauss, Green, Stokes and related problems.

Limit, Continuity and differentiability of functions of single variable, Uniform continuity, boundedness theorem, Intermediate value theorems, Indeterminate forms, Successive differentiation, Maclaurin's and Taylor's series, Rolle's, Lagrange and Cauchy Mean value theorems, Asymptotes, Curvature, Envelopes and evolutes, concavity and convexity, Points of inflexion, Riemann integrals and their properties, Improper integrals.

Vector spaces, Subspaces, Basis and dimension of a vector space, Quotient spaces, Linear transformations, Rank- nullity theorem and it's applications, Rank of a Matrix, Adjoint of a matrix, Determinant of a matrix and it's properties, Consistency of a system of linear equations, Eigen values,

Eigen vectors, Cayley-Hamilton theorem, Diagonalization of a matrix and it's characterizations. Moment of inertia, product of inertia, the general equation of motion (D'Alembert's principle). Virtual work, Stable and Unstable equilibrium, Common Catenary.
Radial and transversal, Tangential and normal components of Velocity and acceleration, Simple Harmonic motion, Motion under other law of forces.
Groups, Subgroups, Cyclic groups, Normal subgroups, Quotient groups, Lagrange's theorem, Isomorphism, Permutation groups, Cayley's theorem, Fermat's and Euler's theorems, Euler's phi function and it's properties, Rings, ideals, Integral domains and fields.
Analytic functions, Cauchy- Riemann equations, Harmonic functions, complex integration, Cauchy's integral formula, Liouville's theorem, Power series and it's radius of convergence, Taylor and Laurent series, Singularities and their classification, Residues.
Partial derivatives, directional derivatives, continuity and differentiability of functions of several variables and properties, Taylor's theorems, maxima and minima for real valued functions of several variables, Saddle points, Jacobian matrix and Determinants, Inverse function theorem.
Numerical solutions of algebraic and transcendental equations, Bisection, Regula falsi and Newton-Raphson's method, Interpolation, Finite differences and interpolation with equal and unequal intervals, Numerical differentiation and integration, Newton Cotes quadrature formula, Trapezoidal, Simpson's one-third and Simpson's third-eight rules, Euler's, Taylor series and Improved Euler's methods, Runge-Kutta method, Gauss Elimination method, LU- factorization method, Choleskey's method, Gauss-Jacobi and Gauss-Seidel iteration methods.
Fourier series and its properties, Fourier and Laplace transforms, Metric spaces: definitions and examples, Open and closed sets, Interior, exterior and boundary points, Limit point, Sequences and their convergence in a metric space.

Syllabus of Section C: Chemistry

The section will contain 50 questions (Multiple Choice Questions)

Atomic Structureand Quantum Mechanics: de-Broglie equation, Heisenberg uncertainty principle, Schrödinger wave equation, quantum numbers, Aufbau and Pauli exclusion principles, Hund's multiplicity rule.
Periodic Properties: Atomic and ionic radii, ionization energy, electron affinity and electronegativitydefinition, trends in periodic table and applications in predicting and explaining the chemical behavior.
Chemical Bonding: Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions, valence shall electron pair repulsion (VSEPR) theory. Molecular orbital theory (MOT).
Ionic Solid: Ionic structures, radius ratio effect and coordination number, lattice defects, semiconductors, lattice energy and Born-Haber cycle, Fajan's rule.Derivation of Bragg equation.
s-Block Elements: Comparative study, diagonal relationship, salient features of hydrides, solvation and complexation tendencies.
Chemistry of Noble Gasses: Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.
p-Block Elements: Comparative study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of group 13-16, hydrides of boron-diborane and higher boranes, borazine,
d-Block Elements: Chemistry of Elements of First, second and third Transition Series. Characteristic properties of d-block elements in respect of ionic radii, oxidation states, magnetic behavior.

Coordination Compounds: Werner's coordination theory, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes. Crystal field theory (CFT).
Chemistry of Lanthanide and Actinides: Electronic configuration, oxidation states, ionic radii and lanthanide contraction, complex formation, oxidation states and magnetic properties.
Spectroscopy: Ultra violet (U.V.) and Infrared (I.R.)
Alkanes, **alkenes and alkynes:** General synthesis and its chemicals reactions.
(i) Alcohols: Classification and nomenclature, Monohydric alcohols – nomenclature, methods of formation and chemical reactions. (ii) **Phenols:** Reactions of phenols – electrophilic aromatic substitution, acylation and carboxylation. Reimer-Tiemann reaction.
(i)Aldehydes and Ketones: Synthesis of aldehydes and ketones, Aldol, Perkin and Knoevenagel condensations, Wittig reaction. Oxidation of aldehydes and ketones, Cannizzaro reaction, MPV, Clemmensen reduction. (ii) **Carboxylic Acids:** Preparation of carboxylic acids, Reactions of carboxylic acids, Hell-Volhard-Zelinsky reaction.
Hetrocyclic Compounds: Preparation and reactions of Pyrrole, thiophene indole, quinoline and isoquinoline.
Arenes and Aromaticity: Aromatic and antiaromatic compounds: Huckel rule.
Alkyl halides: Nomenclature and classes of alkyl halides, methods of formation, chemical reactions, Mechanisms of nucleophilic substitution reactions of alkyl halides, SN2 and SN1 reactions with energy profile diagrams.
Stereochemistry: Cis-trans Isomers, E-Z notation for geometric isomerism, Absolute Configuration: R-S Sequence Rules
Gaseous States: Deviation from ideal behavior, van der Waals equation of state, Critical Phenomena, Molecular velocities: Root mean square, average and most probable velocities,
Solutions: Raoult's and Henry's law, Colligative properties include lowering of vapor pressure, boiling point elevation, freezing point depression, and osmotic pressure.
Chemical Kinetics and Catalysis: Rate of a reaction, factors influencing the rate of a reaction, zero order, first order, second order, pseudo first order
Thermodynamics: I^{st} and II^{nd} law of thermodynamic, Cornot's cycle and its efficiency, Carnot's theorem, Joule- homson coefficient and inversion temperature. Concept of entropy: Entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, Gibbs and Helmholtz free energy. **Thermochemistry:** Hess's Law of heat summation and its applications, Heat of reaction at constant pressure and at constant volume, Enthalpy of neutralization, Bond dissociation energy and its calculation from thermochemical data, temperature dependence of enthalpy, Kirchhoff's equation.
Chemical Equilibrium: Equilibrium constant and free energy, law of mass action, Le Chatelier's principle.
Electrochemistry: Nernst equation, Relationship between cell potential and Gibbs' energy change, Cell Constant, conductance in electrolytic solutions, specific and molar conductivities and their variation with concentration: Kohlrausch's law.

Syllabus for Section D: Zoology

The section will contain 50 questions (Multiple Choice Questions)

Biodiversity; Origin of chordates adaptations; Structure and function of cell and cell division; Chemical constituents of living cells; Enzymeand Vitamins; Metabolism of carbohydrates, protein, lipids and nucleic acids; Physiology with special reference to mammals. Mendelian inheritance and natural selection; Gametogenesis; Ecosystem; Biogeochemical cycles; Population ecology; Pollution and its

impact on biosphere and its prevention; Conservation of natural resources; Animal behavior; Probability; Immunology: biotechnology, recombinant DNA technology.

Syllabus for Section E: Botany

The section will contain 50 questions (Multiple Choice Questions)

Microorganisms: viruses, bacteria, algae, fungi; Important plant diseases; Bryophytes; Pteridophytes; General characters of Gymnosperms; General characters of Angiosperms-Morphology of root, stem and leaves of Angiosperms; Pollination; Development of male and female gametophytes; Endosperm; Utilization of plants: Medicinal plants; Plants and Environment: atmosphere, water, light, temperature, soil; Ecosystems: abiotic and biotic components; Food chain; Food web; Ecological pyramids; Energy flow and biogeochemical cycles; Red data book and IUCN classification; Cell Biology: Concept of heredity; Mendel's laws of heredity; Mutation; Nucleic acids: DNA and RNA-its structure, types and functions.

Syllabus for Section F: Geology

The section will contain 50 questions (Multiple Choice Questions)

Origin of the solar system and the Earth; Interior of earth; Volcanism and volcanic landforms; Earthquakes; Isostasy; Sea floor spreading; Plate tectonics and continental drift; Weathering and erosion due to wind, glacier, river, sea, and resulting landforms; Dip and Strike; Primary and secondary sedimentary structures; Folds, Faults, Joints, Foliation and Lineation, Unconformities; Stratigraphy horizons of India; Symmetry and forms in common crystals classes, Physical properties of minerals, Mineralogy and optical properties of common rock-forming minerals, Silicate structures; Classification of igneous rocks; Sedimentary rocks and metamorphic rocks, and their texture, and structures; General properties, formation and Indian occurrences of the economic and industrial mineral deposits; Coal and petroleum occurrences in India; Ground water hydrology; Global warming; Pollution: air, water and soil; Engineering properties of rocks; Engineering structures: dams, reservoirs, tunnels.