Chemistry Syllabus for PhD Entrance Test

Inorganic Chemistry

- 1. Chemical periodicity
- 2. Chemical bonding in homo- and heteronuclear molecules, including shapes of molecules (VSEPR Theory), MO Theory.
- 3. Concepts of acids and bases, Hard-Soft acid base concept, Non-aqueous solvents.
- 4. Atomic Structure: Concept of proton, neutron, electron, atom and molecule. Bohr's theory and its limitation, Heisenberg Uncertainty principle, Madelung Constant, atomic orbitals and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (only graphical representation). Quantum numbers (n, l, m and s) and its significance. Stability of half-filled and full-filled orbitals. Electronic configuration, Hund's rule, Pauli exclusion principle. Afbau principle.
- 5. Nuclear chemistry: nuclear reactions, fission and fusion, radio-analytical techniques and activation analysis.
- 6. Main group elements and their compounds: Allotropy, synthesis, structure and bonding, industrial importance of the compounds.
- 7. Transition elements and coordination compounds: structure, bonding theories, spectral and magnetic properties, reaction mechanisms.
- 8. Inner transition elements: spectral and magnetic properties, redox chemistry, analytical applications.
- 9. Organometallic compounds: synthesis, bonding and structure, and reactivity. Organometallics in homogeneous catalysis.
- 10. Ring, Cages and metal clusters.
- 11. Analytical chemistry- separation, spectroscopic, electro- and thermoanalytical methods.
- 12. Bioinorganic chemistry: photosystems, porphyrins, metalloenzymes, oxygen transport, electron- transfer reactions; nitrogen fixation, metal complexes in medicine.
- 13. Characterisation of inorganic compounds by IR, Raman, NMR, EPR, Mössbauer, UV-vis, NQR, MS, electron spectroscopy and microscopic techniques.

Organic Chemistry

- 1. IUPAC nomenclature of organic molecules including regio- and stereoisomers.
- 2. Principles of stereochemistry: Configurational and conformational isomerism in acyclic and cyclic compounds; stereogenicity, stereoselectivity, enantioselectivity, diastereoselectivity and asymmetric induction.
- 3. Aromaticity: Benzenoid and non-benzenoid compounds generation and reactions.
- 4. Organic reactive intermediates: Generation, stability and reactivity of carbocations, carbanions, free radicals, carbenes, benzynes and nitrenes.
- 5. Organic reaction mechanisms involving addition, elimination and substitution reactions with electrophilic, nucleophilic or radical species. Determination of reaction pathways.
- 6. Common named reactions and rearrangements applications in organic synthesis.

- 7. Organic transformations and reagents: Functional group interconversion including oxidations and reductions; common catalysts and reagents (organic, inorganic, organometallic and enzymatic). Chemo, regio and stereoselective transformations.
- 8. Concepts in organic synthesis: Retrosynthesis, disconnection, synthons, linear and convergent synthesis, umpolung of reactivity and protecting groups.
- 9. Asymmetric synthesis: Chiral auxiliaries, methods of asymmetric induction substrate, reagent and catalyst controlled reactions; determination of enantiomeric and diastereomeric excess; enantio-discrimination. Resolution optical and kinetic.
- 10. Pericyclic reactions electrocyclisation, cycloaddition, sigmatropic rearrangements and other related concerted reactions. Principles and applications of photochemical reactions in organic chemistry.
- 11. Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms (O, N, S).
- 12. Chemistry of natural products: Carbohydrates, proteins and peptides, fatty acids, nucleic acids, terpenes, steroids and alkaloids. Biogenesis of terpenoids and alkaloids.
- 13. Structure determination of organic compounds by IR, UV-Vis, 1H & 13C NMR and Mass spectroscopic techniques.

Physical Chemistry:

- 1. Basic principles of quantum mechanics: Postulates; operator algebra; exactly- solvable systems: particle-in-a-box, harmonic oscillator and the hydrogen atom, including shapes of atomic orbitals; orbital and spin angular momenta; tunneling.
- 2. Approximate methods of quantum mechanics: Variational principle; perturbation theory up to second order in energy; applications.
- 3. Atomic structure and spectroscopy; term symbols; many-electron systems and antisymmetry principle.
- 4. Chemical bonding in diatomics; elementary concepts of MO and VB theories; Huckel theory for conjugated -electron systems.
- 5. Chemical applications of group theory; symmetry elements; point groups; character tables; selection rules.
- 6. Molecular spectroscopy: Rotational and vibrational spectra of diatomic molecules; electronic spectra; IR and Raman activities selection rules; basic principles of magnetic resonance.
- 7. Chemical thermodynamics: Laws, state and path functions and their applications; thermodynamic description of various types of processes; Maxwell's relations; spontaneity and equilibria; temperature and pressure dependence of thermodynamic quantities; Le Chatelier principle; elementary description of phase transitions; phase equilibria and phase rule; thermodynamics of ideal and non-ideal gases, and solutions.
- 8. Statistical thermodynamics: Boltzmann distribution; kinetic theory of gases; partition functions and their relation to thermodynamic quantities calculations for model systems.
- 9. Electrochemistry: Nernst equation, redox systems, electrochemical cells; Debye-Huckel theory; electrolytic conductance Kohlrausch's law and its applications; ionic equilibria; conductometric and potentiometric titrations.
- 10. Chemical kinetics: Empirical rate laws and temperature dependence; complex reactions; steady state approximation; determination of reaction mechanisms; collision and transition state

theories of rate constants; unimolecular reactions; enzyme kinetics; salt effects; homogeneous catalysis; photochemical reactions.

- 11. Colloids and surfaces: Stability and properties of colloids; isotherms and surface area; heterogeneous catalysis.
- 12. Solid state: Crystal structures; Bragg's law and applications; band structure of solids.
- 13. Polymer chemistry: Molar masses; kinetics of polymerization.
- 14. Data analysis: Mean and standard deviation; absolute and relative errors; linear regression; covariance and correlation coefficient.

Interdisciplinary topics

- 1. Chemistry in nanoscience and technology.
- 2. Catalysis and green chemistry.
- 3. Medicinal chemistry.
- 4. Supramolecular chemistry.
- 5. Environmental chemistry.

PhD Syllabus for Pharmaceutical Sciences

Paper I

Question Pattern : 30 Multiple Choice Questions in Research Methodology

(Common paper for all courses)

Paper II

Syllabus for Ph.D : As prescribed for the GPAT-2017.

Question Pattern : 70 Multiple Choice Questions with the following division

Pharmaceutics : 15%

Pharmacology : 15%

Pharmaceutical Chemistry : 15%

Pharmacognosy/Natural Products : 15%

Pharmaceutical Analysis : 15%

Other Pharmacy related subjects : 25%

(Regulatory affairs, Biotechnology, Hospital pharmacy, Clinical pharmacy etc.)

Ph.D. syllabus for Tribal Studies

Paper – I

Research Methodology

- Unit-I: Type of social and cultural research: ethnography, within culture comparison, regional controlled comparison, cross cultural research, historical research, Social Research and Social Survey Research, hypothesis, Research Design, Qualitative and quantitative data, ethics of social research.
- Unit-II: Research Methods: historical Philosophical, Comparative and Scientific Methods; Sample and Census, Sampling.
- Unit-III: Research Techniques: Observation, Questionnaires, Schedule, Interview Schedule, Case Study.
- Unit-IV: Some Statistical Techniques: Measures of Central tendency, Mean, Mode, Median; Standard Deviation:
- Unit-V: Field work: Field work tradition, Preparation of schedule,

 Documentation, Classification of Primary Data, Report writing, and
 relevant Computer Applications.

Selected Reading ---

- 1. Goode and Hatt: Methods in Social Research, McGraw Hill Book Company, Tokyo
- 2. Dennis, J.: Statistics in Political and Palumbo Behavioral Science Appleton-Century-Croft, New York
- 3. Cargan Leonard, Doing Social Research, Rawat Publications, Jaipur, 2008
- 4. D.K. Das, Design of Social Research, Rawat Publications, Jaipur, 2005

- 5. Cargan Leonard, Doing Social Research, Rawat Publications, Jaipur, 2003
- 6. Ram Ahuja, Research Methods, Rawat Publications, Jaipur, 2006
- 7. D.K. Das, Practice of Social Research, Rawat Publications, Jaipur, 2000
- 8. G. Sjoberg & Nett, Methodology for Social Research, Rawat Publications, Jaipur, 2002
- 9. Pertti Alasuutari and et all, Social Research Method, Sage Publications, New Delhi, 2009
- 10. Lawrence F Locke, Reading and Understanding Research, Sage Publications, New Delhi, 2009
- 11. William Gibson and Andrew Brown, Working with Qualitative Data, Sage Publications, New Delhi, 2009
- 12. Howard Lune & Ross Koppel, Perspectives in Social Research Methods and Analysis, Sage Publications, New Delhi, 2009
- 13. Narayanasamy, Participatory Rural Appraisal: Principles, Methods and Application, Sage Publications, New Delhi, 2009
- 14. Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, Pearson, 2011
- 15. John Gerring, Case Study Research: Principles and Practices, Cambridge University Press, 2010
- 16. Jeff Gill, Essential Mathematics for Political and Social Research, Cambridge University Press, 2010
- 17. Martin Packer, The Science of Qualitative Research, Cambridge University Press, 2009
- 18. Ian Greener, Designing Social Research, Sage Publication, New Delhi, 2011
- 20. Elliot T Berkman and Steven P Reise, A Conceptual Guide to Statistical Using SPSS, Sage Publication, New Delhi, 2011

Paper – II

Philosophy of Tribal studies and Research

- Unit-I: Philosophy of Science and Research: Contributions of Thomas Kuhn and Popper.
- Unit-II: Tribal Heritage of India: Ethnicity and Tribal Identity, Tribal World View.
- Unit-III: History of Indian Art: Prehistoric Art, Proto-Historic Art and Historic Art, social and cultural contexts of Art.
- Unit-IV: Bio-social studies of Man, emerging issues in Tribal Studies.
- Unit-V: Holistic approach , synchronic approach and diachronic approach , Emic and Etic approach and empiricism in Tribal Studies .

Reference Books:

- 1. Tribal Heritage of India S.C Dubey
- 2. Bio- Social Studies in Anthropology Robin Fox
- 3. Indian Architecture Vasudevsharan Agrawal
- 4. Tribal Philosophy and Culture Athikho Kaisi & Heni Francis
- 5. Tribal Culture of India L.P Vidyarthi & Vinay Kumar Rai

PhD SYLLABUS FOR GEOLOGY

Physical Geology: Earth as a Planet- Its shape, size, and density; Origin and age of Earth; Formation of continents and oceans; Earthquakes: Causes, kinds of earthquake waves, Ritchers scale – seismograph and seismogram, Interior of the earth; Isostasy; Elements of Plate tectonics; Orogenic cycles Geological processes exogenic and endogenic; Weathering and agents of weathering; Wind, River and glacier's erosional and depositional landforms; Volcanoes types, Volcanoes eruptional features and products.

Structural Geology: Concept of stress and strain; Contour; Outcrop patterns; Maps and cross sections; Dip and strike; Classification and origin of folds, faults, joints, unconformities, foliations and lineations; shear zones. Stereographic and equal area projections of planes and lines; computation of true thickness of beds from outcrops and bore-holes.

Petrology: Definition and classification of rocks; Igneous rocks-forms of igneous bodies; Crystallization from magma and their behavior; classification, association and genesis of igneous rocks; Bowen's reaction principle; Sedimentary rocks -classification, texture and structure; size and shape of sedimentary bodies. Metamorphic rocks- metamorphic agents, classification, facies, zones and texture. Characteristic mineral assemblages of pelites in the Barrovian zones and mafic rocks in common facies.

Mineralogy: 48 Symmetry and forms in common crystal classes; Physical properties of minerals; Isomorphism and polymorphism, solid solution, Classification of minerals; Structure of silicates; Mineralogy of common rock-forming minerals; Mode of occurrence of minerals in rocks. Transmitted polarised light microscopy and optical properties of uniaxial and biaxial minerals.

Stratigraphy: Stratigraphic correlation; Principles of stratigraphy; Litho-, chrono- and biostratigraphic classification; geological time scale; distribution and classification of the stratigraphic horizons of India from Archaean to Recent.

Economic Geology: Properties of common economic minerals; General processes of formation of mineral deposits; Physical characters; Mode of occurrence and distribution in India both of metallic and non-metallic mineral deposits; Coal and petroleum occurrences in India.

Palaeontology: Major steps in the evolution of life forms through ages; Fossils; their mode of preservation and utility; Morphological characters, major evolutionary trends and ages of important groups of animals—Brachiopoda, Mollusca, Trilobita, Graptolitoidea, Anthozoa, Echinodermata; Gondwana plant fossils; Elementary idea of verterbrate fossils in India.

Applied Geology: Introduction to hydrogeology origin & occurrence; Ground Waterporosity, permeability aquifer, water table, zone of saturation, artesian well; Principles of Engineering Geology.

PhD SYLLABUS FOR HINDI

इन्दिरा गाँधी राष्ट्रीय जनजातीय विश्वविद्यालय, अमरकण्टक (म.प्र.)

हिन्दी विभाग

हिन्दी साहित्य का इतिहास, हिन्दी साहित्य में विविध विमर्श, भाषा विज्ञान, हिन्दी गद्य विधाएं, हिन्दी कथा साहित्य, भारतीय एवं पाश्चात्य साहित्य सिद्धान्त, हिन्दी आलोचना एवं प्रयोजन मूलक हिन्दी।

PhD SYLLABUS FOR ENGLISH

The PhD syllabus for English as per UGC-NET JRF

Ph.D. SYLLABUS FOR ZOOLOGY

I. Pattern of Entrance Examination

The question paper shall consist of two sections **A** and **B**. Section **A** shall consist of 25 questions on General Ability. Section **B** shall consist of subject specific 75 objective type questions. All questions carry equal marks.

All topics in the syllabus carry equal weight.

II. Syllabus

- 1. Molecules and their Interaction relevant to Biology
- 2. Cellular Organization
- 3. Fundamental Processes
- 4. Methods in Biology
- 5. Inheritance Biology
- 6. Animal Physiology
- 7. Immunology
- 8. Evolution and Behaviour
- 9. Developmental Biology

PH.D. SYLLABUS FOR EDUCATION

Ph.D. (Education) Entrance Test will cover following five compulsory papers:

- 1. Philosophical and Sociological Foundation of Education
- 2. Psychological Foundations of Education
- 3. Methodology of Educational Research & Educational Statistics
- 4. Teacher Education
- 5. Educational Technology

Ph. D. Entrance Test Pattern:

All the questions will be of multiple choices in nature.

Ph.D. Entrance Test	Content	Marks
Part-I	General Awareness, Logical Reasoning, Computer Awareness etc.	30
Part-II	Philosophical and Sociological Foundation of Education, Psychological Foundations of Education, Methodology of Educational Research & Educational Statistics, Teacher Education, Educational Technology	70
	Total	100

Syllabus for Ph.D. (Education) Entrance Examination

1- Philosophical & Sociological Foundation of Education:

- ➤ Relationship of Education and Philosophy
- Western Schools of Philosophy: Idealism, Realism, Naturalism, Pragmatism, Existentialism, Marxism with special reference to the concepts of knowledge, reality and values their educational implications for aims, contents and methods of education.
- ➤ Indian school of philosophy: Sankhya, Vedanta, Buddhism, Jainism, Islamic traditions with special reference to the concepts of knowledge, reality and values their educational implications for aims, contents and methods of education.
- > Contributions of Vivekananda, Tagore, Gandhi and Aurobindo to educational thinking.
- ➤ National values as enshrined in the Indian Contribution, and their educational implications.
- > Modern concepts of Philosophy: Analysis-Logical analysis, Logical empiricism and Positive relativism

Sociological Foundation of Education:

- Relationship of Sociology and Education
- Meaning and nature of Educational sociology Sociology of education
- ➤ Education—as a social sub-system-specific characteristics
- > Education and Home
- > Education and the community with special reference to Indian society
- **Education and Modernization**
- ➤ Education and Politics, religion, culture, democracy
- > Meaning and nature of social change
- ➤ Education as related to social satisfaction and social mobility
- Education as related to social equity and equality of educational opportunities
- Constraints on social social change in India (caste, ethnicity, class, language, religion, regionalism)
- Education of the socially economically disadvantaged sections of the society with special reference to scheduled tribes, women and rural population.

2—Psychological Foundations of Education:

- ➤ Relationship of Education and Psychology
- > Process of Growth and Development:
- > Physical, social, emotional and intellectual
- ➤ Development of concept formation, logical reasoning, problem solving and creative thinking, language development.
- ➤ Individual differences-determinants, role of heredity and environment, implication of individual differences for organizing educational programmes.
- > Intelligence- its theories and measurement
- > Learning:

- ➤ Theories of learning--- **Thorndike's** connectionism, **Pavlov's** classical and **Skinner's** operant conditioning, Learning by insight, **Hull's** reinforcement theory, **Tolman's** theory of learning, Lewin's Field theory, **Gagne's** hierarchy of learning.
- > Factors influencing learning
- > Learning and motivation
- > Transfer of learning and its theories.
- > Personality—type and trait theories, measurement of personality.
- > Psychology and education of exceptional children—creative, gifted, backward, learning disables and mentally retarded.
- ➤ Mental health and hygiene—process of adjustment, conflict and defense mechanism, mental hygiene and mental health. Sex education

3—Methodology of Educational Research & Educational Statistics:

- ➤ Nature and Scope of Educational Research
- > Scientific Inquiry and Theory Development-some emerging trends in research
- Fundamental, Applied and Action Research
- > Hypothesis
- Collection of Data
- > Concepts of population and sample
- > Various methods of sampling
- > Types of research tools and techniques and their uses
- Questionnaire-Interviews-Observations
- > Tests and scales, projective and sociometric techniques
- Major Approaches to Research

Descriptive Research

Ex-post facto Research

Laboratory Experiment

Field Experiment

Field Studies

Historical Research

Educational Statistics

- > Descriptive and Inferential Statistics.
- > The null hypothesis
- > Test of significance
- > Types of error

- > One- tailed and two-tailed tests
- ➤ The t-test
- ➤ The F-test (One-way and ANOVA)
- ➤ Non-parametric tests (Chi-square test)
- ➤ Biserial, point-biserial, tetrachoric and phi-coefficient of correlation
- > Partial and Multiple correlations

4—Teacher Education:

- ➤ Historical perspective Recommendations of various commissions on teacher education, Kothari Commission
- ➤ National Policy on Education
- ➤ Aims and objectives of teacher education at—
- > -elementary level
- > -secondary level
- > -college level

Types of teacher education programmes and agencies:

- ➤ In-service teacher education
- > Pre-service teacher education
- > Distance education and teacher education
- Orientation and Refresher courses

5—Educational Technology

Meaning and Scope of Educational Technology

- -educational technology as systems approach to education
- -systems approach in educational technology and its characteristics
- -components of educational technology, software, hardware

Multi-media approach in educational technology

Modalities of Teaching: difference between teaching and instruction, conditioning and training

Stages of Teaching—pre-active, interactive, post-active

Teaching at Different Levels—memory, understanding and reflective

Modification of Teaching Behavior: Microteaching, Flander's Interaction Analysis, simulation

Programmed instruction (origin, types, linear and branching, development of programmed instruction material—linear/branching model, teaching machines, computer assisted instruction)

Models of Teaching: Concepts, different families of teaching models

Designing Instructional System:

- --formulation of instructional objectives
- --task analysis
- --designing of instructional strategies, such as lecture, team teaching, discussion, seminars and tutorials

Communication Process: Concepts of communication, Principles, Modes and Barriers of communication, Classroom communication (interaction verbal and non-verbal)

Distance Education: Concepts, Different contemporary systems, viz, Correspondence, Distance and open, Student support services

Development of Evaluation Tools—Norm-referenced and criterion-referenced tests

PH.D. ENTRANCE EXAM SYLLABUS FOR GEOGRAPHY

SI.	Course
1	Geographical Thoughts

2	Geomorphology
3	Climatology
4	Hydrology
5	Resource Geography
6	Environmental Geography
7	Geography of India
8	Population Geography
9	Rural Settlement Geography
10	Urban Geography
11	Social Geography
12	Cultural Geography
13	Political Geography
14	Agricultural Geography
15	Industrial Geography
16	Regional Planning and Development
17	Remote Sensing and GIS
18	Practical: Use of Statistical Methods and
	Techniques
19	Practical: Cartography