

CAREER POINT UNIVERSITY KOTA (RAJASTHAN)

School of Education

Syllabus and Course Scheme (Annual Scheme)

**Integrated Program of
B.Sc. B.Ed.**

(Biology)

Session – 2021-22

Duration of the Course – Four Years

University Campus :Alaniya, Kota 325 003, Rajasthan Ph: +91-80941-62999

City office: CP Tower (4th Floor), IPIA, Road No-1, Kota (Raj.) -324005 Ph: +91-744-3040045 Fax: +91-744-3040050

Course Scheme of B.Sc. B.Ed. Part-I

Annual Course Scheme of B.Sc. B.Ed. Part-I				
Branch-Biology				
S.No.	Paper Code	Paper Name	Marks	
			Min. Marks	Max. Marks
1	HUL011	General English*	36	100
2	EDL011-I	Childhood and Growing Up	36	100
3	EDL011-II	Contemporary India and Education	36	100
4	EDL011-III	Instructional System and Educational Evaluation	36	100
5	CHL011-I	Inorganic Chemistry	18	50
6	CHL011-II	Organic Chemistry	18	50
7	CHL011-III	Physical Chemistry	18	50
8	CHP011	Chemistry Practical	18	50
9	BOL011-I	Diversity of Microbes and Cryptogams(Thallophyta)	18	50
10	BOL011-II	Diversity of Cryptogams(Bryophyta, Pteridophyta & Paleobotany)	18	50
11	BOL011-III	Cell Biology, Genetics & Plant Breeding	18	50
12	BOP011	Botany Practical	18	50
13	ZOL011-I	Animal Diversity Part-I(Protozoa to Annelida)	18	50
14	ZOL011-II	Genetics & Biotechnology	18	50
15	ZOL011-III	Cell Biology, Bio chemistry & Microscopy	18	50
16	ZOP011	Zoology Practical	18	50
				G.T.
				900
*Eligibility Criteria on passing marks only, marks shall not be included in division				

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Syllabus of B.Sc. B.Ed. Biology Part - I

HUL011: General English

Objectives

An essentially language-based course that aims at making students study English Prose with a view to enlarge their comprehension of the language and develop all the four skills. It also aims at giving them basic skills in grammar, widening their vocabulary and teaching them to write simple and correct English. The question paper will have 100 multiple choice questions.

1) Comprehension and vocabulary Prose: Indian Voices: A course in English literature and language; ed. By Kshamta Chaudhary and Sanjay Chawla. Published by Orient Blackswan, Hyderabad. The following chapters from the text have been prescribed:

1. The Child: Premchand
2. The mark of Vishnu: Khushwant Singh
3. Brain Bhowmik's Ailment: Satyajit Ray
4. Drought: Sarat Chand Chatterjee
5. A vision for 2020: A.P.J. Abdul Kalam
6. Elixir of Life: C.V. Raman
7. Photographs: Shama Futehally
8. The death of a Hero: Jai Nimbkar

- Questions based on the content from the prescribed text
- Objective/Multiple choice questions based on the content from the prescribed text
- Short answered questions from the same text

2) Basic language skills: Parts of speech, Determiners, Voice, Reported-Speech, Correct Verbs, Form of Modals, Phrasal Verbs, Prepositions

& Question Tags.

3) Writing Skills: Paragraph writing/C.V. Curriculum-Vitae, Letter Writing/ E-Mail/ Report Writing.

EDL011-I Childhood and Growing up

Objectives: After completing the course the students will be able:

1. To develop an understanding of the basic concepts, methods and principles of psychology.
2. To develop an understanding of the nature and process of development.
3. To understand the different periods of life with Psycho-Social Perspective.
4. To develop an understanding of the nature and process of learning in the context of various learning theories and factors.
5. To understand the critical role of learning Environment.
6. To acquaint them with various Psychological attribute of an individual.
7. To reflect on the changing roles of children in contemporary society.

Unit I: Role of psychology to understand the child

1. Psychology: Meaning, nature & branches of psychology,
2. Methods of psychology: case study and experimental, Edu. Psychology
3. Meaning, nature, scope, educational implication of psychology in new Era
4. Child psychology; meaning, concept

Unit II: Multi dimensional development

1. Growth and development- concept, stages principles, dimensions, Factors in influencing development- genetic, biological, environmental and physical
2. Theories of development
 - Piaget's vgotzky cognitive development

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- Freud's psycho- sexual development
- Erikson's psycho social development
- Linguistic development
- Kohlberys' gilligan's moral development
- Bandura's social developments
- Gessel's maturation theory

Unit 3: Child Growing up

1. Childhood: Meaning, concept and characteristics, effects of family, schools, neighbourhood and community on development of a child
2. Adolescence: meaning, concept, characteristics, effects of family, school, pear group, social climate and social media.
3. Personality: concept and nature, theories of personality, assessment of personality
4. Individual differences: concept, areas (With Special Educational needsConcept) and educational implication.
5. Stress: meaning, types and coping strategies with special reference to personality of adolescent.

Unit 4: Learning to Learn

1. Concept and beliefs about learning:-Defining misconception, Brain's role in learning
2. Memory and forget, Behaviouristic learning theories (Thorndike, Skinner, Pavlov),Gestalt, Cognitive and Field theory, Information processing theory, Social Constructive approach ,Types of learning by Gagne.
3. Motivation:-Concept and Maslow's Hierarchy need theory, Creating and maintaining a productive Classroom Environment:-Dealing with misbehaviour, Multi-Culturalism, Changing roles and responsibilities in contemporary Indian society with regarding educational psychology.

Unit 5: Psychological Attributes of an individual

1. Intelligence - Meaning, Types of intelligence - Social, Emotional and Spiritual Intelligence, theory of intelligence, Gardner's Multi intelligence theory, Measurement of intelligence, Creativity - Meaning, Components, ways of enhancing creativity, relation with intelligence and other factors, Measurement of creativity, Higher Level thinking skills - critical thinking, reasoning, problem solving, Decision making.
2. Socialization and Mental health: Process of Socialization - Group dynamics - Theory of Kurt lewin's, Leadership and its styles (Kimble young), social prejudice,Mental Health - Common problems related to child - Attention deficit hyperactivity disorder (ADHD), depression, Learning disabilities, dealing with a problematic child.

- Project (Any one of the following) 10 Marks
- Comparative study of developing pattern's of children with reference to different in SES.
- Collecting and analyzing statistics on the girl child with reference to gender ratio.
- Administration of an experiment on learning, span of attention, memory
- Administration and interpretation of an individual group test of intelligence.

Book Suggested:

1. Agarwal, Reetu, Shukla Geeta (2014). Bal Vikas evam Manovigyan, Rakhi Prakashan, Agra
2. Aggarwal, J.C., (1981). Essential of Educational Psychology, Delhi, Doaba Book
3. Arora, Dr. Saroj, Bhargava, Rajshri (2014). Bal Manovigyan, Rakhi Prakashan, Agra
4. Bigge, M.L. (1982). Learning Theories for Teachers. New York: Harper and Row
5. B.P. (2000). Personality theories, Bosten: Allyn and Bacon House.
6. Chauhan, S.S. (2001). Adanaced educational psychology, New Delhi: Vikas Publishing House.
7. Diane E. Papalia, Sally Wendkos olds, Ruth Durkin Feldman, Ninth Edition, Human Development, Tata Mcgraw Hill Publishing company Limited, New Delhi.
8. Helen Bee Denise Boyd, First Indian Reprint 2004.The Developing Child, Published by Pearson Education Pre. Ltd. Indian Branch Delhi, India
9. Jack Snooman, Robert Biehler Ninth Edition. Psychology Applied to Teaching, Houghton Mifflin Company, Bosten New York (<http://www.coursewise.com>)
10. Ormrod Ellis Jenne, Third Edition, Educational Psychology Developing Learners Multimedia Edition (<http://www.prenhall.com/ormrod>)

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11. Sarswat Kuldeep (2015). Bal Vikas evam Bachpan, Published by Rakhi Prakashan, Agra
12. Woolfolk, A. (2004). Educational Psychology published by Dorling Kindersley (India) Pvt. Ltd., Licensees of Pearson Education in South Asia.

EDL011-II Contemporary India and Education

Objectives: After completing the course the students will be able to:

1. To promote reflective thinking among students about issues of education related to contemporary India.
2. To develop an understanding of the trends, issues and challenges faced by contemporary education in India.
3. To appreciate the developments in Indian education in the post independence era.
4. To understand the Commissions and committees on education constituted from time to time.
5. To understand issues and challenges of education and concern for the underprivileged section of the society.
6. To develop awareness about various innovation practices in education.
7. To develop and understanding of self teaching technical devices.
8. To understand the constitutional values and provisions for education. Course Content

Unit I Education as an Evolving Concept

1. Education: Meaning, concept and nature, Ancient to present education as an organized and institutionalized form, formal and state sponsored activities.
2. Aims of Education: Historicity of aims of Education, changing aims of education in the context of globalization, sources of aims of Education: Educational aims as derived from the constitution of India influence of aims of education on the curriculum and transactional strategies. Idea of educational thinkers such as Gandhi, Tagore, Aurobindo, Dewey Krishnamurthy, Friere and Illich.

Unit – II: Issues and Challenges

1. Diversity, Inequality, Marginalization:- Meaning, Concept, Levels with special reference to Individual, Region, Language, Caste, Gender.
2. Role of education in multicultural and multilingual society for Equalization and Improvement of Marginalization groups.
3. Hindrances of Education in India: Quality, Facilities, Access, Cost, Political unwillingness, Youth unsatisfaction, Moral Crisis.

Unit – III: Constitution and Education

1. Study of the Preamble, fundamental rights and duties of citizens, Directive Principles for state and constitutional values of Indian Constitution.
2. Constitutional provisions for education and role of education in fulfillment of the constitutional promise of Freedom, Equality Justice, Fraternity.
3. Education and politics, Constitutional vision related to aims of education, Peace Education, Role of Education, School and Teachers as agents for Imparting Culture, Education and Development. Education and Industrialization.

Unit – IV: Programme and Policies

1. Overview the development of education system in India from 1948 to 2010 University Education Commission-1946-48, Secondary Education Commission-1952-53, Indian Education Commission- 1964-66, National Education Policy- 1986
2. Rammurthy Committee (1990), Yashpal Committee Report (1993) Revised National Education Policy (1992) NCF-2005, NKC-2006, NCFTE- 2009, RTE-2010.
3. SSA, MLL, RMSA, CCE, Navodaya Vidyalaya, Kasturba Gandhi Balika Vidyalaya, Model School.

Unit – V: Innovative Practices

1. Concept, Need of innovation in view of technological and social change, Obstacles in innovation, Role of Education in bringing innovations, Education through interactive mode of teaching: Computer, Internet, Tally and Video-Conferencing, Eduset, Smart Class Room, Role of E- learning, E- content, E- magazines and E-journals, E- library.
2. Yoga Education, Life Skill Education, Education and Competence in life regarding Social inclusion
 - Debate or Organize a one day discussion on the topic related to the subject and submit a report.
 - Critical appraisal on the report or recommendations of any commission and committee.
 - Organize collage, Poster Making activity in your respective institution.

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- Collection of at least three handouts of related topics of the subject.

Book Suggested:

1. Agnihotri, R. (1994) Adhunik Bhartiya Shiksha Samasyaye Aur Samadhan, Jaipur: Rajasthan Hindi Granth Academy 2.
2. Agrawal, J.C: Land Marks in the History of Modern Indian Education, New Delhi
3. Brubecher, John.S: A History of the Problems of Education
3. Altekhar, A. S.(1992) Education in Ancient India, Varanasi: Manohar Prakashan
4. Dev, A.,Dev, T.A.,Das,S. (1996) Human Rights a Source Book, New Delhi, NCERT, Pp. 233.
5. Dubey, S.C. (1994) Indian Society, New Delhi, NBT, Pp.
6. Education and National Development: Report of the Kothari Commission on Education, New Delhi, 1966

EDL011-III Instructional System and Educational Evaluation

Objectives:

This course will enable the student teacher to:

1. Explain the need, importance and characteristics of educational evaluation.
2. Describe the approaches to educational evaluation.
3. Discuss the role of educational evaluation in Teaching - Learning Process.
4. Explain the nature of tools and techniques of educational evaluation.
5. Describe the need and importance of psychological testing,
6. Explain the nature of learners' evaluation and need for continuous comprehensive educational evaluation in schools.

Unit I: Instructional System

1. Educational Objectives and instructional objectives.
2. Relationship between educational objectives and instructional objectives
3. Classification of educational objectives (Cognitive, affective and psycho motor)
4. Functioning of educational objectives
5. Usefulness of the taxonomical classification.

Unit II: Need, importance and characteristics

1. Teaching Learning process and role of evaluation
2. Need and importance of Evaluation
3. Definition of Evaluation
4. Evaluation, Assessment and Measurement.
5. Characteristics of good evaluation.

Unit III: Approaches to Evaluation

1. Formative evaluation and summative evaluation
2. Difference between summative and formative evaluation
3. External evaluation and internal evaluation, advantages and disadvantages,
4. Norm referenced evaluation
5. Criterion referenced evaluation.

Unit IV: Role of Evaluation in Teaching-Learning Process.

1. The relationship between instructional objectives, entering behavior, learning experiences and Performance assessment.
2. Diagnosis to over come deficiency in learning.
3. Importance of results of evaluation to students, teachers, institutions with special reference to help in determining the effectiveness of a course, programme and functioning of a school.

Unit V: Nature of tools and techniques of evaluation

1. Nature of test and Purposes of testing with reference to: o Instructional purpose b) Guidance purpose c) Administrative purpose
2. Administration of Test and Interpreting test result.
3. Meaning of Norms, types of Norms, age, Grade, Percentile and standard score.
4. Norms and interpretation of test scores.
5. Concept of grade system. Absolute grading, comparative grading and its advantages and disadvantages

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- Develop a portfolio for assessment of 2 school students
- Prepare an advanced tool for evaluation.
- Develop a tool for self-assessment.
- Develop an achievement test and its blue print.

Book Suggested:

1. Anastasi, Anne, (1976), Psychological Testing, 4m ed., New York; Macmiflan Publishing Co. Inc.
2. Bertrand, Arthur and Cebula, Joseph P., (1980) : Tests, Measurement and Evaluation, A Developmental Approach, Addison-Wesley, U.S.A.
3. Bloom, Benjamin S., Et.al., (1971): Handbook on formative and Summatice Evaluation in Student Learning, McGraw Hill, USA.
4. Ebel,Robert, L. (1996) : Measuring Educational Achievement, Prentice-Hall of India, New Delhi. 27
5. Ferguson, G A (1974), "Statistical Analysis in Psychology and Education", McGraw Hill Book Co., New York,
6. Freeman, Frank S.,(1962), Theory and Practice of Psychoiological Testing, New Delhi, Oxford and IBH Publishing Co.
7. Guilford, J.P.(1965), Fundamental Statistics in Psychology and Education, Me Graw Hill Book Company, New York.
8. Khan, Mohd, Arif, (1995): School Evaluation, Ashish Publishing House, New Delhi.
9. Noll, V .C (1957). Introduction to Educational Measurement, Houghton Miffline Company, Boston.
10. Nunnally, Jume, (1964), Educational Measurement & Evaluation, New York.

CHL011-I: Inorganic Chemistry

Unit-I Atomic Structure

Idea of De Broglie matter wavs, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation,significance of ψ and ψ^2 , quantum numbers, radial and angular wave function and probability distribution curves, shapes of s,p,d, orbitals.Aufbau and Pauli exclusion principles,Hund's multiplicity rule. Electronic configurations of the elements, Effective nuclear charge.Periodic Properties Atomic and ionic radii, ionization energy, electron affinity and electronegativity-definition, methods of determination or evaluation, trends in periodic table and application in predicting and explaining the chemical behaviour.

Unit –II Chemical Bonding

Covalent Bond- Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH_3 , H_3O^+ , SF_4 , ClF_3 , ICl_2 and H_2O .

MO Theory: Homonuclear and heteronuclear (CO and NO) diatomic molecules, multi-center bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

Unit -III

Ionic Solids-Ionic Structures: radius ratio effect and coordination number, limitations of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber Cycle, solvation energy and solubility of ionic solids, polarizing power and polarizability of ions.Fajan's rule. Metallic

bond -free electron, valence bond and bond theories. Weak Intearactions-Hydrogen bonding, van der waals forces

Unit -IV

s-Block Elements Comparative study, diagonal relationship, salient features of hydrides, solvation and complexation tendencies including their function in biosystems, an introduction to alkyls and aryls. Chemistry of Noble Gases Chemistry of the noble gases. Chemistry of xenon. Structure and bonding in xenon comp p-Block Elements Comparative study (including diagonal relationship) of groups, 13-17 elements compounds like hydrides, oxides, oxyacids and halides of groups 13-16.

Unit -V

Chemistry of the following compounds:

Hydrides of Boron -diborane and higher boranes, borazine, borazoles, fullerenes, carbides, fluorocarbons, silicates, structure principle, tetra sulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.

Book Suggested:

1. Concise Inorganic Chemistry: J.D. Lee
2. General Inorganic Chemistry: J.A. Duffy, Longman (2nd Ed.)

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- Principles of Inorganic Chemistry: B.R. Puri and L.R. Sharma
- Basic Inorganic Chemistry: F.A. Cotton and G. Wilkinson, Wiley Eastern
- Molecular Geometry: R.J. Gillespie, Van Nostrand Reinhold

CHL011-II: Organic Chemistry

Unit –I

Structure and Bonding

Hybridization, bond lengths and bond angles. bond energy, localized and delocalized chemical bond, vander waals interactions, inclusion compounds, clathrates, charge transfer complexes, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding. Mechanism of Organic Reactions Curved arrow notation, drawing electron movements with arrows, half headed and double headed arrow, homolytic and heterolytic bond breaking. Types of reagents, electrophiles and nucleophiles. Types of organic reactions, Energy considerations. Reactive intermediates carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (With examples). Assigning formal charges on intermediates and other ionic species. Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects Kinetic and stereochemical studies.)

Unit-II

Stereochemistry of Organic Compounds

Concept of isomerism, types of isomerism. Optical isomerism: elements of symmetry, molecular chirality enantiomers. stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers. meso compounds, resolution of enantiomers, inversion, retention and racemization. Relative and absolute configuration: sequence rules, D&L and R&S systems of nomenclature.

Geometric isomerism: determination of configuration of geometric isomers, E&Z systems of nomenclature, geometric isomerism in oximes and alicyclic compounds. Conformational isomerism: conformational analysis of ethane and n-butane. conformations of cyclohexane, axial and equatorial bond, conformation of mono substituted cyclohexane derivatives. Newmann projection and sawhorse formulae, Difference between configuration and conformation.

Unit-III

Alkanes and Cycloalkanes

IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reactions, Corey House reaction and decarboxylation of carboxylic acids) Physical properties and chemical reaction of alkanes. Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity. Cycloalkanes nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations, Ring strains in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring: banana bonds.

Unit-IV

Alkenes, Cycloalkenes, Dienes and alkynes

Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halide, regioselectivity

in alcohol dehydration The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes-mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikof's rule, hydroboration-oxidation, oxymercuration

-reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO_4 Polymerization of alkenes. Substitution at the allylic and vinylic-positions of alkenes. Industrial applications of ethylene and propene. Methods of formation, conformation and chemical reactions of cycloalkenes. Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions-1,2- and 1,4- additions, Diels-alder reaction. Nomenclature, structure and bonding in alkynes.

Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation, metal ammonia reductions, oxidation and polymerizations.

Unit-V

Arenes, Aromaticity, Alkyl & Aryl Halides

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Nomenclature of benzene derivatives. The aryl group. Aromatic nucleus and side chain structure of benzene: molecular formula and Kekule structure Stability. Aromaticity: the Huckle's rule, aromatic ions. Aromatic electrophilic substitution-general pattern of the mechanism, role of σ and π complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel Crafts reaction, energy profile diagrams. Activating & deactivating substituents, orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Birch reduction. Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanism of nucleophilic substitution reactions of alkyl halides, SN2 and SN1 reactions with energy profile diagrams. Polyhalogen

compounds: chloroform, carbontetrachloride. Methods of formation of aryl halides, nuclear and side chain reactions. The addition, elimination and the elimination-addition mechanism of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl vs allyl, vinyl and aryl halides. Synthesis and use of D.D.T. and B.H.C

Book Suggested:

1. A Text Book of Organic Chemistry: K.S. Tiwari, S.N. Mehrotra and N.K. Vishnoi
2. Modern Principles of Organic Chemistry: M.K. Jain and S.C. Sharma
3. A Text Book of Organic Chemistry: (Vol. I&II) O.P. Agarwal
4. A Text Book of Organic Chemistry: P.L. Soni
5. Organic Chemistry: (Vol. I, II & III) S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd.
6. Organic Chemistry: Morrison & Boyd, Prentice Hall

CHL011-III: Physical Chemistry

Unit-I

Mathematical Concept and Computers

(a) Mathematical Concepts

Logarithmic relations, curve sketching, linear graphs and calculations of slopes differentiation of functions like $kx, ex, xn, \sin x, \log x$; maxima and minima, partial differentiation and reciprocity relations, integrations of some useful/relevant functions: Permutations and combinations. Factorials. Probability.

(b) Computers

General introduction to computers, different components of a computer, hardware and software input output devices; binary numbers and arithmetic; introduction to computer languages. Programming, operating systems.

Unit II

Gaseous States Postulates of kinetic theory of gases, deviation from ideal behaviour, vander waals equation of state. Critical Phenomena: PV isotherms of real gases, continuity of states, the isotherms of vander Waals equation, relationship between critical constants and vander waals constants, the law of corresponding states, reduced equation of state. Molecular Velocities: Root mean square, average and most probable velocities. Qualitative discussions of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquefaction of gases (based on Joule-Thomson effect.)

Unit III

Liquid state

Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids and gases

Liquid Crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven segment cell. Colloidal State Definition of colloids, classification of colloids. Solids in liquids (sols) properties- kinetic, optical and electrical, stability of colloids. Protective action, HardySchulze law, gold number. Liquids in liquids (emulsions): types of emulsions, preparation. Emulsifier. Liquids in solids (gels): classification, preparation and properties inhibition, general applications of colloids.

Unit IV

Solid State

Definition of space lattice, unit cell. Laws of crystallography- (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements in crystals. X-ray diffraction by crystals. Derivation of Bragg's equation Determination of Crystal structure of NaCl and CsCl (Laue's method and powder method.)

Unit V

Chemical Kinetics and Catalysis

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Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction: concentration, temperature, pressure, solvent, light, catalyst, Concentration dependence of rates, mathematical characteristics of simple chemical reactions zero-order, first order, second order, pseudo order, half-life and mean life period.

Determination of the order of reaction: differential method; method of integration, method of half life period and isolation method. Radioactive decay as a first order phenomenon. Experimental methods of chemical kinetics: conductometric, Potentiometric, optical methods, polarimetry and spectrophotometry.

Theories of chemical kinetics: effect of temperature on rate of reaction, Arrhenius concept of activation energy. Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis). Expression for the rate constant based on equilibrium constant and thermodynamic aspects. Catalysis, characteristics of catalysed reactions, classification of catalysis, miscellaneous examples.

Book Suggested:

1. A Text Book of Organic Chemistry: K.S. Tiwari, S.N. Mehrotra and N.K. Vishnoi
2. Modern Principles of Organic Chemistry: M.K. Jain and S.C. Sharma
3. A Text Book of Organic Chemistry: (Vol. I&II) O.P. Agarwal
4. A Text Book of Organic Chemistry: P.L. Soni
5. Organic Chemistry: (Vol. I, II & III) S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd.
6. Organic Chemistry: Morrison & Boyd, Prentice Hall

CHP011-CHEMISTRY PRACTICAL

Inorganic Chemistry:

Semi-micro / macro Analysis:

1. Anion analysis (3 radicals).
2. Cation analysis: Separation and identification of ions from groups I, II, III, IV, V and VI (3 radicals).

Organic Chemistry:

Laboratory Techniques:

Section-A

1. Determination of melting point:-
 - Naphthalene 80-82^{oC}, Benzoic acid 121.5-122^{oC}, Urea 132.5- 133^{oC}, Succinic Acid 184.5-185^{oC}, Cinnamic acid 132.5-133^{oC}, Salicylic acid 157.5-158^{oC}, Acetanilide 113.5-114^{oC}, m-Dinitrobenzene 90^{oC}, p-Dichlorobenzene 52^{oC}, Aspirin 135^{oC}.
2. Determination of boiling points:-
 - Ethanol 78^{oC}, Cyclohexane 81.4^{oC}, Toluene 110.6^{oC}, Benzene 80^{oC}
3. Determination of mixed melting point:-
 - Urea-Cinnamic acid mixture of various compositions (1:4, 1:1, 4:1)
4. Distillation
 - Simple distillation of ethanol-water, using water condenser or Distillation of nitrobenzene and aniline using air condenser
5. Crystallization
 - Concept of induction of crystallization
 - Phthalic acid from hot water (using fluted filter paper and stemless funnel)
 - Acetanilide from boiling water.
 - Naphthalene from Ethanol.
 - Benzoic acid from water.
6. Decolorisation and crystallization using charcoal
 - Decolorisation of brown sugar (sucrose) with animal charcoal using gravity filtration.
 - Crystallization and decolorisation of impure naphthalene (100g of naphthalene mixed with 0.3g. of Congo Red using 1.0g decolorising carbon) from ethanol.
7. Sublimation (Simple and vacuum)
 - Camphor, Naphthalene, Phthalic acid and Succinic acid.

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Section-B

Qualitative Analysis:

Detection of extra elements (N, S and halogens) and functional groups (phenolic, carboxylic, carbonyl, ester, carbohydrates, amine, amide, nitro and anilide) in simple organic compounds.

Physical Chemistry:

1. Chemical Kinetics

- To determine the specific reaction rate of the hydrolysis of methyl acetate / ethyl acetate catalyzed by hydrogen ions at room temperature.
- To study the effect of acid strength on the hydrolysis of an ester.
- To compare the strengths of HCl and H₂SO₄ by studying the kinetics of hydrolysis of ethyl-acetate.
- To study kinetically the reaction of decomposition of iodide by H₂O₂

2. Distribution Law

- To study the distribution of iodine between water and CCl₄
- To study the distribution of benzoic acid between benzene and water.

3. Colloids

- To prepare arsenious sulphide sol and compare the precipitating power of mono-, bi- and trivalent anions.

4. Viscosity, Surface Tension

- To determine the percentage composition of a given, mixture (non interacting systems) by viscosity method.
- To determine the viscosity of Amyl alcohol in water at different concentrations and calculate the viscosity of these solutions.
- To determine the percentage composition of a given binary mixture by surface tension method (acetone & ethyl-ketone).

Books suggested :

1. Practical Chemistry: Giri Bajpai and Pandey, S. Chand & Co. Ltd., New Delhi

BOT011-I Diversity of Microbes and Cryptogams (Thallophyta)

Unit-I

Viruses and Bacteria: General account of viruses and mycoplasma, bacteria-structure, nutrition, reproduction and economic importance, General account of Cyanobacteria, economic importance, Nostoc, Oscillatoria.

Unit-II

Algae: General Characters, classification and economic importance, important features and life history of chlorophyceae: Volvox, Oedogonium, Coleochaete, Chara.

Unit-III

Algae: General Characters, classification and economic importance, important features and life history of Xanthophyceae - Vaucheria, Phaeophyceae-Ectocarpus Sargassum, Rhodophyceae - Polysiphonia.

Unit-IV

Fungi: General characters, classification and economic importance; important features and life history of Mastigomycotina-Phytophthora Oomycotina-Albugo, Ascomycotina-Saccharomyces, Penicillium, Erysiphae, Basidiomycotina-Puccinia, Ustilago and Agaricus, Deuteromycotina-, Colletotrichum, Alternaria.

Unit-V

Plant diseases and General account of Lichens, special studies about green ear disease, white rust, Stem rust disease of Wheat, Smut disease, Citrus canker, Tobacco mosaic disease, Little leaf disease of brinjal.

BOT011-II Diversity of Cryptogams (Bryophyta, Pteridophyta & Paleobotany)

UNIT-I

Bryophyta: General Characteristics and classification of bryophyte, economic importance and alternation of generation

UNIT-II

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Structure, reproduction and economic importance of Hepaticopsida. Riccia, Marchantia, Porella, Anthocerotopsida- Anthoceros Bryopsida: Sphagnum, Polytrichum.

UNIT-III

Pteridophyta: The first vascular land plant, types of steles, important characteristics of Psilopsida, Lycopsida, Sphenopsida, and Pteropsida, classification of Pteridophyta

UNIT-IV

Structure and reproduction in Lycopodium, Selaginella, Equisetum, Adiantum and Marsilea.

Unit-V

Fossilization, Types of fossils, Techniques of fossil study, Geological time scale. General characters of Rhynia, Lepidodendron, Calamites, Cladoxylon in brief. Indian Gondwana System – Threefold division with major megafossil assemblages. Palynology: Spore and Pollen, Pollen aperture types, NPC classification (Erdtman). Pollen wall, Sporopollenin

BOT011-III Cell Biology, Genetics & Plant breeding

UNIT-I

Membrane structure and function

The cell envelopes: Plasma membrane, bilayer lipid structure, membrane protein diffusion, osmosis, ion channels, active transport, membrane pumps, electrical properties of membranes functions of the cell wall, ultra structure of prokaryotic and eukaryotic cells. Structure and function of other organelles. Mitochondria, Golgi bodies, lysosomes, E.R. Peroxisomes, plastids, vacuoles. Structure and function of nucleus: Ultrastructure, nuclear membrane, nucleolus.

UNIT-II

Chromosome organization: Morphology, Centromere and telomere, chromosome alterations, deletion, duplication, translocation, inversion, variations in chromosome number, aneuploidy, polyploidy, sex chromosomes. DNA the genetic material; DNA structure, replication DNA, protein interactions, the nucleosome model, genetic code, satellite and repetitive DNA, cell division-Mitosis, Meiosis.

UNIT-III

Genetic Inheritance: Mendelian laws of segregation and independent assortment Linkage analysis, allelic and non allelic interaction. **Gene expression:** Structure of gene, transfer of genetic information, transcription, translation, protein synthesis: ribosomes, RNA; regulation of gene expression in prokaryotes, Lac operon.

UNIT-IV

Genetic Variations: Mutations, spontaneous and induced mutation. Extranuclear genome: presence and function of mitochondrial and plastid DNA, Plasmids.

UNIT-V

Plant Breeding: Methods of plant breeding selection (Mass, Pureline and clonal) introduction and acclimatization, Hybridization and hybrid vigour, inbreeding depression.

Books Recommended :

1. Atherly, A.G., Girton, J.R. and Mc Donald, J.F. 1999 The Science of Genetics
2. Saunders College Publishing, Fort Worth, U.S.A.
3. Gupta, P.K. 1999 A Text book of cell and Molecular Biology, Rastogi Publications, Meerut, India.
4. Russel, P.J. 1998 Genetics, Saunders College Publishing, Fort Worth, U.S.A.
5. Snustad, D.P. and Simmons, M.J. 2000 Principles of Genetics, John Wiley and Sons, Inc., U.S.A.
6. Gupta P.K. 1999. Genetics Rastogi Publications Meerut.
7. Vashistha, B.R. 1989, Algae, S. Chand and Co. Delhi.
8. Vashistha, B.R. 1989, Fungi, S. Chand and Co. Delhi.
9. Pandey S.N. & others. 1995, A Text Book of Botany Vol. I, Vikas Publications Dehli
10. Pandey S.N. & others. 1995, A Text Book of Botany Vol. II, Vikas Publications Dehli

BOP011-BOTANY PRACTICAL

1. Microscopic preparations and study of the following algal material : Nostoc, Oscillatoria, Chlamydomonas, Volvox, Coleochaete, Oedogonium, Vaucheria, Chara, Ectocarpus Sargassum and Polysiphonia.
2. Staining of different types of Bacteria.

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3. Study of some locally available plant diseases caused by Viruses. Mycoplasma, Bacteria and Fungi in field/laboratory- TMV, Little leaf of Brinjal. Citrus canker, Green ear disease of Bajra.
4. Study of External morphology and microscopic preparations of following Bryophytes : Riccia, Marchantia, Anthoceros, Sphagnum and Polytrichum.
5. Microscopic examination of fossil slides, specimen/photograph-Rhynia, Lepidodendron Calamites and Cladoxylon.
6. Microscopic temporary, double stained preparations and study of stem/cone/sporocarp of Selaginella. Equisetum and Marsilea.

ZOL011-I Animal Diversity Part-I (Protozoa to Annelida)

Unit –I

Taxonomy: -

1. Classification of Protozoa, Porifera, Coelenterata, Platyhelminthes and Nematoda up to order with examples.
2. Fundamentals of body organization emphasizing symmetry, metamerism, coelome and levels of structural organization.

Unit –II

Protozoa: -

1. Study of structural organization and life history of Trypanosoma and paramecium.
2. Study of locomotion, osmoregulation, nutrition and reproduction in protozoa.
3. Parasitism, pathogenicity and control in protozoans with special reference to Entamoeba, Giardia, Leishmania, Trichomonas and Plasmodium.

Unit-III

1. **Porifera:** - Habit, habitat, structure and function of Sycon. Types of canal system.
2. **Coelenterata:** - Habit, habitat, structure, function and life history of Aurelia. Polymorphism in coelenterata, coral reef.
3. **Ctenophora** - Structural organization and affinities.

Unit IV

1. **Platyhelminthes:** - Structural organization and life history of Dugesia & Fasciola.
2. Parasitic adaptation in Helminthes.
3. **Nematyhelminthes:** - Study of structure and life history of Dracunculus medinensis Nematode parasites and human diseases.

Unit-V

1. Classification of Annelida (up to subclass); metamerism and coelome in Annelida General account and types of Annelida (earthworm)
2. Structural organization, Physiology & life history of Hirudinaria, Trochophore larva.

ZOL011-II Genetics and Biotechnology

Unit-I

1. **Mendelian Genetics:** - Mendel's laws of inheritance. Monohybrid and dihybrid cross. Dominance. Incomplete dominance. Current status of Mendelism.
2. Genetic variation: Variation in chromosome number (Euploidy and Aneuploidy).

Unit-II

1. Genetic disorders in Human beings: Down's, Turner's, Klinefelter's and Edward's syndrome.
2. Types of chromosomal mutations. Molecular basis of gene mutation, mutagens, crossing over and linkage.
3. Polytene and lamp-brush chromosomes.
4. Extra Chromosomal Inheritance

Unit- III

1. Sex-determination XX-XY. XO-XY and WZ mechanisms.
2. Sex-linked inheritance (X-and Y-linked) Color blindness, Hemophilia
3. Gene interactions. Supplementary, complementary, epistasis and inhibitory. Multiple allele-ABO, Rh and MN blood groups and their inheritance, polymorphic genes.

Unit-IV

1. Gene structure (Recon, muton, cistron) and regulation of gene (lac operon: inducible and repressible system).
2. Bacterial genetics: Transformation, Transduction and conjugation. Lytic and lysogenic cycle. Elementary idea about

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eugenics. Elementary idea about genetic engineering.

3. Gene cloning and recombinant DNA technology (Vectors for gene transfers. Plasmids and phages). Restriction enzymes.

Unit V

1. Introduction: Historical prospective animal cell hybridoma, major areas and future prospects of biotechnology.
2. Medicines and Biotechnology: Microbes in medicine, antibiotics, vaccine, antibodies, antigens
3. Environmental Biotechnology: Use of micro-organisms in metal and petroleum recovery pest control. Waste treatment, Processing of industrial waste. Degradation of Xenophobic compounds including pesticides and surfactants. Surfactants, Surfactants and oil pollutants, Food and drink biotechnology, Ferment food dairy products. Food preservation microbial spoilage, alcoholic beverages, Vinegar. Monoclonal antibodies and their applications.

ZOL011-II Cell Biology, Biochemistry and Microscopy

Unit-I

1. Introduction, Discovery of cell, cell theory, golden period of cytology, prokaryotic and eukaryotic cell characteristics of animal cell.
2. Protoplasm:- History, physical characters, colloidal property, chemical composition and Biological characters of protoplasm.
3. Cell organelles: - Structure chemical composition and functions of plasma membrane, endoplasmic reticulum, Golgi apparatus, lysosome ribosome, mitochondria, nucleus and nucleolus.

Unit- II

1. Mitosis: - cell cycle, mitotic apparatus, centriole aster, and significance, Amitosis
2. Meiosis: - Introduction, meiotic cycle, synapses of chromosomes, crossing over mechanism, Initiation and control of meiosis, significance.
3. Gametogenesis: - Introduction, spermatogenesis and oogenesis significance, Structure of Sperm and Ovum

Unit III

1. Nucleic Acid: - Chemistry, Molecular model, Duplication, properties and functions of DNA, Types of RNA, Nucleic Acid as Genetic material.
2. Nucleic Acid synthesis: - Synthesized DNA, RNA biosynthesis of DNA and RNA. Genetic code, transcription and translation.
3. Protein synthesis: - Genetic code, transcription, translation, Role of RNA,
4. Mechanism of protein-synthesis, Regulation of protein synthesis.

Unit –IV

1. Cell chemistry: - Nomenclature, classification, Action theory and specificity of Enzyme, enzyme activator, inhibitor, regulation and control of enzyme activity.
2. Cell metabolism: - Anabolic and catabolic process, metabolism of protein, carbohydrates and fats, ketone bodies.
3. Energy cycle: - Anaerobic and aerobic respiration, Energy transfer, redox, cytochrome-system.

Unit-V

1. Microscopy & cytological techniques: - Introduction, types of microscopes.
2. Autoradiography.
3. Isolation of cell components.

Text Book:

1. R.L. Kotpal "Invertebrates"
2. E.L. Jordan and Dr. P.S. Verma "Invertebrate Zoology" S. Chand Publication
3. Veer Bala Rastogi "Genetics" Rastogi Publication
4. P.S. Verma and V.K. Agrawal "Cell Biology and Genetics" S. Chand

Reference Books:

1. Benjamin Pierce, "Genetics A Conceptual Approach" 2nd edition
2. B.D. Singh, "Biotechnology Expanding Horizon" Kalyani Publication

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ZOP011-ZOOLOGY PRACTICAL

1. General survey of Invertebrate (Spot & Slides)
 - (a) **Protozoa:** - Entamoeba, Polystomella, Monocystis, Euglena, Noctiluca Leismania, Nyctotherus, Paramecium, Vorticella.
Porifera:- Sycon, Hyalonema, Euplectella, Spongilla and Euspongia.
Coelenterate:- Obelia colony (polyp & medusa) Physalia, Porpita, Aurelia, Rhizostom, Alcyonium, Corallium, Gorgonia, Pennatula, Madrepora.
Platyhelminthes:- Dugesia, Fasciola, Taenia, Schistosoma.
Nematode:- Filaria, Dracunculus, Wuchereria, Enterobius
Annelida:- Nereis (Heroneries with parapodia) Aphrodite, Arenicola, Pontobdella, Hirudinaria, Peripatus.
 - (b) **Study of TS/LS of organs & developmental stages.** (i) Porifera: - T.S. of Sycon. (ii) Coelenterata- Planula larva of jelly fish. (iii) Platyhelminthes- T.S of Fasciola, scolex of Taenia, mature & gravid segment of Taenia, Hexacanth, bladderworm & cysticercus stage of Taenia, miracidium, sporocyst, redia, cercaria larva of Fasciola. (iv) Annelida- T.S through different region of leach & Nereis. Parapodia of Nereis and Heteronereis, trochophore larva.
 - (c) **Dissection Through chart / model / Photograph / CD. –**
Hirudinaria – Morphology, general anatomy, digestion, nervous & excretory and reproductive system. Earthworm – Anatomy, morphology, digestive and nervous system.
 - (d) **Mounting- (Permanent)**
Protozoa – Euglena, Paramecium, Polystomella
Porifera- Spicules, fibres, gemmule
Coelenterata- Obelia medusa
Platyhelminthes – Taenia (proglotid)
Annelida – Nereis (parapodia)
2. **Genetics:**
 - a) Drosophila – life cycle and its culture.
 - b) Identification of male and female and wild and mutants (yellow. Ebony body. Vestigial wings. White-eye and vestigial wings).
 - c) Prepare slides of sex combs and salivary gland chromosomes of Drosophilae.
 - d) Barr body of human chromosomes.
 - e) Identification of blood group (ABO and Rh factors).
 - f) Simple problems based on monohybrid / dihybrid cross.
3. **Tests: - Biochemistry**
 - a) Protein
 - b) Fat
 - c) Carbohydrate
 - d) Catalases enzyme in animal tissue
4. **Cell Biology**
 - a) Cell permeability
 - b) Acetocarmin preparation of mitotic activity
 - c) Demonstration of mitochondria by using vital stain.
 - d) Demonstration of Bacteria by using Gram's stain.

Note- Animals used in dissection are subject to the condition that these are not banned under the wild life protection act.

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Course Scheme of B.Sc. B.Ed. Part-II

Annual Course Scheme of B.Sc. B.Ed Part-II				
Branch-Biology				
S.No.	Paper Code	Paper Name	Marks	
			Min. Marks	Max. Marks
1	HIN011	General Hindi*	36	100
2	EDL021-I	Knowledge and Curriculum	36	100
3	EDL021-II	Learning and Teaching	36	100
4	EDL021-III	Peace Education	36	100
5	1. Community Service 2. Survey (Based on social and educational events) 3. Co-Curricular Activities 4. Health and Social awareness programme (DISASTER MANAGEMENT AND CLEANINESS)	Open Air/SUPW Camp	36	100
6	CHL021-I	Inorganic Chemistry	18	50
7	CHL021-II	Organic Chemistry	18	50
8	CHL021-III	Physical Chemistry	18	50
9	CHP021	Chemistry Practical	18	50
10	BOL021-I	Diversity and Systematics of Seed Plants - Gymnosperms	18	50
11	BOL021-II	Diversity and Systematics of Seed Plants - Angiosperms	18	50
12	BOL021-III	Structure Development and Reproduction of Flowering Plants	18	50
13	BOP021	Botany Practical	18	50
14	ZOL021-I	Animal Diversity Part-II(Arthropods to protochordata)	18	50
15	ZOL021-II	Endocrinology and Ethology	18	50
16	ZOL021-III	Animal Ecology and Biostatistics	18	50
17	ZOP021	Zoology Practical	18	50
				G.T.
				1000

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Syllabus of B.Sc. B.Ed. Biology Part – II

HIN011: General Hindi

पद्य भाग

1. नर हो न निराश करो मन को-मैथिलीशरण गुप्त
2. हिमालय के आंगन में-जयशंकर प्रसाद
3. जागो फिर एक बार (भाग 2)निराला
4. दिल्ली दिनकर
5. हम अनिकेतन बालकृष्ण शर्मा नवीन
6. झांसी की रानी-सुभद्रा कुमारी चौहान
7. गीत फरोश-भवानी प्रसाद मिश्र ?
8. बादल को घिरते देखा है-नागार्जुन
9. पन्द्रह अगस्त -गिरिजा कुमार माथुर
10. मैं हार नहीं मानूंगा-श्री अटल बिहारी वाजपेयी
11. शहीद की मां-रघुराज सिंह हाड़ा

गद्य भाग

1. नाखून क्यों बढ़ते हैं-हजारी प्रसाद द्विवेदी
2. राष्ट्र का स्वरूप-वासुदेव शरण अग्रवाल
3. गेहूँ बनाम गुलाब-रामवृक्ष बेनीपुरी
4. भवानी शंकरों वंदे-कुबरे नाथ राय
5. बड़े घर की बेटी-प्रेमचन्द
6. अदम्य जीवन-रांगेय राघव
7. उत्सर्ग-राम कुमार वर्मा
8. गांधी जी से भेंट (आत्म कथा से)-राजेन्द्र प्रसाद
9. महाराजपुर से ग्वारी घाट (सौंदर्य की नदी नर्मदा से)-अमृत लाल बेगड़
10. भक्तितन-महादेवी वर्मा
11. हिन्दी हमारी मातृ भाषा है-मनहर चौहान

व्याकरण भाग

1. सधि
2. समास
3. उपसर्ग
4. प्रत्यय
5. विलोम
6. पर्यायवाची
7. शुद्धिकरण शब्द एवं वाक्य
8. वाक्यांश
9. मुहावरे
10. कहावतें
11. शब्दयुग्म
12. अनेकाथी
13. परिभाषिक शब्दावली
14. तत्सम
15. तदभव
16. देश

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सहायक ग्रन्थ :आधार पुस्तक: गद्य साहित्य और पद्य साहित्य

1.हिन्दी व्याकरण : कामना प्रसाद गुरु, किताब घर, दिल्ली

2.हिन्दी व्याकरण : डॉ.नरेन्द्र भानावत

3.हिन्दी व्याकरण : डॉ वेंकट

EDL021-I: Knowledge and Curriculum

Objectives

- To create excellence in the educational system for facing the knowledge of challenges of the twenty first century.
- To encourage the application of knowledge skills in the Indian educational institutions.
- To enhance the quality of pre-service and in-service teacher training.
- To realize the importance of curriculum modification.
- To provide awareness and understanding of social environment.
- To transform teacher- pupils in to a vibrant knowledge-based society.

Unit I

Concept of knowledge & Child's Construction of Knowledge

- Meaning and Nature of knowledge
- Sources of attainment of knowledge in schools with special references of Society, Culture and modernity.
- Distinctions between- Knowledge and Skill, Knowledge and information, Reason and belief.
- Sources of Knowledge: Empirical knowledge Vs Revealed knowledge ·
- Different kinds of knowledge: (a) Disciplinary knowledge: Concepts and Alternative Concepts (b) Course content knowledge: Criteria of Selection and Concerns (c) Indigenous knowledge Vs Global knowledge (d) Scientific knowledge Vs Religious knowledge
- Concepts of Belief, Information, Knowledge and Understanding

UnitII

Facts of Knowledge

Different facts of knowledge and relationship such as Local and Universal Concrete and Abstract Theoretical and Practical School and Out of School (With an emphasis on understanding special attributes of school knowledge)

Unit III

Concept of curriculum

- Meaning, Nature and Objectives of Curriculum, Need for curriculum in schools.
- Philosophical, Psychological, Sociological and Scientific basis of Education with reference of Gandhi, Tagore, Dewey and Plato.
- Difference between curriculum and syllabus.
- Factors Influencing curriculum.
- Various types of curriculum Subject centred, Experience centred, Activity centred, Child centred, and Craft centred.

Unit IV

Curriculum Planning and Transaction

- Construction of Curriculum
- Models of Curriculum Development given by Franklin Bobbit, Ralph Tyler, Hilda Taba and Philip Jackson ·
- Curriculum Transaction: Role of a teacher in knowledge Construction through Dialogue, Challenge and Feedback as a Critical Pedagogue.

Unit-V

School: The Site of Curriculum Engagement

- Role of School Philosophy, Administration (and organization) in creating a context for transacting the curriculum effectively.
- Role of Infrastructural support in Teaching and Learning: Classroom seating Arrangement, Library, Laboratory, Playground, Canteen etc.
- School Culture and Organizational ethos as the context for Teachers' Work.

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- Teacher's role and Support is "Developing Curriculum, Transacting Curriculum and Researching Curriculum": Realities and expectations.

Project (Any one of the following) 10 Marks

- Seminar discussions, movie appraisals, group work, field works,
- Projects and the close reading of articles, policies, documents from key practitioners in the area of Curriculum Studies in Education.
- How does school knowledge get reflected in the form of curriculum, syllabus and textbooks?
- Review of a text book of any school subject.
- Prepare a children's literature handbook.

Books Suggested:

1. Aggrawal, J.C. (2008). Knowledge Commission -2006: Major Observation and Recommendations, Educational Reforms in India for the 21st Century. New Delhi, Shipra Publication.
2. Balsara, M (1999). Principles of Curriculum Reconstruction. New Delhi, Kanishka Publication.
3. Lal, R.B. and Palod S. (2015). Policy Framework and Issues in Education. New Delhi, R.Lal Book Depot.
4. Malareddy, M. and Ravishankar, S. (). Curriculum Development and Educational Technology. New Delhi, Sterling Publisher P. Ltd..
5. Mohanty, J. (2003). Modern Trends in Education Technology. (Reprint Addition 2013)
6. Prasad, Janardan and Kumar, Vijay (1997). Advanced Curriculum Construction. New Delhi, Kanishka Publication.
7. Ramesh Shukla (2005). Dictionary of Education (2005). New Delhi, A.P.H. Publishing Corporation.
8. Soti and Sharma, A. (2014). Eminent Educational Thinkers of India. Agra, R.S.A. International Publisher. Agra.

EDL021-II: Learning and Teaching

Objectives:

After completing the course the students will be able:-

1. To get acquainted with the concept, principles and nature of teaching and learning.
2. To understand the different learning styles based on the difference of learners.
3. To study the relationship between teaching and learning and the factors which influence learning
4. To make use of modern information and communication technology to improve teaching-learning process.
5. To understand learning as a process of communication and be aware of various resources available for making it effective.
6. To study and analyze the sociocultural factors influencing cognition and learning.
7. To study and understand learning in constructivist perspective.
8. To get acquainted with professional ethics of teaching profession.
9. To study the new trends and innovations involved in teaching learning process with professional ethics.

Unit I

Learning and Teaching Process

- Teaching: Meaning, Nature, Principle, Levels, Phases and maxims of teaching. Difference of training and instruction from teaching.
- Learning: Meaning, Nature, Factors affecting learning and types of learning
- Relationship between teaching and learning, Resource and their development for promoting teaching – learning process.
- Tradition and changes in view of the learning process a shift from teaching and learning.

Unit II

Source of Effective Teaching Learning

- Effective teaching: Meaning, component and parameters of effective teaching, classroom instruction strategies, Teacher behavior and classroom climate. (Flander's interaction analysis system)
- Instructional objectives in terms of bloom's taxonomy.
- Programming Learning: Concept, principles and types of programme learning.
- Concept of micro teaching, various teaching skills.

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Unit III

Educational Technology

- Educational Technology: Meaning, Importance and Approaches.
- Model of teaching: Meaning, Assumptions and Fundamental elements of a model of a teaching suchman's inquiry training model.
- Communication: Concept, Elements and Communication skills, Teaching Learning process as the communication.

Unit IV

New Trends in teaching learning due to technological innovation

- Analysis and organisation learning in diverse class room: Issues and concerns.
- Team Teaching, Panel discussion, Conference, Symposium, Workshop, Cooperative learning, Group discussion, Brain storming- issues and concerns with respect to organise teaching and learning process in a classroom such as study habits, self learning, learning skills, interest, ability, giftedness with respect to socio economic background.

Unit V

Teaching as profession:

- Ethics of teaching, professional growth of a teacher
- Teacher as a professional practitioner, identification of the performance, competency and commitment area for teacher.
- Need of Professional enrichment of teachers
- Professional ethics and its development

Assignment:-

Any One (10 MARKS)

- Preparation and practical implication of at least two technical learning resources (transparencies, Power Point Slides, Animated Videos)
- Identify the learning need of the learner in diverse class room with regard to their abilities, learning styles, socio cultural difference, learning difficulties and their implication for class room teaching.
- Identify the professional skills for teachers and report any two programmes for professional development of teaching organized by the school/ training college/ any other agencies.
- Conduct and Interview of any two students with multilingual background and face the problems in teaching learning process.

Books Suggested:

1. Aggarwal J.C.(2004), " Educational Psychology", Vikas Publishing House Pvt. Ltd., New Delhi
2. Berk Laura (2007), " Child Development"; Prentice Hall of India, New Delhi.
3. Biehler Robert and Snowman Jack(1991), " psychology Applied to Teaching"; Houghton Mifflin company, Boston.
4. Buzan Tony (2003), "Brain Child"; Thorsons, An Imprint of Harper Collins, London.
5. Coleman Margaret (1996), " Emotional and Behavioral Disorders"; Allyn and Bacon, Bostan.
6. Erickson Marian (1967), "The Metally Retarded Child in the classroom"; The macmillan company
7. Goleman Daniel(1995). "Emotional Intelligence"; Bantom Books, N.Y.
8. Goleman Daniel (2007), " Social Intelligence"; Arrow Books, London.
9. Henson Kenneth (1999), "Educational Psychology For Effective Teaching"; Wadsworth Publishing Co. Belmont, california
10. KhandwalaPradip(1988), "Fourth Eye" ; A. H. Wheeler, Allahabad.
11. Mangal S.K. (1993), "Advanced Educational Psychology" Prentice Hall of India Pvt. Ltd., New Delhi
12. National Curriculum Framework 2005, N.C.E.R.T , New Delhi.
13. Osborn Alex (1971), "Your Creative Power"; Saint Paul Society, Allahabad, India.
14. Pringle M.K. and Varma V.P.(Ed) (1974), "Advances in Educational Psychology" University & London Press, London
15. Shaffer David(1999), "Social and Personality Development" Wadsworth Thomson Learning, U.S.A.
16. Sharma Tara Chand (2005), "Reading Problems of Learners "; Sarup and Sons, New Delhi.
17. Sousa David (2001), " How The Brain Learns"; Cowin Press, Inc. A Sage Publication Company, California.

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EDL021-III-I: Peace Education

OBJECTIVES:-

The course will enable the student teachers to

- to understand the concept of peace education.
- to acquire the knowledge about peaceful mind makes peaceful world.
- To understand the theory and practice of peace education
- To understand the philosophical thoughts for peace.
- To promote awareness about the existence of Conflicting relationships between people, within and between nations and between nature and humanity.
- To create frameworks for achieving Peaceful and Nonviolent societies.

UNIT I

Concept of Peace

- Negative peace and Positive peace,
- Negative Peace - Peace as absence of war and abolition of war, as the minimization and elimination of violence, as removal of structural violence, Peace with Justice, Peace and Nonviolent liberation technique (Satyagraha) and Disarmament.
- Positive peace: Peace as Love, Mutual Aid, Positive Interpersonal relations, Peaceful resolution of Conflict, Peace and Development, Alternative defense, living with nature and preserving Life and Eco system and Holistic Inner and Outer Peace.

Unit II

Introduction of Peace Education

- Meaning, Concept and need of Peace Education.
- As a universal value
- Aims and Objectives of Peace Education
- Role of Social Agencies: Family, Religion, Mass Media, Community, School, NGO's, Government Agencies in promoting peace education.
- Current Status of Peace Education at Global Scenario.

Unit II

Bases of Peace Education

- Becoming peace teacher-acquisition of knowledge, values and attitudes.
- Life Skills required for Peace Education (WHO)
- Areas of Peace Education: Conflict management, Conservation of Environment
- Challenges to Peace- Stress, Conflict, Crimes, Terrorism, Violence and Modernization.
- Strategies and Methods of teaching Peace Education- Meditation, Yoga, Dramatization, Debate and etc.

UNIT IV

Effective Teaching of Peace

- Peace Education for Life and Lifelong education, Peace Education and Removing the Bias towards Violence – Correcting Distortions.
- Model of integrated Learning – Transactional Modalities - Cooperative Learning, Group Discussion, Project Work, Role Play, Story Telling, Rational Analytic Method – Case Analysis and Situation analysis,
- Peace Research, International classroom, International Parliament, Peace Awards, Creating Models for Peace technology - development of new tools, techniques, mechanisms and institutions for building up peace and Engaging students in Peace Process.

Unit V

Transacting Peace Education & Role of Social Agencies:

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- Integration of Peace Education through curricular and co-curricular activities
- Role of mass media in Peace Education
- Programmers' for Promoting Peace Education –UNESCO
- Addressing challenges to peace in Multicultural Society.
- Role of Religion in proration of Peace. Nelson Mandela Mother-Theresa, Vivekananda, Gandhian Philosophy in promoting Peace Education. Role of Great personalities in promoting Peace.

Assignment:-

Any One (10 MARKS)

- Prepare a Role Play of Great Personalities who worked/ contributed towards Peace.
- Organize an activity in schools to promote Peace.
- Write a report on Gandhi and Peace.
- Write about the contribution of any two Noble prize winners for Peace.
- Prepare an album of Indian Philosophers and write their thoughts on peace.

Books Suggested:

1. Adams.D (Ed) (1997) UNESCO and a culture of Peace: Promoting a Global Movement. Paris UNESCO.
2. Aber,J.L. Brown, J.L.A.Henrich, C.C.(1999) Teaching Conflict Resolution: An effective.
3. Dr.Haseen Taj (2005) National Concerns and Education, NeelkamalPublications.pvt.Ltd
4. Dr.Haseen Taj (2005) Current challeges in Education, NeelkamalPublications.pvt.Ltd
5. Mahesh Bhargava and Haseen Taj (2006) Glimpses of Higher Education. Rakhi

CHL021-I: INORGANIC CHEMISTRY

Unit-I

Chemistry of Elements of First Transition Series:

Characteristics properties of d-block elements. Properties of the elements of the first transition series, their binary compounds and complexes-illustrating relative stability of their oxidation states, coordination number and geometry.

Unit-II

Chemistry of Elements of Second and Third Transition Series: General characteristics, comparative treatment with their 3d-analogues in respect to ionic radii, oxidation states, magnetic behaviour, spectral properties, stereochemistry.

Unit-III

Coordination Compounds:

Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes.

Unit-IV

Chemistry of Lanthanide Elements:

Electronic structure, oxidation states, ionic radii and lanthanide contraction, complex formation, occurrence and isolation of lanthanide compounds.

Chemistry of Actinides: General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, similarities between the later actinides and later lanthanides.

Unit-V

Acids and Bases :

Arrhenius, Bronsted-Lowry, the Lux-Flood solvent system and Lewis concept of acids and bases.

Non-aqueous Solvents: Physical properties of solvents, type of solvents and their general characteristics, reactions in liquid NH₃ and Liquid SO₂.

Oxidation and Reduction: Use of redox potential data-analysis of redox cycle, redox stability in water, Frost, Latimer and Pourbaix diagrams. Principles involved in the extraction of the elements.

Suggested books:

1. Text book of Quantitative Inorganic Analysis : A. I. Vogel (Chapter – I, II and XXIII)
2. Text book of Quantitative Inorganic Analysis : I. M. Kothoff and E. R. Sandell
3. Concise Inorganic Chemistry : J. D. Lee

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4. General Inorganic Chemistry : J. A. Duffy
5. Principle of Inorganic Chemistry : B. R. Puri and L. R. Sharma
6. Basic Inorganic Chemistry : Cotton and Wilkinson and Gaus, Willey

CHL021-II: ORGANIC CHEMISTRY

Unit-I

Electromagnetic Spectrum: Absorption Spectra:

Ultra-violet (UV) Absorption Spectroscopy: Absorption laws (Beer-Lambert's law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated dienes and enones.

Infrared (IR) Absorption Spectroscopy: Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, finger print region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.

Unit-II

Alcohols:

Classification and nomenclature. Monohydric Alcohols: Nomenclature, method of preparation by reduction of aldehydes, ketones, carboxylic acids and esters. hydrogen bonding. acidic nature, reactions of alcohols. Dihydric Alcohols: Nomenclature, methods of preparation, chemical reaction of vicinal glycols, oxidative cleavage [$\text{Pb}(\text{OAc})_4$ and HIO_4] and pinacol-pinacolone rearrangement. Trihydric Alcohols: Nomenclature and methods of preparation, chemical reactions of glycerol.

Phenols: Nomenclature, structure and bonding, preparation of phenols, physical properties and acidic character. comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion, Reactions of phenols: electrophilic aromatic substitution, acylation and carboxylation. mechanism of fries rearrangement, Claisen rearrangement, Gatterman synthesis. Hauben-Hoesch reaction, Lederer-Manasse reaction and Reimer-Tiemann reaction.

Unit-III

Aldehydes and Ketones:

Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic additions to carbonyl group in benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction, Mannich reaction. Use of acetals as protecting group. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketone, Cannizzaro's reaction, Meerwein-Ponndorf-Verley, Clemmensen, Wolff Kishner, LiAlH_4 reductions, Halogenation of enolizable ketones. An introduction to α,β -Unsaturated aldehydes and ketones.

Unit-IV

Ethers and Epoxides:

Nomenclature of ethers and methods of preparation, physical properties. Chemical reactions: cleavage and autoxidation. Ziesel's method of synthesis of epoxides. acid and base catalyzed ring opening and orientation. reactions of Grignard and organolithium reagents with epoxides.

Carboxylic Acids: Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effect of substituents on acid strength. preparation of carboxylic acids. Reactions of carboxylic acids, Hell-Volhard-Zelinsky reaction. Synthesis of acid chlorides, esters and amides. Reductions of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions of unsaturated monocarboxylic acids. Dicarboxylic Acids: Methods of synthesis and effect of heat and dehydrating agents.

Carboxylic Acid Derivatives: Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides. Relative stability and reactivity of acid derivatives. physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. preparation of carboxylic acid derivatives and chemical reactions. mechanism of esterification and hydrolysis (acidic and basic).

Unit-V

Organic Compounds of Nitrogen:

Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanism of nucleophilic substitution in nitroarenes and their reduction in acidic, neutral and alkaline media. Picric Acid.

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Alkyl and Aryl Amines: Reactivity, structure and nomenclature of amines, physical properties, stereochemistry of amines. separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase transfer catalysts. preparation of alkyl and aryl amines (reduction of nitro compounds and nitriles). Reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reactions of amines. Electrophilic aromatic substitution in arylamines, Reactions of amines with nitrous acid. Synthetic transformations of aryldiazonium salts, azo coupling.

Suggested Books:

1. A Text Book of Organic Chemistry : K. S. Tiwari, S. N. Mehrotra and N. K. Vishnoi
2. Modern Principles of Organic Chemistry : M. K. Jain & S. C. Sharma
3. A Text Book of Organic Chemistry: (Vol. I & II) O. P. Agarwal
4. A Text Book of Organic Chemistry : B. S. Bahl and Arun Bahl
5. A Text Book of Organic Chemistry : P. L. Soni
6. Organic Chemistry: (Vol. I, II & III) S. M. Mukherji, S. P. Singh and R P. Kapoor

CHL021-III: PHYSICAL CHEMISTRY

Unit-I

Thermodynamics-I:

Definition of Thermodynamic Terms: System, surroundings, types of systems, intensive and extensive properties. state and path functions and their differentials. thermodynamic process, concept of heat and work.

First Law of Thermodynamics: Statement, definition of internal energy and enthalpy, heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's law, Joule-Thomson coefficient. Isothermal and adiabatic conditions for reversible processes. Calculation of w , q , dU & dH for the expansion of Ideal gases under adiabatic conditions for reversible process.

Thermochemistry: Standard state, standard enthalpy of formation, 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. Kirchoff's equation.

Unit-II

Thermodynamics-II:

Second Law of Thermodynamics: Need for the law, different statements of the law. Carnot's cycle and its efficiency, Carnot-Theorem. Thermodynamic scale of temperature.

Concept of Entropy: Entropy as a state function, entropy as a function of V&T, Entropy as a function of P&T, entropy change in physical change, Clausius inequality and entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

Third Law of Thermodynamics: Nernst's heat theorem. Statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz function's: Gibbs function (G) & Helmholtz function (A) as thermodynamic quantities. A&G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. variation of G & A with P.V. & T.

Unit-III

Chemical Equilibrium:

Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. Le chatelier's principle. Reaction isotherm and reaction isochores, isochore Clapeyron equation and Clausius-Clapeyron equation, applications.

Phase Equilibrium: Statement and meaning of the terms: phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system-water, CO₂ and sulphur systems. phase equilibria of two component system solid-liquid equilibria, simple eutectic Bi-Cd, Pb-Ag systems, desilverization of lead. Solid solutions-compound formation. Congruent melting point (Mg-Zn) and incongruent melting point (NaCl-H₂O) system. Freezing mixtures: acetone-dry ice. Liquid-Liquid mixtures-Ideal liquid mixtures, Rault's and Henry's laws, non-ideal system-Azeotropes-HCl-H₂O and ethanol-water system. Partially miscible liquids: phenol-water. Lower and upper consolute temperature. effect of impurity on consolute temperature. Nernst Distribution law-Thermodynamic derivation, applications.

Unit-IV

Electrochemistry-I:

Electrical Transport: conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution, migration of ions

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and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes. Ostwald dilution law, its uses and limitations. Debye-Huckel

Onsager's equation for strong electrolytes (elementary treatment only). Transport number: definition and determination by Hittorf's method and moving boundary method. Applications of conductivity measurements: Determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Unit-V

Electrochemistry-II:

Types of reversible electrodes: gas-metal ion, metal-metal ion, metal-insoluble salt anion and redox electrodes. electrode reactions. Nernst's equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode, reference electrodes, electrochemical series and its significance. Electrolyte and Galvanic Cells: Reversible and irreversible cells, conventional representation of electrochemical cells. E.M.F. of a cell and its measurements. Computation of cell EMF. Calculation of thermodynamic quantities of cell reactions (ΔG , ΔH and K), polarization, over potential and hydrogen over-voltage. Concentration cell with and without transport, liquid-junction potential, application of concentration cells, valency of ions. Solubility product and activity coefficient, potentiometric titrations. Definition of pH and pKa. Determination of pH using hydrogen, quinhydrone and glass electrodes by potentiometric methods.

Suggested Books:

1. Principles of Physical Chemistry : B. R. Puri Sharma and M. S. Pathania
2. A Text Book of Physical Chemistry : A. S. Negi and S. C. Anand
3. A Text Book of Physical Chemistry : Kundu and Jain

CHP021 – Chemistry Practical

Inorganic Chemistry:

Section-A

Calibration of fractional weights, pipettes and burettes. Preparation of standard solution. Dilution-0.1M to 0.001M solutions.

Section-B

Quantitative Analysis: Volumetric analysis

- Determination of acetic acid in commercial vinegar using NaOH
- Determination of alkali content in antacid tablet using HCl.
- Estimation of calcium content in chalk as calcium oxalate by permanganometry.
- Estimation of hardness of water by EDTA.
- Estimation of ferrous and ferric by dichromate method.
- Estimation of copper using thiosulphate.

Gravimetric analysis

- Analysis of Cu as CuSCN and Ni as Nickel dimethylglyoxime.

Organic Chemistry

Laboratory techniques:

A. Thin Layer Chromatography:

- Determination of R_f values and identification of organic compounds.
- Separation of green leaf pigments (spinach leaves may be used)
- Preparation and separation of 2,4-Dinitrophenyl hydrazones of acetone, 2-butanone, hexan-2 and 3-one using toluene and light petroleum (40:60)
- Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5)

B. Paper Chromatography-Ascending and Circular:

- Determination of values and identification of organic compounds.
- Separation of a mixture of phenyl alanine and glycine. Alanine and aspartic acid. leucine and glutamic acid. Spray reagent-Ninhydrin.
- Separation of a mixture of D,L-alanine, glycine and L-leucine using n-butanol: acetic acid:water (4:1:5) Spray reagent-Ninhydrin.

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- Separation of mono saccharides-a mixture of D-galactose and D-fructose using n-butanol:acetone:water (4:5:1) spray reagent- Aniline hydrogen phthalate.

Qualitative Analysis:

- Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable derivatives.

Physical Chemistry:

A. Transition temperature:

- Determination of the transition temperature of the given substance by thermometric /dilatometric method (e.g. $MnCl_2 \cdot 4H_2O$ / $SrBr_2 \cdot 2H_2O$)

B. Phase Equilibrium

- To study the effect of a solute (e.g. NaCl, succinic acid) on the critical solution temperature of two partially miscible liquids (e.g. phenol-water system)
- To construct the phase diagram of two component (e.g. diphenylbenzophenone) system by cooling curve method.

C. Thermochemistry:

- To determine the solubilities of benzoic acid at different temperatures and to determine ΔH of the dissolution process.
- To determine the enthalpy of neutralization of a weak acid weak base versus strong acid and strong base and determine the enthalpy of ionisation of the weak acid/weak base.
- To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using born haber cycle.

Books Suggested:

1. Practical Chemistry: Giri Bajpai and Pandey, S. Chand & Co. Ltd., New Delhi
2. Practical Chemistry (Hindi Ed.): Suresh Ameta & P. B. Punjabi, Himanshu Publication

BOT021-I Diversity & Systematics of Seed Plants-Gymnosperms

Unit-I

Origin and Evolution of Angiosperms : Some examples of primitive Angiosperms and Ranales.

Unit-II

Angiosperm taxonomy ; Brief history ; aims and fundamental components ; Alpha taxonomy, omega-taxonomy, keys, taxonomic literature, Botanical nomenclature ; principles and rules ; taxonomic ranks ; type concept, principle of priority.

Unit-III

Classification of Angiosperms ; Salient features of the systems proposed by Bentham and Hooker and Engler & Prantl. Major contributions of cytology, phytochemistry and taxometrics to taxonomy.

Unit-IV

Diversity of flowering plants as illustrated by members of the families Ranunculaceae, Brassicaceae, Papaveraceae, Capparidaceae, Malvaceae, Rutaceae, Fabaceae, Apiaceae.

Unit-V

Salient features of some families; Asteraceae, Acanthaceae, Apocynaceae, Asclepiadiaceae, Solanaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae, Liliaceae and Poaceae.

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BOT021-III Structure Development and Reproduction of Flowering Plants

Unit-I

The basic body plan of flowering plant, modular type of growth, Diversity in plant form in annuals, biennials and perennials, Convergence and evolution of tree habit in gymnosperms, monocotyledons and dicotyledons, trees-largest and longest lived organisms.

Unit-II

The shoot system : The shoot apical meristem and its histological organization, vascularization of primary shoot in monocotyledons and dicotyledons ; formation of internodes, branching pattern, monopodial and sympodial growth, canopy architecture, cambium and its function, formation of Secondary Xylem; a general account of wood structure in relation to conduction of water and minerals, characteristics of growth rings, sapwood and heart wood, role of wood skeleton, secondary phloem, structure, function, relationships; periderm.

Unit-III

Leaf : Origin, development arrangement and diversity in size and shape, internal structure in relation to photosynthesis and water loss; adaptation to water stress, senescence and abscission. The root system : The root apical meristem ; differentiation of primary and secondary tissues and their roles ; structural modification for storage, respiration, reproduction and for interaction with microbes.

Unit-IV

Flower : A modified shoot, structure, development and varieties of flower, functions, structure of anther and pistil, the male and female gametophytes, types of pollination, attractions and rewards for pollinators, pollen pistil interaction, self-incompatibility, double fertilization ; formation of seed-endosperm and embryo, fruit development and maturation.

Unit-V

Significance of seed : Suspended animation, ecological adaptation, unit of genetic recombination and replenishment, dispersal strategies, vegetative reproduction, vegetative propagation, grafting, economic aspects.

Text Books

1. Structure Development and Reproduction in Flowering Plants Alka publication.(Medium: Hindi).
2. Structure Development and Reproduction in Flowering Plants, Rastogi Publication (Medium: English)

Reference books

1. Vanaspati Vigyan , Prakash Publication (Medium: Hindi /English)

BOP021 – BOTANY PRACTICAL

Gymnosperms

A. Cycas.

- Habit, armour of leaf bases on the stem (if specimen is not available show photograph), very young leaf (circinate venation) and old foliage leaves, scale leaf, bulbils, male cone (specimen); microsporophyll, megasporophyll, mature seed.
- Study through permanent slides - normal root (T.S.), stem (T.S.) (if sections are not available show photographs), ovule (L.S.).
- Study through hand sections or dissections - coralloid root (T.S.), rachis (T.S.), leaflet (T.S.), microsporophyll (T.S.), pollen grains (W.M.)

B. Pinus

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- Habit, long and dwarf shoot showing cataphylls and scale leaves, T.S. wood showing growth rings, male cone, 1st year, 2nd year and 3rd year female cones, winged seeds.
- Study through permanent slides - root (T.S.), female cone (L.S.), ovule (L.S.), embryo (W.M.) showing polycotyledonous condition.
- Study through hand sections or dissections - young stem (T.S.), old stem (wood) (T.L.S. and R.L.S.), needle (T.S.), male cone (L.S.), male cone (T.S.), pollen grains (W.M.)

C. Ephedra

- Habit and structure of whole male and female cones.
- Permanent slides - female cone (L.S.).
- Hand sections/dissections - node (T.S.), internode (T.S.), male cone (T.S. and L.S.), pollen grains.
- Ginkgo, Taxus & Gnetum - Study of morphology and anatomy of vegetative and reproductive parts.

Angiosperms

The following species are suitable for study. This list is only indicative. Teachers may select plants available in their locality.

- Ranunculaceae** : Ranunculus, Delphinium
- Brassicaceae** : Brassica, Iberis, Papaveraceae : Argemone / Papaver.
- Malvaceae** : Hibiscus, Abutilon
- Rutaceae** : Murraya, Citrus
- Fabaceae** : Faboideae : Lathyrus, Cajanus, Melilotus, Trigonella
Caesalpinioideae : Cassia, Caesalpinia
Mimosoideae : Acacia, Prosopis, Mimosa
- Apiaceae** : Coriandrum, Foeniculum, Anethum
- Asteraceae** : Helianthus, Ageratum, Sonchus, Tridax
- Acanthaceae** : Adhatoda, Peristrophe
- Apocynaceae** : Vinca, Thevetia, Nerium
- Asclepiadaceae** : Calotropis
- Solanaceae** : Solanum, Withania, Datura
- Euphorbiaceae** : Euphorbia, Phyllanthus, Ricinus
- Lamiaceae** : Ocimum, Salvia
- Amaranthaceae** : Amaranthus, Achyranthus
- Liliaceae** : Asphodelus, Asparagus
- Poaceae** : Avena, Triticum, Hordeum.

(B)

1. Study of any commonly occurring dicotyledonous plant (for example Solanum nigrum or Kalanchoe) to understand the body plan and modular type of growth.
2. Life forms exhibited by flowering plants (by a visit to a forest or a garden).
3. L.S. shoot tip to study the cytohistological zonation and origin of leaf primordia.
4. Monopodial and sympodial types of branching in stems (especially rhizomes)
5. Anatomy of primary and secondary growth in monocots and dicots using hand sections (or prepared slides). Structure of secondary phloem and xylem. Growth rings in wood. Microscopic study of wood in T.S., T.L.S. and R.L.S.
6. Internal structure of leaf. Structure and development of stomata (using epidermal peels of leaf)
7. Anatomy of the root. Primary and secondary structure.
8. Examination of a wide range of flowers available in the locality and methods of their pollination.
9. Structure of anther, microsporogenesis (using slides) and pollen grains (using whole mounts). Pollen viability using in vitro pollen germination.
10. Structure of ovule and embryo sac development (using serial sections).
11. Nuclear and cellular endosperm. Embryo development in monocots and dicots (using slides/dissections)
12. Simple experiments to show vegetative, propagation. (leaf cuttings in Bryophyllum, Sansevieria, Begonia; stem cuttings in rose, salix, money plant, sugarcane and Bougainvillea).

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13. Germination of non-dormant and dormant seeds. Viability of seeds.

ZOL021-I : Animal Diversity (Part-2) Arthropod to Protochordata

Unit – I

Arthropoda

1. General characters and classification of phylum - Arthropoda up to subclass.
2. Habit, habitat, external features, appendages, digestive, respiratory, circulatory, excretory, reproductive and nervous system and sense organs of prawn (*Palaemon*).
3. Larval forms of Crustacea. Metamorphosis in Insects.

Unit – II

Mollusca

1. General characters and classification phylum - Mollusca upto subclass.
2. Habit, habitat, external features, coelom, general anatomy, digestive, respiratory, circulatory, excretory, reproductive systems, of snail (*Pila*).
3. Torsion in Gastropoda. Larval forms of Mollusca.

Unit – III

Echinodermata

1. General characters and classification of phylum-Echinodermata upto subclass.
2. Habit, habitat, symmetry, external features, coelom, general anatomy, digestive, respiratory, circulatory, excretory, water vascular, reproductive, nervous system and sense organs of star fish (*Asterias*).
3. Larval forms of Echinodermata. Autotomy and regeneration in Echinoderms.
4. **Chordata** :Primary chordate characters, invertebrate chordates (Protochordata), concept of invertebrate and nonchordates.

5. Hemichordata :

- i. General characters and classification of Hemichordata.
- ii. Habit, habitat, external features, coelom, body wall, digestive, skeletal, respiratory, circulatory, excretory, nervous and reproductive system and sense organs of *Balanoglossus*.
- iii. Tornaria larva.
- iv. Affinities of Hemichordata.

Unit - IV

1. Urochordata

- i. General characters and classification upto class level.
- ii. Habit, habitat, general anatomy and various systems, including sense organs of *Herdmania*.
- iii. Ascidian tadpole and its metamorphosis; affinities of Urochordata.

2. Cephalochordata:

- i. Habit, habitat, general anatomy and various systems, including sense organs of *Branchiostoma* (*Amphioxus*).
- ii. Affinities of Cephalochordata.

Unit – V

Applied Animal Science :

1. Harmful and beneficial insects.
2. Apiculture, lac-culture and sericulture. Aquaculture : Prawn and molluscan fisheries; pearl culture.
3. Frontier areas of animal cell, tissue and organ culture; cloning and tissue - engineering.

ZOL021-II: Endocrinology and Ethology

UNIT I

Endocrinology : Introduction, basics and functions

1. Glands : Exocrine and endocrine; Secretions : Autocrine and paracrine.
2. Hormones : Chemical nature and properties, role in homeostasis.
3. Structure and functions of major endocrine glands : Pituitary, thyroid, parathyroid, adrenal gland, pancreas; their hormones, role and abnormalities due to hyposecretion and hypersecretion.

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4. Structure and functions of minor endocrine glands : Thymus, pineal, GIT, kidney , heart; endocrine glands in insects; their hormones and role.

UNIT II

Endocrinology : Control and regulation of secretion and molecular mechanism

1. Regulation of hormone secretion; positive and negative feedback control mechanism.
2. Extra cellular and intracellular receptors.
3. Second messengers : Cyclic AMP, PIP₂, IP₃, DG, G-protein, protein kinase and role of Ca⁺⁺ as messenger; cell signalling; amplification of signal.
4. Molecular mechanism of insulin action .

UNIT III

Endocrinology : Role in reproduction

1. Male Reproductive System, Hormones from testis, Female Reproductive System ,ovary and placenta, their structure and functions.
2. Importance of hormones in sexual differentiation in embryo.
3. Hormonal control of menstrual cycle, implantation, pregnancy, parturition and lactation.
4. Different types of contraceptives (Natural Methods, Barriers, IUDs, Pills & surgical Methods) their composition and effects.

UNIT IV

Ethology : Introduction and basics

1. Introduction and history of behaviour, approaches and study of animal behaviour (ecological, physiological, evolutionary and neural methods) MRI and CAT scan.
2. Genetic basic of animal behaviour and evolution of ethology.
3. Biological clock; circadian and circannual rhythms.
4. Learning and imprinting, instinct behaviour.

UNIT V

Ethology : Areas of behaviour

1. Searching of food : Honey bee , rhesus monkey and langoor.
2. Social behaviour and organization : Honey bee, termite, mammals (black buck and monkeys).
3. Communication, fights and alarm call : Vocal, visual, tactile, olfactory and acoustic; honey bee language; pheromonal and hormonal basis of aggression, brain hormone relation in sexual behaviour.
4. Migration in fishes and birds. Orientation : Taxes and kinesis.

ZOL021-III: Animal Ecology and Biostatistics

Unit-I

1. 'Ecology' as a science, its meaning and history.
2. Modern concept, scope, components of ecosystem,
3. Abiotic physical factors : temperature, light, water, soil and soil profile, current, pressure, gravity, biotic factors, intraspecific and interspecific relation,
4. Concept of limiting factors; Liebig's law of minimum, Shelford's law of tolerance, modern concept, importance.

Unit - II

1. Population ecology : Determination of population density, factors affecting population density, demography,
2. Community ecology, characteristics of bio-community, interdependence for reproduction and protection , ecosystem homeostasis,
3. ecosystem and productivity concept, its types and methods, energy flow, food chain and food web in ecosystem, ecological pyramids, ecological niche.

Unit - III

1. Aquatic ecology, fresh water lotic and lentic fresh water habitat, fresh water biota, marine habitat, zonation, marine water biota, ecology and biota of deep sea zone.
2. Estuarine habitat and biota.
3. Terrestrial habitat, forest and desert ecosystem and biomes.
4. Ecology and human future, growth rate, role of man in modification of natural communities.

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Unit - IV

1. Natural resources, renewable resources (forest/wild life), non-renewable resources (water, mineral resources), Aquaculture and Mariculture.
2. Conservation, management of natural resources (renewable resources and non-renewable resources)
3. Environmental pollution, types (water, air, soil, pollution by insecticides, noise).
4. Basic concepts of bioaccumulation, biomagnification, and biodegradation of pollutants.
5. Impact of urbanization, characteristics of urbanization in India, urban problems.

Unit - V

1. Functions and importance of biostatistics,
2. frequency - distribution, presentation of data, mean, mode, median, deviation, error, probability-distribution, correlation, significance-tests, biostatistical analysis of gene distribution in populations.

Text Book:

1. R.L. Kotpal "Invertebrates"
2. A.K. Berry, "A textbook of Endocrinology", Emkay Publication
3. Reena Mathur, "Animal Behaviour", Rastogi Publication
4. Dr. P.S. Verma and V.K. Agrawal, "Environment Biology", S.Chand

ZOP021-ZOOLOGY PRACTICAL

1. Study of animal diversity through museum specimens :-

- a. Arthropoda - Peripatus, Limulus, spider, Lepas, crab, lobster, Balanus, Saculina, Lepisma, moth, butterfly, rice weevil, centipede, millipede, locust, cyclops.
- b. Mollusca - Chiton, Neopilina, Patella, Aplysia, Dentalium, Ostrea, Teredo, Slug, Loligo, Octopus, Nautilus, Mytilus, pearl oyster.
- c. Echinodermata - Antedon, Cucumaria, Echinus, Astropecten, Ophiothrix, Holothuria.
- d. Invertebrate chordates - Balanoglossus, Herdmania, Doliolum, Salpa, Oikopleura, Amphioxus.

2. Study of sections of organs and developmental stages :

- a. Arthropoda - Larval stages of crustacea and insecta - Nauplius, Zoea, Megalopa, Mysis, Cypris larva, mosquito larvae and instars of flies. Book lung, trachea, malpighian tubule, pectens (scorpion)
- b. Mollusca - Veliger and glochidium larvae. Sections of unio through different regions, unio gill T.S.
- c. Echinodermata - Pedicellaria, pluteus larva, bipinnaria larva.
- d. Hemichordata - T.S. through proboscis, collar and trunk regions of Balanoglossus, tornaria larva.
- e. Urochordata : Pharyngeal wall, spicules and tadpole larva of Herdmania.
- f. Cephalochordata: T.S. of Branchiostoma through oral hood, pharynx, gonads and caudal region.

3. Dissections : Ththrough Chart / Model / Photograph / CD

a. Major –

- i. Palaemon - digestive and nervous system.
- ii. Scorpion - digestive, reproductive and nervous system.
- iii. Pila - general anatomy, nervous system.
- iv. Unio - nervous system.

b. Minor –

- i. Palaemon - hastate plate, appendages, alimentary canal and statocyst.
- ii. Scorpion - appendages, book lungs.
- iii. Pila - gill lamella, radula, osphradium and pallial complex.
- iv. Unio - gill lamella and pallial complex.

4. Permanent slide preparation/mounting :

Daphnia, cyclops, crustacean larvae, book lung of scorpion, statocyst and hastate plate of prawn, Mouth parts, wings, appendages and salivary glands of cockroach and wasp gill lamella, radula and osphradium of Pila, gill lamella of unio, glochidium larva; spicules and pharyngeal wall of Herdmania, W.M. of Branchiostoma.

5. Endocrinology :

- a. Demonstration of major endocrine glands using models/ charts / computer software.

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- b. Histological slides of major endocrine glands (pituitary, thyroid, parathyroid, adrenal glands, testes, ovary, pancreas), kidney, insect endocrine glands.

6. Ethology :

- a. Thigmotactic, phototactic and chemotactic response of Paramecium.
- b. Antennal grooming in cockroach.
- c. Phototactic response in Tribolium and earthworm.
- d. Chemotactic response of Cockroach and Ant. (using synthetic pheromone)

7. Ecology (Environment) :

- a. Water analysis, pH, acidity, alkalinity, dissolved O₂ and free CO₂ , chloride (salinity)
- b. Soil analysis - pH.
- c. Qualitative estimation of zooplanktons in a given sample of water (permanent slide preparation of zooplanktons).

8. Biostatistics :

- a. Frequency tables, bar diagrams, histograms, polygons, pie charts.
- b. Exercises on mean, median and mode.
- c. Standard error of mean and standard deviation.

Note: Animals used for practical work must not be banned under the wild life protection act.

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Course Scheme for B.Sc. B.Ed. Biology Part III

Annual Course Scheme of B.Sc. B.Ed. Part-III				
Branch-Biology				
S.No.	Paper Code	Paper Name	Marks	
			Min. Marks	Max. Marks
1	CSL011	Elementary Computer Application*	36	100
2	EDL031-I	Language Across the Curriculum	36	100
3	EDL031-II	Guidance and Counseling in School	36	100
4	Practicum	Special Training Programme .Micro Teaching(5 Skills) 10 marks .Simulated Teaching(5 Lessons) 10 marks .Practice Lesson during Internship Teaching(4 Weeks 15 Lessons) 50 marks .Observation of Teaching of Peer Group(5) 5 marks .Technology Based Lessons(2 Lessons) 10 marks . Criticism Lesson 15 marks	36	100
5	EDL031-III	Pedagogy of a School Subject (part-1) , 1st & IInd Year(candidate shall be required to offer any two papers from the following for part-1 & other for part-2).1. General Science 2. Biology Physics3.Chemistry 4. Mathematics 5. Physics	36	100
Final Lesson			36	100
6	CHL031-I	Inorganic Chemistry	18	50
7	CHL031-II	Organic Chemistry	18	50
8	CHL031-III	Physical Chemistry	18	50
9	CHP031	Chemistry Practical	18	50
10	BOL031-I	Plant Physiology and Biochemistry	18	50
11	BOL031-II	Ecology and Phytogeography	18	50
12	BOL031-III	Biotechnology and Utilization of Plants	18	50
13	BOP031	Botany Practical	18	50
14	ZOL031-I	Animal Diversity (Part 3) Vertebrates and Evolution	18	50
15	ZOL031-II	Mammalian Physiology and Immunology	18	50
16	ZOL031-III	Developmental Biology	18	50
17	ZOP031	Zoology Practical	18	50
				G.T. 1100

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Syllabus of B.Sc. B.Ed. Biology Part III

CSL011: Computer Fundamentals

1.Introduction to Information Technology: evolution and generation of computers, types of computers, micro, mini, mainframe and super computer, Architecture of a computer system: CPU, ALU, Memory (RAM, ROM families), cache memory, input/output devices, pointing devices. Development of Super Computers in India "PARAM": History, Characteristics, Strength, Weakness and basic Architecture.

2.Number system: Binary, octal, decimal and hexadecimal) and their inter-conversions, character codes (ASCII, EBCDIC and Unicode). Logic gates. Boolean Algebra, machine, assembly and high level language including 3 GL and 4GL

3.Concept of Operating system: types of operating systems, need of OS, batch processing, multiprocessing, Single user & Multi user OS, distributed and time sharing operating systems, Process and memory management concept, Introduction to Unix, Linux, Windows, Windows NT systems and their simple commands.

4.Internet: Concepts, email services, world wide web, web browsers, search engines. Exploring various Citizen-centric services of Govt. of India such as Income Tax Services, Passport Seva, ticket Booking (IRCTC & RSRTC), National Voters Service Portal, LPG service.

5.Word processing packages:

standard features like tool bar, word wrap, text formatting, paragraph formatting. Effects to text, Mail-merge.

6.Presentation packages: Slide creation, slide shows, adding graphics, formatting, customizing and printing custom and animation.

7.Computer networking: Type of networks, LAN, MAN and WAN, concept of bridges and routers, gateways and modems. ISDN and leased lines, Teleconferencing and videoconferencing.

8.Multimedia Technology: Introduction, framework for multimedia devices, image compression standards, JPEG, MPEG and MIDI formats.

9.Database Management Systems: Data, field and records, information database, creation of a database file, insertion, deletion and updating of records, modifying structure, editing and browsing of records, searching sorting and indexing of records, retrieving of records and report generation. Data processing in government organizations.

10.E-commerce: Concept of e-commerce, benefits and growth of e-commerce, security considerations and hazards of virus and other security risks, antivirus software, electronic payment system. E-Commerce: An Indian perspective, Digi locker, attendance gov.in, mygov.in, Swachh Bharat Mission, E-Hospital, National Scholarship portal, E-Sampark, UID, various modes of Digital payment of govt. of India

EDL031-I: LANGUAGE ACROSS THE CURRICULUM

Objectives:

The student teacher will be able:

- To understand children's language background for effective teaching and learning.
- To create sensitivity to the language diversity that exists in the classroom
- To be familiar with theoretical issues, and to develop competence in analyzing current school practices and coming up with appropriate alternatives.
- To enhance the theoretical understanding of multilingualism in the classroom.

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- To understand the nature of classroom discourse and develop strategies for using oral language in the classroom in a manner that promotes learning in the subject area.
- To understand the nature of reading comprehension in the content area and writing in specific content areas.
- To understand interplay of language and society.
- To understand function of language and how to use it as a tool.
- To understand language and speech disorder and make remedial measures too.

Unit-I

Language and Society:

1. Language – Introduction, types, components, linguistic skills and interrelationship between language and literacy.
2. Relationship of language and society: Identification, power and discrimination.
3. Nature of multilingualism: Managing multilingualism in classroom
4. Constitutional status of languages: Hindi, English, Regional languages
5. Language policy in Education

UnitII

Language development

1. Theories of language development and its implementation in teaching, psychological basis of language.
2. The home language and school language and teaching learning process, the power dynamics of the standard language as the school language Vs. home language on dialects.
3. Deficit theory and discontinuity theory of language and teaching – 6 learning process.

Unit-III

Language acquisition

1. Understanding Hindi alphabets & its logical & simple classification
2. Language acquisition and cognitive development, Learning languages with fun
3. Culture acquisition through language.

UnitIV

Classroom and Language:

1. Understanding the nature of classroom, discourse, strategies for using and language in the classroom to promote learning in the subject area.
2. Tools for learning: Dictionary, Discussion, Natural exposition, Word puzzles
3. The nature of questioning in the classroom, Types of questions and teacher control.

UnitV

Development of Reading and writing

1. Nature of reading comprehension in the content area (Informational reading), nature of expository texts vs. narrative texts, transactional texts vs reflective texts.
2. Scheme theory, text structures, knowhow of examining content area of texts books.
3. Strategies for reading text book, children, note making, summarizing, making reading writing connections.
4. Process writing: Analyse children's writing to understand their conception, writing with a sense of purpose, writing to learn and understand.

Practicum/Field Work

1. Narrate your first experience of first day for internship programme.
2. Collect a literary style poem of any language and critically analyse it diagnoses speech defects of primary level student and make a remedial strategy.
3. Prepare a list of at least 10 proverb of any language and interpret their cultural significance.
4. Collect a literary style poem of any language and analyse it.

Books Suggested:

1. Agnihotri, R.K. (1995). Multilingualism as a classroom resource. In K. Heugh, A Siegruhn, & P. Pluddemann (Eds.) Multilingual education for South Africa 9pp. 3-&). Heinemann Educational Books.
2. Anderson, R.C. (1984). Role of the Reader's Schema in comprehension, learning and memory. In R. C. Anderson, J. Osborn, & R.J. Tierney (Eds.), Learning to read in American Schools: Basad readers and Content texts. Psychology Press.

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3. Eller, R.G. (1989). Johnny can't talk, either: The perpetuation of the deficit theory in classrooms. *The Reading Teacher*, 670-674.
4. Erlwanger, S. H. (1973). Benny's conception of rules and answers in IPI Mathematics. *Journal of children's Mathematical Behavior*, 1(2), 7- 26 University of Kota, Kota 30
5. Grellet, f. (1981). *Developing reading skills: A practical Guide to reading comprehension exercises*. Cambridge University Press.
6. Ladson-Billings. G. (1995). *Toward a Theory of Culturally Relevant Pedagogy*. *American Educational research journal*. 32(3), 465-491.
7. NCERT. (2006d) *Position Paper National Focus Group on teaching of Indian language (NCF- 2005)*. New Delhi: NCERT.
8. Sankhla, Arjun Singh, (2013) *Hindi Bhasha Shikshan aur Praveenta*, Arihant Shiksha Prakashan Jaipur.
9. Thwaite, A. & Rivalland, J.(2009) *How can analysis of classroom Taks help teachers reflect on their practices?* *Australian Journal of Language and Literacy*, the 32(1) 38

EDL031-II: GUIDANCE AND COUNSELLING IN SCHOOL

OBJECTIVES:

The course will enable the student teachers to

- Understand the concept, need and meaning of guidance.
- Get acquainted with the principles, issues, problems and procedure of guidance.
- Develop understanding about the role of school in guidance.
- Understand the various areas, tools and techniques in guidance.
- Understand the concept, need and meaning of counselling.
- Get acquainted with the principles and process of counselling.
- Understand the tools and techniques in counselling.

Unit I

GUIDANCE IN SCHOOL

- Concept, Need and Meaning of Guidance.
- Principles of Guidance.
- Procedure of Guidance (steps).
- Issues and problems of Guidance.
- Role of school in Guidance.

Unit II

AREAS, TOOLS AND TECHNIQUES IN GUIDANCE.

- Personal, Educational and vocational Guidance.
- Tools: Records of students.
- Rating scale.
- Psychological tests.
- Questionnaire and Inventories.
- Techniques in Guidance (a) Observation, (b) Interview, (c) Sociometry.

Unit III

COUNSELLING IN SCHOOL

- Concept, Need and Meaning of Counselling.
- Principles of Counselling.
- Counselling Process and Role.
- Directive, Non-Directive and Eclectic counselling.
- Qualities and role of a school counselor

Unit IV

TOOLS AND TECHNIQUES IN COUNSELING

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- Individual counselling and Group counselling.
- Lectures, discussions and Dramatics as techniques in counselling.
- Importance of follow-up in counselling.
- Counselling for the children with special needs.
- Counselling for parents.

Unit V

GUIDANCE AND COUNSELING FOR SPECIAL NEEDS POPULATION GUIDANCE OF CHILDREN WITH SPECIAL NEEDS

- Problems and needs.
- Guidance of the gifted and creative students.
- Guidance of under achiever.
- Slow learning and first generation learners.
- Guidance of learning disabled, Drug addicts and alcoholics.
- De addiction centers, Career resource centre.
- Evaluation of counselling, Need for research and reforms in guidance and counselling.

Assignment:

Any One (10 MARKS)

- Interview of a school counselor.
- Visit to a guidance or counselling centre and write a report.
- Administration of an individual test and preparing a report.

Books Suggested:

1. Anastasi A, Differential Psychology, New Youk: Macmillan Co, 1996
2. Arbuckle Dugland, Guidance and Counselling in the classroom, Allyn & Bacon Inco, 1985.
3. Baqrki. B.G., Mukhopadhyaya. B., Guidance and Counselling; A Manual, New Delhi: Stanley Publishers, 1990. 4. Crow & Crow, An introduction to Guidance, New Delhi: Eurasia Publishing House, 1992.
5. Freeman E.S., Theory and Practice of Psychological Testing, New Delhi: Henry Holt 1992.
6. Jones. A.J., Principles of Guidance, New Delhi: McGrew Hills Publishers, 1970.
7. Kochhar S.K., Educational and vocational Guidance in secondary schools, New Delhi, sterling publishers Pvt. Ltd., 1990.
8. Kolher. S.K., Educational and Vocational Guidance, New Delhi: Practice Hall India Ltd., 1995.
9. NCERT, Guidance and Counseling in Indian Education, New Delhi: NCERT, 1978.

PEDAGOGY OF GENERAL SCIENCE

Objectives

1. Student-teachers will be able to
2. Understand General Science as an interdisciplinary area of learning.
3. Understands aims and objectives of teaching General Science at different levels.
4. Explore different ways of creating learning situations for different concepts of science:
5. Formulate meaningful inquiry episodes, problem-solving situations, investigatory and discovery learning projects based on upper primary, secondary and higher secondary stages.
6. Facilitate development of scientific attitudes in learners.
7. Examine different pedagogical issues in learning science.
8. Stimulate curiosity, inventiveness and creativity in science.
9. Develop ability to use science concepts for life skills.
10. Develop competencies for teaching, learning of science through different measures.

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11. Construct appropriate assessment tools for evaluating learning of science.

12. Understands the CCE pattern of Evaluation.

Unit I

Nature of General Science as a Discipline

Meaning, Concept, Needs of General science teaching. Nature and scope of General science teaching Main discoveries and development of science (special reference to ancient India) Science as a domain of enquiry, as a dynamic and expanding body of knowledge, science as a process of constructing knowledge. Science as an interdisciplinary area of learning (Physics, chemistry, biology etc.); science for environment, health, peace & equity, science and society. fact, concept, principles, laws and theories- their characteristics in context of general science.

Constructivist approach in learning General Science.

Unit II

General science as a school subject Importance of General science in school curriculum. Aims & objectives of teaching General science at secondary level. Writing objectives in behavioural terms. Bloom's taxonomy (revised). Correlation of General Science with other School Subjects Changing trends and goals of teaching General Science with reference to N.C.F. 2005. Concept mapping of themes related to General Science.

Unit III

Methodology of Teaching and learning of General science Methods and devices of teaching General science at secondary level – Lecture-cum Demonstration, Project, Problem solving, Heuristic, Laboratory method. Techniques of teaching General Science

Unit IV

Pedagogical Analysis and mode of learning Engagement Pedagogical analysis of the Units with reference to concepts, learning outcomes, activities and learning experiences and evaluation techniques of following content at secondary level Physics – light, Electricity, magnetism, Gravitation, Work and Energy, Sound Chemistry – Atom And molecules, Chemical Reactions, Acid, Bases and Salt, Carbon and Its Compounds, metal and non-metals Biology – Cell and its Structure, Life processes, Diversity in living organisms, Environmental Science – Our Environment, natural resources and its management Modes of learning engagement in General Science Providing opportunities for group activities and observations. Group/Individual Presentation Providing opportunities for sharing ideas Teaching aids and activities in laboratory work Reflective written assignment

Unit V

Assessment & Evaluation of General Science learning Meaning, concept and construction of Achievement test, diagnostic test and remedial teaching. Blue print: Meaning, concept, need and construction. Open-book tests: Strengths and limitations Continuous and Comprehensive Evaluation (CCE) in Sciences. Difficulties Faced by the teacher in evaluation process and suggestive measures to overcome them.

Practicum/Field Work

Any two of the following

Visit Ayurveda college/ science labs to address lauding their working process and draft a report on their contribution to prosperity.

Prepare a concept map on any theme of General Science and explain its importance for Teaching and learning.

Collect Information about Indian Cultural traditions and find out the scientific basis or hidden concern for life and preservation of environment.

Being a Science teacher how you will remove superstitions from the Society. Report your Strategic planning.

Prepare a diagnostic test and apply it in school, after discussion with concerning teacher and give remedial measures.

1. Sood, J.K. (1987): Teaching Life Sciences, Kohli Publishers, Chandigarh.
2. Sharma, L.M. (1977): Teaching of Science and Life Sciences, Dhanpat Rai & Sons, Delhi.
3. Kulshreshtha, S.P. (1988): Teaching of Biology, Loyal Book Depot, Merrut
4. Yadav, K. (1993): Teaching of Life Science Anmol Publishers, Daryaganj, Delhi.
5. Yadav, M.S. (2000): Modern Methods of Teaching Sciences, Anmol Publishers, Delhi

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6. Singh, U.K. & Nayab, A.K. (2003) : Science Education Commonwealth
7. Venkataih, S. (2001): Science Education in 21st Century, Anmol Publishers, Delhi.
8. Yadav, M.S. (Ed.) (2000): Teaching Science at Higher Level, Anmol Publishers, Delhi.
9. Edger, Marlow & Rao, D.B. (2003): Teaching Science Successfully, Discovery
10. Mangal, S.K. (1996): Teaching of Science, Arya Book Depot, and New Delhi.
11. Dave, R.H.: (1969): Taxonomy of Educational Objectives and Achievement
12. Testing, London University Press, London. 12. Sood. J.K. (1989): New Directions in Science Teaching, Kohli Publishers, Chandigarh.

PEDAGOGY OF CHEMISTRY

Objectives-

Student-teachers will be able to:

- Gain insight on the meaning and nature of chemistry for determining aims and strategies of teaching-learning. Appreciate that chemistry is a dynamic and expanding body of knowledge.
- Appreciate the fact that every child possesses curiosity about his/her natural surroundings.
- Identify and relate everyday experiences with learning chemistry.
- Trace historical background of Chemistry.
- Appreciate various approaches of teaching-learning of chemistry.
- Analyze the contents of Chemistry with respect to Content, process, skills, knowledge organization and other critical issues.
- Perform Pedagogical analysis of various topics in Chemistry.
- Use effectively different activities/ demonstration/laboratory experiences for teaching-learning of chemistry.
- Integrate chemistry knowledge with other school subjects.
- To understand meaning, concept and various types of assessment.

Unit I

Nature of Chemistry as a Discipline Concept, Nature and Needs of Chemistry and Chemistry teaching. Scope of Chemistry teaching. Historical Background of Chemistry with special reference to India. Constructivist approach in learning Chemistry.

Unit II

Chemistry as a school subject

Importance of Chemistry in school curriculum. Aims & objectives of teaching Chemistry at school level. Writing objectives in behavioural terms. Bloom's taxonomy (revised). Correlation of Chemistry with other School Subjects Changing trends and goals of teaching Chemistry.

Unit III

Methodology of Teaching and learning of Chemistry Scientific attitude and scientific temper: Nurture the natural curiosity, aesthetic senses and creativity in Chemistry: essential skills, methods and process that lead to exploration: Generalization and validation of scientific knowledge in Chemistry. Lecture –cum Demonstration, Team teaching, project method, problem solving method, Heuristic method, Group discussion, programmed instruction, Inductive- Deductive, investigatory approach, Concept mapping, Collaborative learning, and Experiential learning in chemistry: Facilitating learners for self-study.

Unit IV

Pedagogical Analysis and mode of learning Engagement Pedagogical analysis of the Units with reference to concepts, learning outcomes, activities and learning experiences and evaluation techniques of following content at secondary and Senior secondary level-Solutions, colloids, chemical equilibrium, electrochemistry, mechanical and thermal properties of matter, chemical bonding and molecular structure, periodic table, Atom and molecules, Chemical Reactions, Acid, Bases and Salt, Carbon and Its Compounds, metal and non-metal setc) Modes of learning engagement in Chemistry.

- a. Observations and experiments in Chemistry: interdisciplinary linkages,
- b. Relating knowledge to students, daily life situations.

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- c. Providing opportunities for group activities and idea Sharing
- d. Group/Individual Presentation
- e. Teaching aids and activities in laboratory work
- f. Reflective written assignment

Unit V

Assessment & Evaluation of Chemistry learning Meaning, concept and construction of Achievement test, Diagnostic testing and remedial teaching Blue print: Meaning, concept, need and construction. Open-book tests: Strengths and limitations Continuous and Comprehensive Evaluation (CCE) in Sciences. Assessment of project work in work in Chemistry (both in the laboratory and in the field) Performance-based assessment; learner's record of observations, field diary, Oral presentation of learners work, portfolio; Developing assessment framework in Chemistry; assessment of experimental work in Chemistry.

Practicum/Field Work

Any two of the following –

1. Perform Some Simple Experiment to clarify any Concept in Chemistry and to develop Observation Skills. Prepare a report of entire activity.
2. Organization of exploratory activities to develop scientific attitude and temper. Report your Experiences
3. Plan an innovation method of teaching chemistry so as to facilitate the correlation of content with other subjects/ day to day life. Teach that lesson in class and report complete activity with your experiences.
4. Write a reflective journal on some innovative trends in Chemistry teaching and their importance in Achieving aims of teaching chemistry at different level.
5. Prepare a diagnostic test and apply it in school, after discussion with concerning teacher and give remedial measures.

Books Suggested:

1. adav, M.S. 1995, Teaching of Chemistry, Anmol Publication, New Delhi.
2. Megi, J.S. & Negi, Rasuita, 2001, Teaching of Chemistry.
3. Yadav, M.S. 2000: Teaching Science at Higher level, Anmol Publications, New Delhi.
4. Misra, D.C. : Chemistry Teaching, Sahitya Preparation, Agra
5. Khirwadbar, Anjab 2003: Teaching of Chemistry by Modern Method, Sarup & Sons. New delhi.
6. Das, R.C., 1985: Science Teaching in Schools, Sterling publishers Pvt. Limited. New Delhi
7. Venkataih, S., 2001: Science Education in 21st Century, Anmol Publishers, New Delhi.
8. Rao, D.B., 2001 : World conference on Science Education Discovery publishing work, New Delhi.
9. Singh, U.K. & Nayab, A.K. : 2003 : Science Education, Commonwealth Publishers, Daryaganj, New Delhi.
10. Singh, Y.K. & Sharma Archnessh, 2003 : Modern Methods of Teaching Chemistry A.P.H. Publishing corporation, Daryaganj, New Delhi

PEDAGOGY OF BIOLOGY

Objectives

Student-teachers will be able to:-

1. Develop insight on the meaning and nature of Biology for determining aims and strategies of teaching-learning.
2. Appreciate that science is a dynamic and expanding body of knowledge.
3. Appreciate the fact that every child possesses curiosity about his/her natural surroundings.
4. Identify and relate everyday experiences with learning of Biology.
5. Appreciate various approaches of teaching- learning of Biology.
6. Explore the process, skill in science and role of laboratory in teaching- learning.

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7. Use effectively different activities / experiments/ demonstrations / laboratory experiences for teaching-learning of Biology.
8. Integrate the Biology knowledge with other school subjects.
9. Analyze the contents of Biology with respect to Content, process, skills, knowledge organization and other critical issues.
10. Perform Pedagogical analysis of various topics in Biology.
11. Develop process-oriented objectives based on the content themes/Units.
12. To understand meaning, concept and various types of assessment

Unit I

Nature of Biology as a Discipline Meaning, Concept, Nature and Need of Biology and Biology teaching. Scope of Biology teaching.

Historical development of Biology as a discipline. Contribution of Indian and western Biologist like Hargobind Khurana, Mohinder Singh Randhawa, Salim Ali, Mendel, Darwin, and Lamark in the field of Biology.

Constructivist approach in learning Biology.

Unit II

Biology as a school subject Importance of Biology in school curriculum.

Aims & objectives of teaching Biology at school level. Writing objectives in behavioural terms. Bloom's taxonomy (revised).

Correlation of Biology with other School Subjects

Changing trends and goals of teaching Biology

Unit III Methodology of Teaching and learning of Biology

Scientific attitude and scientific temper: Nurture the natural curiosity, aesthetic senses and creativity in biology: essential skills, methods and process that lead to exploration, Generalization and validation of scientific knowledge in Biology.

Lecture –cum Demonstration, Team teaching, Project method, Problem solving method, Inquiry approach, Programmed instruction, Investigatory approach, Concept mapping, Collaborative learning, and Experiential learning in Biology: Facilitating learners for self study.

Unit IV

Pedagogical Analysis and mode of learning Engagement Pedagogical analysis of the Units with reference to concepts, learning outcomes, activities and learning experiences and evaluation techniques of following content at secondary and Senior Secondary level- Biology for environment and health, peace, equity, origin of life and evolution, biodiversity, Photosynthesis, Life processes and factors affecting it.

Modes of learning engagement in Biology

- a. Observations and experiments in Biologys: interdisciplinary linkages,
- b. Providing opportunities for group activities
- c. Group/Individual Presentation
- d. Providing opportunities for sharing ideas
- e. Designing different working Models for concept formation.
- f. Teaching aids and activities in laboratory work
- g. Reflective written assignment

Unit V Assessment & Evaluation in Biologys

Meaning, concept and construction of Achievement test

Blue print: Meaning, concept, need and construction.

Construction of test items (open-ended and structured) in Biology and administration of tests.

Open-book tests: Strengths and limitations

Formative and Summative Assessment in Biology.

Continuous and Comprehensive Evaluation (CCE)

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Assessment of project work in biology (both in the laboratory and in the field)

Performance based assessment: learners,, record of observations, field diary, herbarium and collection of materials.

Oral presentation of learners,, work in Biology, portfolio; Developing assessment framework in Biology; assessment of experimental work in Biology.

Practicum/Field Work

Any Two of the following

1. Preparation of Scrap book to show the Contribution of any two Biologist
2. Conduct any activity among students for linking child's natural curiosity with natural phenomena like weather, flora and fauna; contexts. Report your Observations.
3. Preparation/ designing programmed instruction material on any topic of Biology to facilitate learners for self –study.
4. Prepare a low cost or waste material based experiment for secondary/ senior secondary schools.
5. Prepare a plan to assess Students,, Practical work in Biology.

CHL031-I: INORGANIC CHEMISTRY

Unit-I

Hard and Soft Acids and Bases (HSAB):

Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

Unit-II

Metal-Ligand Bonding in Transition Metal Complexes:

Limitations of valence bond theory, an elementary idea of crystal field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal field parameters.

Magnetic Properties of Transition Metal Complexes: Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula, L-S coupling, correlation of n_s and n_{eff} and values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes.

Unit-III

Electronic Spectra of Transition Metal Complexes:

Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series, Orgel-energy level diagram for d^1 and d^9 states, discussion of the electronic spectrum of $[(T_1(H_2O)_6)]^{3+}$ complex.

Thermodynamic and Kinetic Aspects of Metal Complexes: A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes.

Unit IV

Organometallic Chemistry:

Definition, nomenclature and classification of organometallic compounds. Preparation, properties, bonding and applications of alkyl and aryls of Li, Al, Hg, Sn and Ti. A brief account of metal ethylenic complexes and homogeneous hydrogenation. mononuclear carbonyls and the nature of bonding in metal carbonyls.

Unit-V

Bioinorganic Chemistry:

Essential and trace elements in biological processes. metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{+2} and Mg^{+2} . Nitrogen fixation.

Silicones and Phosphazenes: Silicones and phosphazenes as examples of inorganic polymers. nature of bonding in triphosphazenes.

Books Suggested :

1. Basic Inorganic Chemistry F.A. Cotton. G. Wilkinson and P.L. Gaus. Wiley.
2. Concise Inorganic Chemistry, J.D. Lee ELBS.

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3. Inorganic Chemistry, A.G. Sharpe. ELBS.
4. Inorganic Chemistry, G.L. Miessler and D.A. Tarr, Prentice Hall.
5. Selected Topics in Inorganic Chemistry : W. U. Malik, G. D. Tuli and R. Madan
6. Principles of Inorganic chemistry : D. Banerje
7. Modern Aspect of Inorganic Chemistry : H. J. Emeleus and A. G. Sharpe

CHL031-II: ORGANIC CHEMISTRY

Unit-I

Spectroscopy:

Nuclear Magnetic Resonance (NMR) Spectroscopy: Nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constant, areas of signals. Interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone. Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.

Unit-II

Organometallic Compounds:

Organomagnesium Compounds: The Grignard reagents-formation, structure and chemical reactions. **Organozinc Compounds:** Formation and chemical reactions. **Organolithium compounds:** Formation and chemical reactions. **Organosulphur compounds:** Nomenclature, structural features, methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine.

Unit-III

Heterocyclic Compounds:

Introduction, Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole. Introduction to condensed five and six-membered heterocycles. Preparation and reactions of indole, quauinoline and isoquinoline with special reference to Fisher Indole synthesis, Skraup's synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

Unit-IV

Organic Synthesis via Enolates:

Acidity of α -hydrogens. Alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate. Alkylation of 1,3-dithianes. Alkylation and acylation of enamines

Carbohydrates: Classification and nomenclature. monosaccharides: mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses, configuration, erythro and threo diastereomers, conversion of glucose into mannose, formation of glycosides, ethers and esters, determination of ring size, cyclic structure of D(+) glucose, mechanism of mutarotation, structure of ribose and deoxyribose. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

Unit-V

Amino Acids, Peptides, Proteins and Nucleic Acids:

Classification, structure and stereochemistry of amino acids. Acid-base behaviour, isoelectric point and electrophoresis. Preparation and reactions of α -amino acids. Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid phase peptide synthesis. Structures of peptides and proteins, Levels of protein structure, Protein denaturation/renaturation.

Nucleic Acids: Introduction, constituents of nucleic acids. Ribonucleosides and ribonucleotides. The double helical structure of DNA.

Fats, Oils and Detergents: Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Saponification value, iodine value, acid value, soaps, synthetic detergents, alkyl and aryl sulphonates.

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Synthetic Polymers: Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes. Natural and synthetic rubbers.

Synthetic Dyes: Colour and constitution (electronic concept), classification of dyes. Synthesis of methyl orange, Congo red, malachite green, crystal violet, phenolphthalein, fluorescein, alizarin and Indigo.

Suggested Books:

1. A Text Book of Organic Chemistry : R. K. Bansal
2. Organic Reaction and Their Mechanisms : P. S. Kalsi
3. Organic Chemistry, Morrison and Boyd, Prentice Hall.
4. Fundamentals of Organic Chemistry, Solomons, John Wiley.
5. Introduction to Organic Chemistry. Streitwieser, Heathcock and Kosover. Macmilan.
6. Organic Chemistry (Vol. I & II) : S. M. Mukherji, S. P. Singh and R. P. Kapoor, Wiley Eastern Ltd.
7. A Text Book of Organic Chemistry (Vol. I & II) : K. S. Tiwari, S. N. Mehrotra & N. K. Vishnoi
8. Organic Chemistry : M. K. Jain and S. Sharma
9. A Text Book of Organic Chemistry (Vol. I & II) : O. P. Agarwal

CHL031-III: PHYSICAL CHEMISTRY

Unit-I

Elementary Quantum Mechanics:

Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects. Compton effect. Luis De Broglie hypothesis, Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box. Schrodinger wave equation for H-atom. Separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions.

Unit-II

Molecular Orbital Theory:

Basic ideas, criteria for forming MO from AOs, construction of MO's of H_2^+ ion by LCAO, calculation of energy level from wave functions, physical picture of bonding and anti-bonding wave functions, concept of σ , σ^* , π , π^* orbitals and their characteristics. Hybrid orbitals- sp , sp^2 , sp^3 . Calculation of coefficients of AO's used in these hybrid orbitals. Introduction to valence bond model of H_2 , comparison of MO and VB models.

Unit-III

Spectroscopy:

Introduction, electromagnetic radiation, spectrum, basic features of different spectrometers, statement of the Born-Openheimer approximation, degrees of freedom.

Rotational Spectrum: Diatomic molecules, energy levels of a rigid rotator (semi classical principles), selection rules, spectral intensity, using population distribution (Maxwell-Boltzmann distribution) determination of bond length, qualitative description of non-rigid rotator, isotope effect.

Vibrational (Infrared) Spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups.

Raman Spectrum: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.

Electronic Spectrum: Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Frank Condon principle. qualitative description of σ , π and n MO their energy levels and the respective transitions.

Unit-IV

Photochemistry:

Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grothus-Draper law, Stark-Einstein law, Jablonski diagram depicting various processes occurring in the excited state.

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qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples).

Unit-V

Physical Properties and Molecular Structure:

Optical activity, polarization (Calusius-Mossotti equation), orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment- temperature method and refractivity method. dipole moment and structure of molecules, magnetic properties-paramagnetism, diamagnetism and ferromagnetics.

Solutions, Dilute Solutions and Colligative Properties: Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient.

Dilute Solutions: Colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal value and abnormal molar mass, degree of dissociation and association of solutes.

Suggested Books:

1. Physical Chemistry, G.M. Barrow. International Student Edition, McGraw Hill.
2. Physical Chemistry, RA. Alberty, Wiley Eastern Ltd.
3. The elements of Physical Chemistry, P.W. Atkins, Oxford.
4. Principles of Physical Chemistry : B. R. Puri Sharma and M. S. Pathania
5. A Text Book of Physical Chemistry : A. S. Negi and S. C. Anand
6. A Text Book of Physical Chemistry : Kundu and Jain

CHP031 - CHEMISTRY PRACTICAL

Inorganic Chemistry

Synthesis and Analysis

- Preparation of sodium tri oxalate ferrate (III) $\text{Na}_3[\text{Fe}(\text{C}_2\text{O}_4)_3]$ and determination of its composition by permagnometry.
- Preparation of Ni-DMG complex $[\text{Ni}(\text{DMG})_2]$.
- Preparation of copper tetraammine complex $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$.
- Preparation of cis- and trans-bisoxalato diaquachromate (III) ion. Instrumentation
- Colorimetry - Job's method and Mole-ratio method.
- Adulteration - Food stuff.
- Effluent analysis - water analysis.
- Solvent Extraction - Separation and estimation of Mg(II) and Fe(II)
- Ion Exchange Method - Separation and estimation of Mg(II) and Zn(II) Volumetric Analysis
- Iodometric & Iodimetric titrations.

Organic Chemistry

Section-A

Laboratory Techniques:

(i) Steam Distillation:

- Naphthalene from its suspension in water.
- Clove oil from Clove
- Separation of o- and p-nitrophenols

(ii) Column Chromatography:

- Separation of fluorescein and methylene blue.
- Separation of leaf pigments from spinach leaves.
- Resolution of racemic mixture of (Z)-mandelic acid.

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Qualitative Analysis:

Analysis of an organic mixture containing two solid components using water, NaHCO₃, NaOH for separation and preparation of suitable derivatives.

Section-B

Synthesis of Organic Compounds

- Acetylation: Salicylic acid, aniline, glucose and hydroquinone.
- Benzoylation: Aniline and phenol.
- Aliphatic Electrophilic Substitution: Preparation of Iodoform from ethanol and acetone.
- Aromatic Electrophilic Substitution:

o Nitration:

Preparation of m-dinitrobenzene,

Preparation of p-nitroacetanilide o Halogenation:

Preparation of p-bromoacetanilide Preparation of 2,4,6-tribromophenol.

- Diazotization/coupling:

Preparation of methyl orange and methyl red.

- Oxidation: Preparation of benzoic acid from toluene.
- Reduction: Preparation of aniline from nitrobenzene and m-nitroaniline from m-dinitrobenzene. Stereo-chemical study of Organic Compounds via Models
- R and S configuration of optical isomers.
- E and Z configuration of geometrical isomers.
- Conformational analysis of cyclohexanes and substituted cyclohexanes.

Section-C

Organic estimation:

Amino group, phenolic group, carboxylic acid group and glucose.

Physical Chemistry

Electrochemistry

- To determine the strength of the given acid conductometrically using standard alkali solution.
- To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically.
- To study the saponification of ethyl acetate conductometrically.
- To determine the ionization constant of a weak acid conductometrically.
- To titrate potentiometrically the given ferrous ammonium sulphate solution using KMnO₄ / K₂Cr₂O₇ as titrate and calculate the redox potential of Fe²⁺/Fe³⁺ system on the hydrogen scale. Refractometry and Polarimetry
- To verify law of refraction of mixtures for (e.g. of glycerol and water) using Abe's refractometer.
- To determine the specific rotation of a given optically active compound. Molecular Weight Determination
- Determination of molecular weight of a non-volatile solute by Rast method / Beckmann freezing point method.
- Determination of the apparent degree of dissociation of an electrolyte (e.g. NaCl) in aqueous solution at different concentrations by ebulliscopy. Colorimetry
- To verify Beer-Lambert law KMnO₄ / K₂Cr₂O₇ and determined the concentration of the given solution of the substance.

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BOT031-I : PLANT PHYSIOLOGY AND BIOCHEMISTRY

Unit – 1

Plant water relations : importance of water to plant life, physical properties of water diffusion and osmosis, absorption, transport of water and transpiration.

Mineral nutrition : Essential macro and micro elements and their role, mineral uptake, deficiency and toxicity symptoms.

Transport of organic substances : Mechanism of phloem transport source sink relationship, factors affecting translocation.

Unit – II

Photosynthesis : Significance, historical aspects, photosynthetic pigments, action spectra and enhancement effects, concept of two photo systems, z-scheme. Photophosphorylation, C-3 & C-4 pathway, CAM plants, photorespiration.

Unit – III

Respiration : ATP the biological energy currency, aerobic and anaerobic respiration kreb's cycle, electron transport mechanism (chemi-osmotic theory), redox potential, oxidative phosphorylation, pentose phosphate pathway.

Basics of enzymology : Discovery and nomenclature characteristics of enzymes, concept of enzyme, apo enzyme and cofactors, regulation of enzyme activity, mechanism of action.

Unit – IV

Nitrogen and lipid metabolism : Biology of nitrogen fixation, importance of nitrate reductase and its regulation, ammonium assimilation, structure and function of lipids, fatty acid biosynthesis, β -oxidation, saturated and un saturated fatty acids, storage and mobilization of fatty acids.

Unit – V

Growth and Development : Definitions, phases of growth and development, kinetics of growth, seed dormancy Seed germination and factors of their regulation plant movements the concept of photoperiodism, physiology of flowering, florigen concept, biological clocks. Physiology of senescence, fruit ripening, plants hormones auxins, gibberellins, cytokinins, abscissic acid, ethylene, history of their discovery, biosynthesis and mechanism of actions photomorphogenesis, phytochromes and cytochromes, their discovery, physiological role and mechanism of action.

BOT031-II : ECOLOGY AND PHYTOGEOGRAPHY

Unit – I

Plant and Environment : Atmosphere (gaseous composition), water (Properties of water cycle), light (global radiation, photosynthetically active radiation), temperature, soil (development, soil profiles, physico – chemical properties), and biota.

Unit – II

Morphological, anatomical and physiological responses of plants to water: hydrophytes, xerophytes and halophytes, temperature, light (heliophytes and sciophytes) and salinity.

Unit – III

Community ecology : Community characteristics, (analytical and synthetic). Ecological succession. (Hydoasere, lithosere, psammosere) , concept of climax.

Unit – IV

Ecosystems : structure, abiotic and biotic components, food chain, food web, ecological pyramids, energy flow, biogeochemical cycles carbon, water, nitrogen and phosphorus

Unit – V

Biogeographical regions of India, vegetation types of India: Forests and grassland with particular reference to Rajasthan. Environmental pollution – Air, Water and Soil. WWF, Chipko movement, green house effect. Introduction to Climate change, Carbon sequestration, energy and environment, clean development mechanism (CDM).

BOT031-III : Biotechnology And Utilization Of Plants

Unit – I Biotechnology

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Genetic Engineering : Tools and techniques of recombinant DNA technology, cloning vectors; genomic and C-DNA library, transposable element, techniques of gene mapping and chromosome walking, genetic transformation and production of bioactive molecules Basic concept of metabolic engineering, improvement of biosynthesis and accumulation of bioactive immobilization, elicitation, transgenic plants.

Unit – II

Biotechnology : Functional definition, basic aspects of plant tissue culture, cellular totipotency, differentiation and morphogenesis, biology of Agrobacterium ; vectors for gene delivery and marker genes; salient achievements in crop biotechnology.

Unit – III Utilization of Plants

Food Plants :Rice, wheat, maize, bajra, potato, sugarcane, (History origin & distribution), morphology, climate & soil, cultivation, preparation improved varieties, user & crop protection.

Vegetable Oils : Groundnut, mustard and coconut, volatile oils, Fatty oils, classification of vegetable oils, History, origin and distribution, extraction of vegetable oils, Morphology of plant, cultivation varieties.

Unit – IV

Fibers :Cotton and Jute, classification of fibers, History and origin, Important fibers and their source, Distribution, Types, Climate and Soils. Cultivation, processing, characters, Improved varieties.

General account of sources of firewood, timber and bamboos. Structure and characters of wood, Important source of Timber wood, characters, plantation of fire wood, Botanical characteristics of bamboo, climate and soil, uses, diseases and insect pests.

Rubber & Hydrocarbon yielding plants – Calotropis, Euphorbia, History of Rubber, properties of Rubber, Types of Rubber, cultivation of plant, extraction and processing, uses.

Unit – V

Spices :General account Clove, black pepper, Dalchini, Cardamon.

Medicinal Plants: General account, Withania, Rauwolfia, Cinchona, Azadirachta
Ephedra, Taxus, Chlorophytum.

& Aloe,

Beverages :Tea and Coffee.

BOP031 – BOTANY PRACTICAL

Physiology:

1. To study the permeability of plasma membrane using different concentration of organic solvents.
2. To study the effect of temperature on permeability of plasma membrane.
3. To study of effect of toxic substances on permeability of plasma membrane.
4. To demonstrate the phenomenon of the osmosis by the use of potato osmometer.
5. To study the phenomenon of plasmolysis and deplasmolysis using Tradescantia / Rhoen discolor leaves and different concentrations of sugar.
6. To study the protoplasmic streaming (In Hydrilla / Vallisneria)
7. To demonstrate the rate of transpiration by use of potometers (Ganong's/Farmers)
8. To study the relative rate of transpiration from the leaf surfaces of the different plants using cobalt chloride paper.
9. To demonstrate that oxygen is evolved during the photosynthesis by inverted funnel method.
10. To demonstrate that light is necessary for photosynthesis.
11. To demonstrate the effect of different wavelengths of light during the photosynthesis.
12. To demonstrate the carbon-dioxide, light, water and chlorophyll are essential for photosynthesis by Moll's experiment.
13. To compare the rate of photosynthesis under different condition by using Wilmott's bubbler.
14. Comparison of the rate of respiration (R.Q.) of various plant parts or substrates with the help of Ganong's respirometer.
15. Separation of chlorophyll pigments by the paper chromatography.

Biochemistry:-

1. To study the activity of catalase, peroxidase dehydrogenase enzymes in plant tissues.
2. Phytochemical test for starch, sugars, protein, fats, tannins, Anthocyanin.

Biotechnology :

1. Introduction of the instruments/techniques laminar air flow/ sterile bench and autoclave
2. Preparation of M.S and P.D.A. culture media, slant preparation.
3. Demonstration of inoculation techniques, aseptic transfer of explants and microbial transfer technique
4. Demonstration of the technique of micropropagation by using different explants e.g., axillary buds, shoot meristem

Ecology:

1. To determine minimum size of quadrat for phytosociological studies of herbaceous plants.

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2. To determine frequency of the herbaceous species by quadrat method.
3. To determine density and abundance of the herbaceous flora by quadrat method.
4. Soil analysis/Field test
 - a) Soil Texture
 - b) Soil moisture
5. To determine water holding capacity of soil of grass land or wood land
6. To determine the pH of given soil samples.
7. To demonstrate the presence of carbonate and chloride in different water samples/soil samples.

Ecological adaptations:

1. Morphological & Anatomical adaptations in some hydrophytes & xerophytes: (Specimens/slides/section cutting)
Hydrilla, Typha, Eichhornia, opuntia, Euphorbia, Capparis, Casurin, Nerium, Calotropis
2. Ecological instruments and their working
3. Morphological & Anatomical adaptations in some hydrophytes & xerophytes: (Specimens/slides/section cutting)
Hydrilla, Typha, Eichhornia, opuntia, Euphorbia, Capparis, Casurin, Nerium, Calotropis
4. Ecological instruments and their working

Economic Botany:

1. Microchemical tests for – Lignin, Cellulose, Cutin, Suberin, Starch, Sugar, Protein and Oil in plant tissues.
2. Microscopic examination of starch grains of wheat, maize Rice and Potato.

Utilization of plants

- a) Food plants – Wheat, Maize, Rice, Potato, Sugarcane
- b) Fibres – Cotton, Jute
- c) Vegetable oils – Ground nut, mustard and coconut
- d) A general account of the fire wood, timber yielding plants and Bamboos
- e) Spices and condiments – Clove, Black pepper, Cinnamon, Cardamom.
- f) Medicinal Plants – Rauwolfia, Withania, Cinchona, Papaver, Ocimum, Datura, Ephedra, Taxus, Aloe, Azadirachta
- g) Beverages – Tea, Coffee
- h) Rubber – Ficus elastica, Hevea

Viva-Voce

ZOL031-I : Animal Diversity (Part-3) Vertebrates and Evolution

UNIT-I Cyclostomata and Pisces

1. Origin, ancestry and diversity of vertebrates.
2. Cyclostomata: Classification and characters with suitable examples. Petromyzon: General morphology and Ammocoete larva.
3. Pisces-I: Classification and characters with suitable examples; differences between cartilaginous and bony fishes; Latimaria; Dipnoans.
4. Pisces-II: General morphology of Scoliodon and Labeo rohita; types of scales and caudal fin; electric organs, air bladder; aquatic adaptations in fishes.
5. Pisciculture: Introductory knowledge of Pisciculture; important fresh water and marine fishes as food.

UNIT-II Tetrapoda

1. Amphibia: Classification and characters with suitable examples, adaptations for amphibious life, neoteny and paedogenesis.
2. Reptilia: Classification and characters with suitable examples, difference between lizards and snakes, identification of poisonous and non- poisonous snakes, biting mechanism in snakes, snake venom; Dinosaurs, Sphenodon.
3. Aves: General classification and characters with important examples; difference between Ratitae and Carinatae; flight muscles, flight mechanism, flight adaptations, perching mechanism, migration, Archaeopteryx as a connecting link.
4. Mammalia-I: Classification and characters with suitable examples; oviparity; ovoviviparity and viviparity in mammals.
5. Mammalia-II: Dentition; adaptive radiation; convergent evolution of placental and Australian mammals.

UNIT-III Comparative Anatomy of Vertebrates-I

1. Comparative anatomy of the following organ systems of Scoliodon, Rana, Uromastix / Varanus, Collumba and Oryctolagus:
 2. Integument and integumentary derivatives.
 3. Alimentary canal and accessory digestive glands.
 4. Respiratory organs.
 5. Heart, aortic arches and their evolution.

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6. Comparative structure and evolution of urinogenital system (pro, meso and metanephric kidney and genital ducts in males and females)

UNIT-IV Comparative Anatomy of Vertebrates-II

1. Comparative anatomy of the organ systems of Scoliodon, Rana, Uromastix / Varanus, Collumba and Oryctolagus and miscellaneous:
2. Brain and cranial nerves, evolution of brain, spinal cord and ANS.
3. Osteology: Girdles, limb bones, ribs and sternum; jaw suspension in vertebrates.
4. Comparative anatomy of eye.
5. Membranous labyrinth; sound production; hearing; Echolocation in bats.
6. Parental care in vertebrates.

UNIT-V Evolution

1. Basics and origin of life: Definition, pre-darwinian theories of evolution; Oparin-Haldane concept of origin of life; Miller-Urey experiment; molecular evolution of RNA, proteins and DNA; characters of coacervates.
2. Micro-evolution: Work and theories of Lamarck, Weisman and Darwin; theory of natural selection of Darwin and Wallace, industrial melanism, DDT resistance in mosquitoes; neo-darwinism.
3. Evidences of evolution: Various evidences favouring evolution: Homology, analogy, vestigial organs; palaeontological, embryological, biogeographical and biochemical evidences; adaptive radiations, mimicry.
4. Genetic basis of evolution and speciation : Hardy-Weinberg law, gene frequency, genetic drift, factors affecting Hardy-Weinberg law, Founder effect, bottle neck effect, Sewall -Wright effect; speciation; role of various isolating mechanisms in speciation.
5. Macro-evolution: Geological time scale and imperfection of geological record, types of fossils and fossilization, continental drift, extinction, replacement; human evolution.

ZOP031-II : Mammalian Physiology and Immunology

UNIT-I Physiology

1. Digestion:
 - a) Nutrients: Carbohydrates, lipids, proteins, vitamins.
 - b) Digestive enzymes and hormones of GIT.
 - c) Digestive mechanism: Mechanical and chemical digestion.
 - d) Absorption and assimilation of end products of digestion.
 - e) Balanced diet, malnutrition (PEM), obesity; endoscopy.
2. Respiration:
 - a) Aerobic and anaerobic respiration.
 - b) Structure of respiratory organs.
 - c) Mechanism and regulation of breathing.
 - d) Transport of O₂ and CO₂.
 - e) Respiratory disorders: Emphysema, asthma, occupational disorders, spirometry.

UNIT-II Physiology

1. Circulation:
 - a) Circulatory fluids: Blood, lymph; blood cells; structure of haemoglobin.
 - b) Blood circulation through heart, arteries, arterioles, capillaries, venules and veins.
 - c) Cardiac cycle and its regulation. d. Blood clotting mechanism, blood pressure.
 - d) Cardiac disorders, ECG, heart transplantation (an introductory idea).
2. Excretion:
 - a) Excretory products: NH₃, urea, uric acids, amino acids.
 - b) Structure of kidney, nephron; mechanism of urine formation; micturition.
 - c) Autoregulation, counter-current mechanism, renin-angiotensin system.
 - d) Accessory excretory organs: Skin, liver, lungs etc.
 - e) Excretory disorders, dialysis, Kidney transplant.

UNIT-III –Physiology

1. Muscle and Neural Physiology:
 - a) Structure of smooth, skeletal and cardiac muscles; myofibrils.
 - b) Isotonic and isometric contraction of muscles, sliding- filament theory of muscle contraction; relaxation of muscle fibres; Properties of muscles (muscle twitch, fatigue, summation, treppe, tetanus, rigor mortis), myopathy.

- c) Kinds of neuron, structure of myelinated and nonmyelinated nerve fibres.
 - d) Origin and propagation of nerve impulse through different types of neurons and synapse.
2. Reflex action, types.
- a) Sensory Physiology:
 - b) Tactile receptors, pain receptors, thermoreceptors, chemoreceptors.
 - c) Structure of human eye; image formation and colour vision.
 - d) Eye disorders, lenses used in eye care.
 - e) Structure of human ear, mechanism of hearing, kinds of deafness.
 - f) EEG, MRI, CT-scan, mental health (epilepsy, neurosis, psychosis).

UNIT-IV- Immunology

1. Basics of Immunity:
- a) Types of immunity: Active, passive, innate and acquired immunity.
 - b) Antigens and antibodies.
 - c) Types of antibodies and their structure.
 - d) Interferons, cytokines (haptens).
 - e) Mechanism of reactions: Precipitation, agglutination, neutralisation, opsonisation
2. Cells and Organs in Immunity:
- a) Humoral and cell-mediated immunity.
 - b) B and T cells.
 - c) Lymphocytes: Helper, killer, memory and suppressor cells.
 - d) Complement system, secondary lymphoid organs; tonsils, adenoids, thymus, bone marrow, bursa fabricus, macrophages.
 - e) Antigen - antibody reaction.

UNIT-V- Immunology

1. Immune disorders and techniques:
- a) Basic idea of immune disorders.
 - b) Auto-immune diseases
 - c) AIDS, mechanism of HIV infection.
 - d) Monoclonal antibodies and their production.
 - e) Applications of monoclonal antibodies; ELISA.
2. Vaccines and Transplants:
- a) Vaccination and immunisation.
 - b) Surface antigens; vaccines; hepatitis vaccine, attenuation (oral polio vaccine).
 - c) Antivenoms.
 - d) Organ transplants: Various types of transplant (allograft, xenograft, autograft).
 - e) Major histocompatibility complex

ZOP031-III: Developmental Biology

UNIT-I- Basics of Embryology

1. Historical perspective and scope of developmental biology.
2. General idea of asexual reproduction (fission, budding, gemmule formation, metagenesis, polyembryony etc.).
3. An introduction to animal development in sexually reproducing animals.
4. Development of sex and its success over asexual reproduction.
5. Neuroendocrine regulation of reproductive organs; estrous and menstrual cycles.
6. In vitro fertilization and test tube baby.

UNIT-II - Gametogenesis and fertilization

1. Gametogenesis: Definition; structure of gametes (sperm and egg).
2. Spermatogenesis and oogenesis.
3. Types of eggs; detailed structure of amphibian, avian and mammalian egg.
4. Fertilization: Events of fertilization, polyspermy and preventing mechanism.

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5. Significance of fertilization; parthenogenesis; evolution of viviparity.

UNIT-III - Cleavage and Gastrulation

1. Cleavage, creating multicellularity; definition of embryonic cleavage, morula; blastula, patterns and planes of cleavage; blastulation, types of blastula.
2. Types of gastrulation mechanisms.
3. Fate maps (with suitable examples); cell lineage.
4. Reorganization of embryonic cells, gastrulation in amphibians, birds and mammals. e. Morphogenetic cell movements and their significance in gastrulation.

UNIT-IV- Induction, Differentiation, Organogenesis and Regeneration

1. Embryonic induction, organizers, competence.
2. Mechanism of cellular differentiation; sex determination during development. Government rules against sex determination during pregnancy.
3. Neurula formation, growth and organogenesis.
4. Elementary idea of molecular aspects of developmental biology; cell interaction in embryonic development.
5. Regeneration: types and mechanism. Senescence and ageing.

UNIT-V- Embryonic adaptations

1. Role of jelly in amphibian spawn; cleidoic eggs; viviparity.
2. Salient features of development of frog/toad; amphibian metamorphosis and its endocrine regulation.
3. Extraembryonic membranes in chick, salient features of development of chick upto 72 hours of incubation.
4. Placentation in mammals: Definition, types; classification on the basis of morphology and histology; functions of placenta.
5. Changes in foetal circulation and respiration during birth in a mammal.

Text Book:

1. R.L. Kotpal "Vertebrates"
2. A.K. Berry, "Animal Physiology" Emkay Publication
3. Dr. Asha Sharma, "Development Biology" R.B.D. Publication

Reference Books:

1. P.S. Verma and V.K. Agarwal, "Chordate Embrology" S.Chand.
2. Dr. R.A. Agarwal, Dr. Anil k. Srivastava and Dr. Kaushal Kumar, "Animal Physiology and Biochemistry" S.Chand.

ZOP031 - ZOOLOGY PRACTICAL

1. Study of museum specimens / models / chart / photograph:

Petromyzon, Myxine/Bdellostoma, ammocoete larva, Acipenser, Amia, Lepidosteus, Labeo, Clarius, Anguilla, Hippocampus, Exocoetus, Echeneis, Protopterus, Ichthyophis, Proteus, Ambystoma, axolotl larva, Siren, Alytes, Hyla, Chelone, Testudo, fresh water tortoise, Sphenodon, Hemidactylus, Phrynosoma, Draco, Chamaelion, Eryx, Hydrophis, Naja, Vipera, Bungarus, Cocodylus, Alligator, Archaeopteryx, Pavo cristatus, Psittacula, Collumba, Mylva, great Indian bustard, saras crane, vulture, crow, Ornithorhynchus, Tachyglossus, Macropus, bat, Loris, Manis, Herpestes, Erinaceus.

2. Permanent slides:

Mammalian Histology: V. S. skin, T.S. spinal cord, stomach, duodenum, ileum, rectum, pancreas, liver, lung, kidney, bone, cartilage, testis, ovary, placenta, pituitary gland, V. S. eye; striated muscle fibre.

3. Dissection: Through Chart / Model / Photograph / CD. Any bony fish :

External features, general anatomy, afferent and efferent branchial vessels, brain, cranial nerves, eye ball, its muscles and innervation, internal ear, urinogenital system.

4. Permanent mounting:

Cycloid scales, striated, nonstriated and cardiac muscle fibres, filoplume, blood film.

5. Osteology:

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A comparative study of articulated and disarticulated (original / artificial) bones of frog, Varanus, fowl and rabbit.

6. Developmental Biology:

Study of development of chick: Whole mounts and sections of 18 to 72 hour's embryo. Histological study of development of frog/toad : Egg, early cleavage, blastula, gastrula, neurula and different stages of tadpole. Study of spermatogenesis, oogenesis, fertilization and metamorphosis of frog/toad. Development of mammalian embryo through charts/models.

7. Physiology:

- a) Demonstration of catalase and ptyalin enzyme activity.
- b) Haematocrit value.
- c) RBC counting.
- d) WBC counting.
- e) Differential counting.
- f) Haemoglobin percentage.

Note: Animals used in practical are subject to the condition that these are not banned under the Wild Life Protection Act.

CAREER POINT
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Course Scheme for B.Sc. B.Ed. Biology Part IV

Annual Course Scheme of B.Sc. B.Ed. Part-IV				
Branch-Biology				
S.No.	Paper Code	Paper Name	Marks	
			Min. Marks	Max. Marks
1	ENL041	Environmental Studies*	36	100
2	EDL041-I	Creating an inclusive school	36	100
3	EDL041-II	Understanding Disciplines and Subject	36	100
4	EDL041-III	Physical Education & Yoga	36	100
5	EDL041-IV	Gender, School and Society	36	100
6	EDL041-V	Assessment for Learning	36	100
7	EDL041-VI	Pedagogy of a School Subject (part-1) , 1st & IIInd Year (candidate shall be required to offer any two papers from the following for part-1 & other for part-2). 1. General Science 2. Biology Physics 3. Chemistry 4. Mathematics 5. Physics	36	100
8	Practicum	1. Micro Teaching, 2. Internship (Practice teaching 2. Block Teaching (Participation in School Activities Social Participation in Group) 3. Report of any feature of School /case study/ action research)		100
9		4. Final Lesson		100
				G.T. 800

+

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Syllabus of B.Sc. B.Ed. Biology Part IV

ENL041: Environmental Studies

Unit-I

Introduction: the multidisciplinary nature of environmental, studies: Definition, scope and important need for public awareness

Unit-II

Natural Resources: Renewable and non-renewable resources, natural resources and associated problems. **Forest resources:** use and overexploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest, and tribal people

Water resources: use and overutilization of surface and groundwater, floods, drought, conflicts over water, dams-benefits and problems.

Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, case studies.

Food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer pesticide problems, water logging, salinity, case studies.

Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.

Land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual

in conservation of natural sources. Equitable use of resources for sustainable lifestyles.

Unit-III

Concept of an eco-system: Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem Ecological succession Food chains, food webs and ecological pyramids Introduction, type, characteristic, features, structure and function of the following ecosystem: a. Forest eco system grassland eco system desert ecosystem Aquatic ecosystems (ponds, streams, lakes)

Unit- IV

Bio diversity and its conservation Introduction definition: genetic, species and ecosystem diversity. Bio Geographically classification

of India. Value of biodiversity: Consumptive use, productive use, social, ethical, aseptic and option values Biodiversity at global, National and local levels. India as a megadiversity nation Hot-spots of biodiversity.

Threats to biodiversity: habitat loss, poaching of wildlife, man- wildlife conflicts Endangered and endemic species of India Conservation of biodiversity: in-situ and Ex-situ conservation of biodiversity.

Unit-V

Disaster Management & Environmental Pollution Disaster: Types – Natural and Manmade; Detailed study of the following –Earthquakes, Volcanic eruption, Landslides, Flood, Drought, Fire, Nuclear and Chemical disaster and their management. Causes, effects and control measures of Air pollution Water pollution Soil Pollution Marine pollution Noise pollution Thermal pollution Radioactive Pollution

Unit- VI

Social Issues and the Environment from Unsustainable to sustainable development Urban problems related to energy Water conservation, rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns, case studies.

Environmental ethics: issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies Wasteland reclamation. Consumerism and waste products.Environmental protection Act.Air (Prevention and Control of Pollution) Act.Water (Prevention and Control of Pollution) Act.Wild life protection Act.Forest conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.Road and safety measures.

Unit-VII

Human Population and the Environment Population growth, variation among nations.Population explosion family welfare programme.Environment and human health Human rights Value education.HIV/AIDS.Women and child welfare. Role of information technology in environment and human health Case studies

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EDL041-I: Creating and inclusive school

Objectives

The Course will enable the student teachers to-

- To demonstrate knowledge of different perspectives in the area of education of children with disabilities.
- To reformulate attitudes towards children with special needs.
- TO use specific strategies involving skills in teaching special need children in inclusive classrooms.
- To modify appropriate learner – friendly evaluation procedures.
- To incorporate innovative practices to respond to education of children with special needs.
- To contribute to the formulation of policy.
- To implement laws pertaining to education of children with special needs.

Unit-I

PARADIGMS IN EDUCATION OF CHILDREN SPECIAL NEEDS

- Historical perspectives and contemporary trends approaches of viewing disabilities:
- The charity model, the bio centric model, functional model and the human rights model.
- Concept of special education, integrated education and inclusive education; Philosophy of inclusive education.

Unit- II

LEGAL AND POLICY PERSPECTIVES RTE Act, 2009.

- National Policy – Education of students with Disabilities in the National Policy on Education, 1968, 1986.
- POA (1992); Education in the National Policy on Disabilities, 2006.

Unit-III

SCHEME OF INCLUSIVE EDUCATION

- Education of Special Focus Groups under the sarva Shiksha Abhiyan (SSA, 2000);
- MHRD, 2005, Scheme of Inclusive Education for the Disabled at Secondary School (IEDSS, 2009), National Trust and NGOs.
- Community-based education.

Unit- IV

CLASS ROOM MANAGEMENT

- Class Room management – meaning and approaches
- School's readiness for addressing learning difficulties
- Technological advancement and its application – ICT, adaptive and assistive devices, equipments and other technologies for different disabilities.

Unit-V

INCLUSIVE PRACTICES IN CLASSROOMS FOR ALL

- Pedagogical strategies to respond to individual needs of students: Cooperative Learning strategies in the classroom, peer tutoring, social learning, buddy system, reflective teaching multisensory teaching, etc.
- Documentation, record keeping and maintenance.
- Teacher role in classroom management

Any one of the following –

- Case study of a Learner with Special needs.
- Making a Report of Visit to a resource room of SSA.
- Interviewing a teacher working in an Inclusive School.

Books Suggested:

1. Dunn., L & Bay, D.M. (ed.) Exceptional Children in the Schools, New York Holt, Rinehart, Winston.
2. Hallahar, D.P. & Kauffman, J.M., Exceptional Children: Introduction to Special Education, Allyn & Bacon, Massachusetts, 1991

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3. Hewett, Frank M. & Foreness Steven R., Education of Exceptional Learners, Allyn & Bacon, Massachusetts, 1984.
4. Kirk, S.A & Gallagher J.J., Education of Exceptional Children ; Houghton mifflin Co., Boston, 1989.
5. Magnifico, L.X.: Education of the Exceptional Child, New York, Longman.
6. Shanker Udey: Exceptional Children, Jullundur : Sterling Publications.
7. Singh, N.N. and Beale, I.L. (eds.) Learning Disabilities – Nature, Theory and Treatment Spring-Verlag, New Yourk, Inc: 1992.

EDL041-II: Understanding Disciplines and Subjects

Objectives

After Completing the Course the students will be able:

- To develop an understanding of the nature of disciplinary knowledge in the school curriculum.
- To acquire a conceptual understanding of the impact of school subjects on disciplines.
- To develop interest, attitudes and knowledge about the content in respect of framing the syllabus.
- To build up a professional, disciplinary and curriculum programme.

Unit-I

Meaning and concept of disciplinary knowledge

- The Nature and role of disciplinary knowledge in the school curriculum.
- Relationship of Disciplinary areas with school subject.
- Difference between disciplines & Interdisciplinary Subject.

Unit-II

School Subjects on Disciplines Impact of Social science Subject on Disciplines:

- Social Science: Method: Lecture method, Project method, Supervised study, Story, telling, Biographical, Source Method, Brain-Storming Dramatization, Experimental Learning.

Unit-III

Impact of science and maths subject on disciplines.

- Science: Methods & Techniques of Teaching Science: Brain Storing, Laboratory, Demonstration, Project & Field visit, Constructive Learning, Concept Mapping, Heuristic Learning & Problem Solving, Group Discussion & Panel Discussion
- Maths: Methods of teaching mathematics: Lecture, Inductive, Analytic, Synthetic, Heuristic, Project, Problem solving, and Laboratory methods & techniques of Teaching Mathematics: Questioning, Brain Storming, Role playing, Simulation, non-formal techniques of learning Mathematics.

Unit-IV

Impact of Language subject on disciplines

- Language: Story Novel, Poetry, Personal Essay, Pen Portrait. Travelogue, Self-Narration Memories.
- Redefinition of the school Subject with concern to social Justice
- Meaning of Social Cultural perspective in context of Universal education

Unit-V

Process and framing of disciplines and subjects

- Recognized the theory of content, Principles and process of preparing the syllabus and content
- Practical Knowledge, Community & Co-curricular activity Knowledge with reference to Disciplinarily and Relation with school Curriculum
- Creativity development of learning through horticulture and hospitality

Any one of the following –

- Prepare charts with related language (Hindi, English, or Sanskrit)
- Preparation of a talk with related social justlee.
- Collection of newspapers cutting related with horticulture and hospitality.
- Prepare a lab with science and maths tools and their operation
- Life sketch and contribution of two Indian Scientists and socialistic.
- Study of any one aspect of social and prepare a report
- Preparation of Five (5) word cards, 5 picture cards and word puzzles (Language)
- 5 Microteaching skills & 5 micro-teaching (based on different innovative methods)

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Books Suggested:

1. Apply: M.W. (2008) can school contribute to a more just society education citizenship and social justice, 3 (3) 239-261
2. Brantom F.K.: The teaching of social studies in changing world
3. Chash, S.C. (2007) history of education in India, NCERT (2005) National Curriculum frame work NCERT
4. Clinton Golding of the centre study of higher Integrating of Disciplines.
5. Daman.c Howard, Rastman, Meil (1965) "the uses of language "New yark.Holt Rinchyart and winstan. Inc.
6. Dengz. Z 92013) School subject and academic discipline in a luke a woods, B.K. weir (Eds) curriculum, syllabus design and equity: A priner and model Rutledge
7. Egen, Marlow & Rao, D.B. 2003 Teaching Successfully, Discvery Pub. House New Delhi
8. Freeman Diane-Larsen (2000) Technigues and Principles in language teaching oxford:049.
9. Sharma L.M. 1977 (Teaching of Science & Life Science Dhanpat Rai & Sans. Delhi.)
10. Westey, Edgar Brose: Social Studies for School.

EDL041-III: Physical Education and Yoga

Objectives

After Completing the course the students will be able:

- To enable them to understand the need & importance of Physical Education.
- To acquaint them to allied areas in Physical Education.
- To sensitize the student teacher towards physical fitness & its importance.
- To make them aware of the benefits of physical fitness & activities for its development.
- To help them acquire the skills for assessment of physical fitness.
- To introduce them to the philosophical bases of yoga.
- To introduce them to types of Yoga & its importance.
- To motivate them to resort to physical activity for the fitness development.
- To help them understand the procedure of health related fitness evaluation.

Unit-I

PHYSICAL EDUCATION

- Introduction, Definition and Meaning of physical education
- Objectives of physical education
- Scope of physical education & allied areas in Physical Education

Unit-II

PHYSICAL EDUCATION AND METHODS

- Need & Importance of physical education in different levels or school (sec. and sr. sec. level)
- **Training methods:**Development of components of physical fitness and motor fitness through following training methods (continuous method, interval method, circuit method, fartlek/speed play and weight training)
- Development of Techniques and Tactics.

Unit- III

PHYSICAL FITNESS

- Definition, Meaning, Types and factors of physical fitness
- Factors affecting physical fitness • Benefits Physical Fitness

Unit-IV

PHYSICAL FITNESS AND YOGA ACTIVITIES

- Need of physical activities at school level
- Importance of physical activities at schools level
- Assessment of physical fitness
- Introduction, Meaning and mis-concepts of Yoga
- Ashtang Yoga (8 stages of Yoga)

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- Types of Yoga
- Importance of Yogasanas, Pranayama and Shudhikriya
- Importance of Meditation in school

Unit-V

Human abilities and Yoga in Indian Context

- Education and Yoga – Promotion of intelligence, awareness and creativity through yoga, yoga in Classrooms (Primary, Secondary and Higher education levels).
- Stress and Yoga: Stress – Definition, Causes, Symptoms complications in life; Yogic management of stress related disorders – Anxiety, Depression and suicidal tendencies.
- Learning and performing of basic yogic activities
- Health and physical education relationship with other subject areas like science, social science and languages.
- Fundamental skill of games/sports and yoga

Books Suggested:

- Kuvalayananda, Swami, Pranayama, (1983), Popular Prakashan Bombay.
- Kuvalayananda, Swami, Asanas, (1983) Popular Prakashan Bombay English/Hindi.
- Lal, Raman Bihari. (2008). Siksha Ke Daarshnik Evam Samajshastriye Sidhant Meerut, Rastogi Publications.
- Nagendra, H.R. (1993). Yoga in Education. Banglore, Vivekananda Kendra.
- Niranjananada, Swami. (1998). Yoga Darshan, Deoghar, Panchadashanam Paramahansa Alakh Bara.
- Rai, Lajpat Sawhney, R.C. and Sevvamurthy, W. Selvamurthy (1998). Meditation Techniques, their Scientific Evaluation. Gurgaon, Anubhav Rai Publication.
- Raju, P.T. (1982). The Philosophy Tradition of Delhi. Moti Lal Banarsi Dass.
- Ram, Swami. (1999). A Practical Guide to Holistic Health, Pennsylvania, Himalayan Institute of Yoga.
- Reyna, Ruth. (1971). Introduction to India Philosophy New Delhi, Tata McGraw Hill Publishing Co. Ltd

EDL014-IV: Gender, School and Society

Objectives

After Completing the course the students will be able:

- To develop basic understanding familiarity with key concepts-gender bias, gender stereotype, empowerment, gender parity, equity and equality, patriarchy and feminism and transgender,
- To understand some important landmarks in connection with growth of women's education in historical and contemporary periods.
- To learn about gender issues in school, curriculum, textual materials across disciplines, pedagogical processes and its intersection with class, caste, religion and region;
- To understand the need to address gender based violence in all social spaces and evolves strategies for addressing.

Unit-I

Gender Issues: Key Concepts

- Gender, Sexuality, Patriarchy, Masculinity and Feminist
- Gender Bias, Gender Stereotyping and Empowerment
- Equity and Equality in Relation with caste, Class Religion, Ethnicity, Disability and Region. • Issues and Concerns of Transgender

Unit-II

Socialization Processes in India: Family, School and Society

- Gender Identities and Socialization Practices in different types of families in India.
- Gender Issues in Curriculum-Gender, Culture and Institution: Intersection of Class, Caste, Religion and Region – Construction of Gender in Curriculum Frameworks since Independence: An Analysis-Gender and the hidden curriculum – Gender in text and classroom processes – Teacher as an agent or change-Life skill and sexuality.
- Sites of Conflict: Understanding the Importance of addressing sexual abuse in family, Neighbourhood and School and in other formal and informal institutions.

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Unit-III

Gender Issues in Curriculum Gender, Culture and Institution:

Intersection of class caste, Religion and Region – Construction of gender in curriculum Framework since Independence: An Analysis – Gender and the hidden curriculum – Gender in Text and classroom processes – Teacher as an agent of change – Life skills and sexuality.

Unit-IV

Gender Studies:

Historical Perspectives on Education Historical Backdrop: Some Landmarks in Socio-Economic and education upliftment of Girls and Women.

Unit-V

Constitutional Commitments

- Report of Commissions and Committees, Policy initiatives.
- Schemes and Programmes on Girls Education and overall Development of women for Addressing Gender Discrimination in Society

Any one of the following –

- Preparation of Project on Key Concepts and its operational definitions relating it with the Social Context of the teachers and students.
- Analyses Textual Materials from the Perspective of Gender Bias and Stereotype.
- Organize Debates on Equity and Equality cutting across Gender, Class, Caste, Religion, Ethnicity Disability and Region.
- Prepare a project on Issues and Concerns of Transgender.
- Project on analyzing the growing up of Boys and Girls in different types of family in India.

Books Suggested:

- Desai, Neera and Thakkar, Usha. (2001). Women in Indian society. National Book Trust, New Delhi.
- Dunne, M. et al. (2003) Gender and Violence in Schools. UNESCO.
- Kirk Jackie e.d., (2008). Women Teaching in south Asia, SAGE, New Delhi
- Leach, Fiona. (2003). Practising Gender Analysis in Education, Oxfam
- National Curriculum Framework 2005: Position Paper, National Focus Group on Gender Issues in Education, 3.2, NCERT, 2006.
- Nayar, Sushila and Mankekar Kamla (ed.) 2007, 'Women Pioneers in India's Renaissance, National Book Trust, New Delhi, India.
- Sherwani, Azim. (1998.). the girls child in crisis. Indian Social Institute, New Delhi.
- Srivastava Gouri, (2012), Gender and Peace in Textbooks and Schooling Processes, Concept Publishing Company Pvt. Ltd. New Delhi
- UNICEF (2005 and Beyond – Accelerating Girls' Education in South Asia. Meeting Report.
- Unterhalter, Elaine. (2007) Gender, Schooling and Global Social Justice, Routledge.
- Srivastava Gouri, (2012), Gender and Peace in textbooks and Schooling Processes, Concept Publishing Company Pvt. Ltd, New Delhi
- UNICEF (2005). 2005 and Beyond –Accelerating Girls' Education in South Asia Meeting Report. Unterhalter, Elaine (2007). Gender, Schooling and Global Social Justice, Routledge.

EDL014-V: Assessment for Learning

Objectives

After Completing the course the students will be able:

- Understand the process of evaluation
- Develop the skill in preparing, administering and interpreting the achievement test.
- Understand and use different techniques and tools of evaluation for learning.
- Comprehend the process of assessment for learning.
- Develop skill necessary to compute basic statistical measures to assess the learning Develop

Unit-I

Basic Concepts and Overview

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- Basic Concepts: assessment, evaluation, measurement, test examination, formative and summative evaluation, continuous and comprehensive assessment mandated under RTE, and grading.
- Purpose of assessment in different paradigms: (a) behaviourist (with its limited view on learning as behaviour), (b) constructivist paradigm and (c) socio-culturalist paradigm; distinction between 'assessment of learning' and assessment for learning; assessment as a basis for taking pedagogic decisions.
- Self-assessment and peer assessment

Unit-II

Analysis of Existing Practices of Assessment

- Records used in Assessment:
 - a) Profiles: Meaning steps involved and criteria for developing and maintaining a comprehensive learner profile.
 - b) Evaluation rubric: Meaning, Construction and Uses
 - c) Cumulative records: Meaning, Significance.
- Ethical Principles of Assessment Examination Reforms
 - a. Continuous and Comprehensive Evaluation (CCE)
 - b. Choice Based Credit System (CBCS)
 - c. open Book Examination.

Unit-III

Assessment in the Classroom and Record Keeping

- Expanding notice of learning in a constructivist perspective.
- Ability to develop indicators for assessment.
- Task for assessment: Projects, assignments.
- Formulating task and questions that engage the learner and demonstrate the process of thinking. • Scope for original responses, observation of learning processes by self, by peers, by teacher. • Organizing and planning for student portfolios and developing rubrics for portfolio assessment, teacher' diaries and group activities for assessment.

Unit-IV

INTERPRETING TEST SCORES

- Presentation and organization of data: Frequency distribution
- Graphical Presentation of data: Frequency p.....
- Measures of Central Tendency : Mean, Median, Mode
- Measures of Variability : Quartile Deviation, Standard Deviation
- Percentile and Percentile Rank
- Rank difference method by spearman's Co-efficient of correlation, Types of Correlation • Normal Probability Curve : Properties, Uses

Unit-V

Feedback

- Feedback: meaning, importance and types
- Feedback as an essential component of assessment; types' of teacher feedback (Written and oral).
- Feedback to students and feedback to parents; peers' feedback, scores, grades and qualitative descriptions, developing and maintaining a comprehensive learner profile.
- Challenges of assessments.

Any one of the following –

- Developing an achievement test with its Blue Print, Answer Key and Marks Distribution.
- Developing a Portfolio/Profile/Evaluation Rubric (format).
- Evolution of available Unit test and reformation of the same.
- Designing Questionnaire/Interview Schedule on a given topic
- Preparing any four evaluation tools for Formative Assessment.

Books Suggested:

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Books Suggested:

- Deshpande, J.V. Examining the Examination System Economic & Political Weekly, April 17, 2004 Vol XXXIX, No. 16. Nawani, D (2015).
- Re-thinking Assessments in School, Economic & Political Weekly, Jan 17, Vol, No.
- Nawani, D (2012) Continuously and comprehensively evaluating children, Economic & Political Weekly, Vol. XLVIII, Jan 12, 2013
- NCERT (2007) National Focus Group Paper on Examination Reforms S.K. (1994).
- Applied Statistics for Education, Mittal Publications.
- Garrett, H.E. (2008). Statistics in Psychology and Education Delhi: Surjeet Publication.
- Mrunalini, T. (2013). Educational Evaluation. Hyderabad: Neelkamal Publication Pvt. Ltd

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