

BACHELOR OF SCIENCE BACHELOR OF EDUCATION (ZBC) – FIFTH SEMESTER

Fifth Semester			
S. No.	Name of Subject	Credits	Total Marks
1	Polymer Chemistry and Green Chemistry	4	100
2	Polymer Chemistry and Green Chemistry Lab	3	100
3	Economic Botany and Biotechnology	4	100
4	Economic Botany and Biotechnology Lab	3	100
5	Applied Zoology	4	100
6	Applied Zoology Lab	3	100
7	Herbal Technology	3	100
8	Knowledge and Curriculum	4	100
9	Assessment for Learning	4	100
10	Drama and Art in Education(P)	4	100
Total		36	

Subject Name: POLYMER CHEMISTRY AND GREEN CHEMISTRY

Introduction and history of polymeric materials:

Different schemes of classification of polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers, Texture of Polymers.

Functionality and its importance:

Criteria for synthetic polymer formation, classification of polymerization processes, Relationships between functionality, extent of reaction and degree of polymerization. Bifunctional systems, Poly-functional systems.

Kinetics of Polymerization:

Mechanism and kinetics of step growth, radical chain growth, ionic chain (both cationic and anionic) and coordination polymerizations, Mechanism and kinetics of copolymerization, polymerization techniques.

Crystallization and crystallinity:

Determination of crystalline melting point and degree of crystallinity, Morphology of crystalline polymers, Factors affecting crystalline melting point.

Nature and structure of polymers-Structure Property relationships.

Determination of molecular weight of polymers (M_n , M_w , etc) by end group analysis, viscometry, light scattering and osmotic pressure methods. Molecular weight distribution and its significance. Polydispersity index.

Glass transition temperature (T_g) and determination of T_g, Free volume theory, WLF equation, Factors affecting glass transition temperature (T_g).

Polymer Solution – Criteria for polymer solubility, Solubility parameter, Thermodynamics of polymer solutions, entropy, enthalpy, and free energy change of mixing of polymers solutions, Flory- Huggins theory, Lower and Upper critical solution temperatures.

Properties of Polymers (Physical, thermal, Flow & Mechanical Properties).

Brief introduction to preparation, structure, properties and application of the following polymers: polyolefins, polystyrene and styrene copolymers, poly(vinyl chloride) and related polymers, poly(vinyl acetate) and related polymers, acrylic polymers, fluoro polymers, polyamides and related polymers. Phenol formaldehyde resins (Bakelite, Novalac), polyurethanes, silicone polymers, polydienes, Polycarbonates, Conducting Polymers, [polyacetylene, polyaniline, poly(p-phenylene sulphide polypyrrole, polythiophene)].

Reference Books:

- Seymour's Polymer Chemistry, Marcel Dekker, Inc.
- G. Odian: Principles of Polymerization, John Wiley.
- F.W. Billmeyer: Text Book of Polymer Science, John Wiley.
- P. Ghosh: Polymer Science & Technology, Tata Mcgraw-Hill.
- R.W. Lenz: Organic Chemistry of Synthetic High Polymers.

CHEMISTRY PRACTICAL - DSE LAB: POLYMER CHEMISTRY

Polymer synthesis

1. Free radical solution polymerization of styrene (St) / Methyl Methacrylate (MMA) / Methyl Acrylate (MA) / Acrylic acid (AA).
 - a. Purification of monomer
 - b. Polymerization using benzoyl peroxide (BPO) / 2,2'-azo-bis-isobutyronitrile (AIBN)
2. Preparation of nylon 66/6
 1. Interfacial polymerization, preparation of polyester from isophthaloyl chloride (IPC) and phenolphthalein
 - a. Preparation of IPC
 - b. Purification of IPC
 - c. Interfacial polymerization
3. Redox polymerization of acrylamide
4. Precipitation polymerization of acrylonitrile
5. Preparation of urea-formaldehyde resin
6. Preparations of novalac resin/resold resin.
7. Microscale Emulsion Polymerization of Poly(methylacrylate).

Polymer characterization

1. Determination of molecular weight by viscometry:
 - (a) Polyacrylamide-aq.NaNO₂ solution
 - (b) (Poly vinyl propylidene (PVP) in water
2. Determination of the viscosity-average molecular weight of poly(vinyl alcohol) (PVOH) and the fraction of —head-to-head— monomer linkages in the polymer.
3. Determination of molecular weight by end group analysis: Polyethylene glycol (PEG) (OH group).
4. Testing of mechanical properties of polymers.
5. Determination of hydroxyl number of a polymer using colorimetric method.

Polymer analysis

1. Estimation of the amount of HCHO in the given solution by sodium sulphite method
2. Instrumental Techniques
3. IR studies of polymers
4. DSC analysis of polymers
5. Preparation of polyacrylamide and its electrophoresis

*at least 7 experiments to be carried out.

Reference Books:

- Malcohm P. Stevens, Polymer Chemistry: An Introduction, 3rd Ed.
- Harry R. Allcock, Frederick W. Lampe and James E. Mark, Contemporary Polymer Chemistry, 3rd ed. Prentice-Hall (2003)
- Fred W. Billmeyer, Textbook of Polymer Science, 3rd ed. Wiley-Interscience (1984)
- Joel R. Fried, Polymer Science and Technology, 2nd ed. Prentice-Hall (2003)
- Petr Munk and Tejraj M. Aminabhavi, Introduction to Macromolecular Science, 2nd ed. John Wiley & Sons (2002)
- L. H. Sperling, Introduction to Physical Polymer Science, 4th ed. John Wiley & Sons (2005)
- Malcolm P. Stevens, Polymer Chemistry: An Introduction, 3rd ed. Oxford University Press (2005)
- Seymour/ Carraher's Polymer Chemistry, 9th ed. by Charles E. Carraher, Jr. (2013)

Introduction to Green Chemistry

What is Green Chemistry? Need for Green Chemistry. Goals of Green Chemistry. Limitations/ Obstacles in the pursuit of the goals of Green Chemistry

Principles of Green Chemistry and Designing a Chemical synthesis

Twelve principles of Green Chemistry with their explanations and examples and special emphasis on the following:

- Designing a Green Synthesis using these principles; Prevention of Waste/ byproducts; maximum incorporation of the materials used in the process into the final products, Atom Economy, calculation of atom economy of the rearrangement, addition, substitution and elimination reactions.
- Prevention/ minimization of hazardous/ toxic products reducing toxicity. risk = (function) hazard × exposure; waste or pollution prevention hierarchy.
- Green solvents– supercritical fluids, water as a solvent for organic reactions, ionic liquids, fluorous biphasic solvent, PEG, solventless processes, immobilized solvents and how to compare greenness of solvents.
- Energy requirements for reactions – alternative sources of energy: use of microwaves and ultrasonic energy.
- Selection of starting materials; avoidance of unnecessary derivatization – careful use of blocking/protecting groups.
- Use of catalytic reagents (wherever possible) in preference to stoichiometric reagents; catalysis and green chemistry, comparison of heterogeneous and homogeneous catalysis, biocatalysis, asymmetric catalysis and photocatalysis.
- Prevention of chemical accidents designing greener processes, inherent safer design, principle of ISD “What you don’t have cannot harm you”, greener alternative to Bhopal Gas Tragedy (safer route to carcarbaryl) and Flixiborough accident (safer route to cyclohexanol) subdivision of ISD, minimization, simplification, substitution, moderation and limitation.
- Strengthening/ development of analytical techniques to prevent and minimize the generation of hazardous substances in chemical processes.

Future Trends in Green Chemistry

Oxidation reagents and catalysts; Biomimetic, multifunctional reagents; Combinatorial green chemistry; Proliferation of solventless reactions; co crystal controlled solid state synthesis (C2S3); Green chemistry in sustainable development.

Reference Books:

- Ahluwalia, V.K. & Kidwai, M.R. New Trends in Green Chemistry, Anamalaya Publishers (2005).
- Anastas, P.T. & Warner, J.K.: Green Chemistry - Theory and Practical, Oxford University Press (1998).
- Matlack, A.S. Introduction to Green Chemistry, Marcel Dekker (2001).
- Cann, M.C. & Connely, M.E. Real-World cases in Green Chemistry, American Chemical Society, Washington (2000).
- Ryan, M.A. & Tinnensand, M. Introduction to Green Chemistry, American Chemical Society, Washington (2002).
- Lancaster, M. Green Chemistry: An Introductory Text RSC Publishing, 2nd Edition, 2010.

LAB: GREEN CHEMISTRY

1. Safer starting materials

- Preparation and characterization of nanoparticles of gold using tea leaves.

2. Using renewable resources

- Preparation of biodiesel from vegetable/ waste cooking oil.

3. Avoiding waste

Principle of atom economy.

- Use of molecular model kit to stimulate the reaction to investigate how the atom economy can illustrate Green Chemistry.
- Preparation of propene by two methods can be studied
 - (I) Triethylamine ion + OH⁻ → propene + trimethylpropene + water H₂SO₄/Δ
 - (II) 1-propanol → propene + water
- Other types of reactions, like addition, elimination, substitution and rearrangement should also be studied for the calculation of atom economy.

4. Use of enzymes as catalysts

- Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide.

5. Alternative Green solvents

Extraction of D-limonene from orange peel using liquid CO₂ prepared from dry ice.

Mechanochemical solvent free synthesis of azomethines

6. Alternative sources of energy

- Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper (II).
- Photoreduction of benzophenone to benzopinacol in the presence of sunlight.

Reference Books:

- Anastas, P.T & Warner, J.C. Green Chemistry: Theory and Practice, Oxford University Press (1998).
- Kirchoff, M. & Ryan, M.A. Greener approaches to undergraduate chemistry experiment. American Chemical Society, Washington DC (2002).
- Ryan, M.A. Introduction to Green Chemistry, Tinnensand; (Ed), American Chemical Society, Washington DC (2002).
- Sharma, R.K.; Sidhwani, I.T. & Chaudhari, M.K. I.K. Green Chemistry Experiment: A monograph International Publishing House Pvt Ltd. New Delhi. Bangalore CISBN 978-93-81141-55-7 (2013).
- Cann, M.C. & Connelly, M. E. Real world cases in Green Chemistry, American Chemical Society (2008).
- Cann, M. C. & Thomas, P. Real world cases in Green Chemistry, American Chemical Society (2008).
- Lancaster, M. Green Chemistry: An Introductory Text RSC Publishing, 2nd Edition, 2010.
- Pavia, D.L., Lampman, G.M., Kriz, G.S. & Engel, R.G. Introduction to Organic Laboratory Techniques: A Microscale and Macro Scale Approach, W.B.Saunders, 1995.

Subject Name: ECONOMIC BOTANY AND BIOTECHNOLOGY

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Subject Name: ECONOMIC BOTANY AND BIOTECHNOLOGY LAB

Unit 1: Origin of Cultivated Plants

Concept of Centres of Origin, their importance with reference to Vavilov's work. examples of major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties, importance of germplasm diversity.

Unit 2: Cereals

Wheat and Rice (origin, morphology, processing & uses), brief account of millets.

Unit 3: Legumes

General account, importance to man and ecosystem.

Unit 4: Sugars & Starches

Morphology and processing of sugarcane, products and by-products of sugarcane industry. Potato – morphology, propagation & uses.

Unit 5: Spices

Listing of important spices, their family and part used, economic importance with Special reference to fennel, saffron, clove and black pepper

Unit 6: Beverages

Tea, Coffee (morphology, processing & uses)

Unit 7: Oils & Fats

General description, classification, extraction, their uses and health implications groundnut, coconut, linseed and Brassica and Coconut (Botanical name, family & uses)

Unit 8: Essential Oils

General account, extraction methods, comparison with fatty oils & their uses.

Unit 9: Natural Rubber

Para-rubber: tapping, processing and uses.

Unit 10: Drug-yielding plants

Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis.

Unit 11: Tobacco

Tobacco (Morphology, processing, uses and health hazards)

Unit 12: Timber plants

General account with special reference to teak and pine.

Unit 13: Fibres

Classification based on the origin of fibres, Cotton and Jute (morphology, extraction and uses).

Practical

- 1. Cereals:** Wheat (habit sketch, L. S/T.S. grain, starch grains, micro-chemical tests) Rice (habit sketch, study of paddy and grain, starch grains, micro-chemical tests).
- 2. Legumes:** Soya bean, Groundnut, (habit, fruit, seed structure, micro-chemical tests).
- 3. Sugars & Starches:** Sugarcane (habit sketch; cane juice- micro-chemical tests), Potato(habit sketch, tuber morphology, T.S. tuber to show localization of starch grains, w.m. starch grains, micro-chemical tests).
- 4. Spices:** Black pepper, Fennel and Clove (habit and sections).
- 5. Beverages:** Tea (plant specimen, tea leaves), Coffee (plant specimen, beans).
- 6. Oils & Fats:** Coconut- T.S. Nut, Mustard–plant specimen, seeds; tests for fats in crushed seeds.

7. **Essential oil-yielding plants:** Habit sketch of Rosa, Vetiveria, Santalum and Eucalyptus (specimens/photographs).
8. **Rubber:** specimen, photograph/model of tapping, samples of rubber products.
9. **Drug-yielding plants:** Specimens of Digitalis, Papaver and Cannabis.
10. **Tobacco:** specimen and products of Tobacco.
11. **Woods:** Tectona, Pinus: Specimen, Section of young stem.
12. **Fibre-yielding plants:** Cotton (specimen, whole mount of seed to show lint and fuzz; whole mount of fibre and test for cellulose), Jute (specimen, transverse section of stem, test for lignin on transverse section of stem and fibre).

Suggested Readings

1. Kochhar, S.L. (2012). Economic Botany in Tropics, MacMillan & Co. New Delhi, India.
2. Wickens, G.E. (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.
3. Chrispeels, M.J. and Sadava, D.E. (2003). Plants, Genes and Agriculture. Jones & Bartlett Publishers.

Subject Name: APPLIED ZOOLOGY

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Subject Name: APPLIED ZOOLOGY LAB

Unit 1: Introduction to Host-parasite Relationship

Host, Definitive host, Intermediate host, Parasitism, Symbiosis, Commensalism, Reservoir, Zoonosis

Unit 2: Epidemiology of Diseases

Transmission, Prevention and control of diseases: Tuberculosis, typhoid

Unit 3: Rickettsiae and Spirochaetes

Brief account of Rickettsia prowazekii, Borrelia recurrentis and Treponema pallidum

Unit 4: Parasitic Protozoa

Life history and pathogenicity of Entamoeba histolytica, Plasmodium vivax and Trypanosoma gambiense

Unit 5: Parasitic Helminthes

Life history and pathogenicity of Ancylostoma duodenale and Wuchereria bancrofti

Unit 6: Insects of Economic Importance

Biology, Control and damage caused by Helicoverpa armigera, Pyrrilla perpusilla and Papilio demoleus, Callosobruchus chinensis, Sitophilus oryzae and Tribolium castaneum

Unit 7: Insects of Medical Importance

Medical importance and control of Pediculus humanus corporis, Anopheles, Culex, Aedes, Xenopsylla cheopis

Unit 8: Animal Husbandry

Preservation and artificial insemination in cattle; Induction of early puberty and synchronization of estrus in cattle

Unit 9: Poultry Farming

Principles of poultry breeding, Management of breeding stock and broilers, Processing and preservation of eggs

Unit 10: Fish Technology

Genetic improvements in aquaculture industry; Induced breeding and transportation of fish seed

PRACTICAL

1. Study of *Plasmodium vivax*, *Entamoeba histolytica*, *Trypanosoma gambiense*, *Ancylostoma duodenale* and *Wuchereria bancrofti* and their life stages through permanent slides/photomicrographs or specimens.
2. Study of arthropod vectors associated with human diseases: *Pediculus*, *Culex*, *Anopheles*, *Aedes* and *Xenopsylla*.
3. Study of insect damage to different plant parts/stored grains through damaged products/photographs.
4. Identifying feature and economic importance of *Helicoverpa (Heliothis) armigera*, *Papilio demoleus*, *Pyrilla perpusilla*, *Callosobruchus chinensis*, *Sitophilus oryzae* and *Tribolium castaneum*
5. Visit to poultry farm or animal breeding centre. Submission of visit report
6. Maintenance of freshwater aquarium

SUGGESTED READINGS

- Park, K. (2007). Preventive and Social Medicine. XVI Edition. B.B Publishers.
- Arora, D. R and Arora, B. (2001). Medical Parasitology. II Edition. CBS Publications and Distributors.
- Kumar and Corton. Pathological Basis of Diseases.
- Atwal, A.S. (1986). Agricultural Pests of India and South East Asia, Kalyani Publishers.
- Dennis, H. (2009). Agricultural Entomology. Timber Press (OR).
- Hafez, E. S. E. (1962). Reproduction in Farm Animals. Lea & Fabiger Publisher
- Dunham R.A. (2004). Aquaculture and Fisheries Biotechnology Genetic Approaches. CABI publications, U.K.
- Pedigo, L.P. (2002). Entomology and Pest Management, Prentice Hall.

Subject Name: HERBAL TECHNOLOGY

Unit 1: Herbal medicines: definition, history and scope of herbal medicine; definition of medical terms. Cultivation - harvesting - processing - storage -marketing and utilization of medicinal plants.

Unit 2: Pharmacognosy—definition. Medicinal uses of the following herbs in curing various ailments; Tulsi, Ginger, Fenugreek, Indian Goose berry and Ashoka.

Unit 3: Phytochemistry—Introduction and different classes of phytochemicals; active principles and techniques of their testing; identification and utilization of the medicinal herbs viz. *Catharanthus roseus*

(cardiotonic), Withaniasomnifera (drugs acting on nervous system), Clerodendronphlomoides (anti-rheumatic) and Centellaasiatica (memory booster).

Unit 4: Analytical pharmacognosy: Introduction commercial drugs, An overview of classification of drugs, drugs history, pharmaceuticals aids- Definitions and advantages. Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds)

Subject Name: KNOWLEDGE AND CURRICULUM

Unit 1: Knowledge and Knowing

Knowledge Meaning

- What is knowledge?
- What is knowing? Can doing, thinking and feeling be discerned separately in knowing?
- Differentiate between information, knowledge, belief and truth.

Knowing Process

- What are different ways of knowing?
- How knowledge can be constructed? What is involved in construction of knowledge?
- What are the relative roles of knower and the known in knowledge transmission and construction?

Facets of Knowledge

Different facets of knowledge and relationship, such as:

- local and universal
- concrete and abstract
- theoretical and practical
- contextual and textual?
- school and out of school

(With an emphasis on understanding special attributes of 'school knowledge'.)

- What is the role of culture in knowing?
- How is knowledge rendered into action? How to reflect on knowledge?

Views of Gandhi, Tagore, Krishnamurti and Aurobindo on knowledge and education

Unit 2: Forms of Knowledge and its Organisation in Schools

- Can we categorise knowledge? On what basis?
- What forms of knowledge are included in school education?
- On what basis are knowledge categories selected in school education?
- Who selects, legitimises, and organises categories of knowledge in Schools? In what form?
- How does school knowledge get reflected in the form of curriculum, Syllabus and textbooks?
- Understanding the meaning and nature of curriculum: Need for Curriculum in schools
- Differentiating curriculum framework, curriculum and syllabus; their significance in school education
- Facets of curriculum: Core curriculum—significance in Indian context

- Meaning and concerns of 'hidden' curriculum
- Curriculum visualised at different levels: National-level; state-level; school-level; class-level and related issues(Connections, relations and differences)

Unit 3: Curriculum Determinants and Considerations

- Broad determinants of curriculum making:(At the nation or state-wide level)
 - (i) social-political-cultural-geographical-economic diversity;
 - (ii) socio-political aspirations, including ideologies and educational vision;
 - (iii) Economic necessities;
 - (iv) Technological possibilities;
 - (v) Cultural orientations;
 - (vi) National priorities;
 - (vii) System of governance and power relations; and
 - (viii) International contexts.
- Considerations in curriculum development:(At the level of the school)
 - (i) Forms of knowledge and its characterisation in different school subjects
 - (ii) Relevance and specificity of educational objectives for concerned level
 - (iii) Socio-cultural context of students – multi-cultural, multilingual aspects
 - (iv) Learner characteristics
 - (v) Teachers' experiences and concerns
 - (vi) Critical issues: Environmental concerns, gender differences, inclusiveness, value concerns and issues, social sensitivity.

Unit 4: Curriculum Development (at School Level)

- Understanding different approaches to curriculum development: Subject-centred; environmentalist (incorporating local concerns); behaviourist; competency-based (including 'minimum levels of learning'); learner-centred and constructivist.
- Process of curriculum making
 - (i) Formulating aims and objectives (based on overall curricular aims and syllabus)
 - (ii) Criteria for selecting knowledge and representing knowledge in the form of thematic questions in different subjects
 - (iii) Organising fundamental concepts and themes vertically across levels and integrating themes within (and across) different subjects
 - (iv) Selection and organisation of learning situations.
- Available infrastructure, curricular sites and resources (library, laboratory, school playground, neighbourhood, ICT etc.)
- School culture, climate and environment as the context for teachers 'work
- Construction of curriculum vis-a-vis teachers' role and support in 'transacting curriculum'; 'developing curriculum'; 'researching curriculum'
- Role of external agencies in providing curriculum and pedagogic supports to teachers within schools – local, regional, national

Unit 5: Curriculum Implementation and Renewal

- Operationalising curriculum into learning situations
- Teachers' role in generating dynamic curricular experiences through

- (i) flexible interpretation of curricular aims;
- (ii) contextualisation of learning;
- (iii) varied learning experiences.
- Selection and development of learning resources (textbooks, teaching-learning materials and resources outside the school – local environment, community and media, etc.)
- Evolving assessment modes
- Appropriate reviewing and renewal of aims and processes.
- Process of curriculum evaluation and revision
 - (i) Need for a model of continual evaluation
 - (ii) Feedback from learners, teachers, community, and Administrators
 - (iii) Observable incongruencies and correspondence between expectations and actual achievements

Suggested Readings

1. Acharya, P. (1996). Indigenous Education and Brahminical Hegemony in Bengal, and Shahidullah, Kazi „The Purpose and Impact of Government Policy on Pathshala: Gurumohashays in Nineteenth Century Bengal'. In Nigel Crook (ed.) The Transmission of Knowledge in South Asia: Essays on Education, Religion, History and Politics. New Delhi: Oxford University Press, 98-118.
2. Badheka, G. (2001). Ball Shiksham aur Shikshak Bikaner: Vaagdevi Prakashan.
3. Dewey, J. (1952). The School and the Child, New York: The Macmillan Company, (Also available in Hindi School and Bachche Translation: RRCEE)
4. Palmer, Joy A. et. al (2001). Jean –Jacques Rousseau, John Dewey, Rabindranath Tagore, M.K. Gandhi, Maria Montessori Fifty Major Thinkers on Education From Confucius to Dewey, USA: Routledge.
5. Badheka, G. (1999). Montessori Paddhati. Chapter 5: Montessori Shala ka Vatavaran. Bikaner: Vaagdevi Prakashan.
6. Dewey, J. (2009). School aur Samaj. Delhi: Aakar. Chapter 2: School aur Bachche ka Jeevan (Also available in English Dewey (2007, 1899) The School and Society Cosimo: New York).
7. Krishnamurti, J. (2006). Krishnamurti on Education. Part I: Talks to Students:
8. Chapter 1: On Education, Chapter 4: On Freedom and Order, Part II: Discussion with Teachers: Chapter 1: On Right Education. Chennai: Krishnamurti Foundation of India.
9. Rousseau, Jacques J. (1979). Emile or on Education, translated by Allan Bloom Basic. 7-18.
10. Sykes, M. (1988). The Story of Nai Taleem, Nai Taleem Samiti, Sevagram: Vardha. Chapter 3: The Seed Germinates, Chapter 4: Basic National Education, (Also available in Hindi Nai taleem Ki Kahani Translation: RRCEE)
11. Thakur, R. (2004). Ravindranath ka Shikshadarshan Chapter 1: Tote ki Shiksha, Chapter 7: Aashram Shiksha, New Delhi: Granthshipli.
12. Weir (Eds.), Curriculum, syllabus design and equity: A primer and model. Routledge.
13. Shulman, L.S. (1986). Those who understand: Knowledge growth in teaching. Educational Researcher, 4–14.
14. Sternberg, R.J. (2013). Intelligence, competence, and expertise. In A. J. Elliot & C. S.
15. Dweck (Eds.), Handbook of competence and motivation (pp. 15–30). Guilford Publications.
16. Stiggins, R. (2005). From formative assessment to assessment for learning: A path to success in standards-based schools. Phi Delta Kappan, 324–328.
17. Sykes, M. (1987). The story of Nai Talim. Wardha: Nai Talim Samiti.
18. Tagore, R. (2003). Civilization and progress. In Crisis in civilization and other essays. New Delhi: Rupa & co.
19. The PROBE Team. (1999). Public report on basic education in India. Delhi: Oxford
20. NCERT (2014). Basics in Education-Textbook for B. Ed. Course. New Delhi: NCERT

Subject Name: ASSESSMENT FOR LEARNING

Unit 1: Assessment and Evaluation-An Overview

- Perspective on assessment and evaluation for learning in a constructivist paradigm
- Distinction between 'Assessment of Learning' and 'Assessment for Learning'
- Purpose of assessment in a 'constructivist' paradigm:
 - engaging with learners' minds in order to further learning in various dimensions
 - promoting holistic development of students taking care of cognitive, social and emotional aspects in balanced and integrated way.
- Purposes and approaches of assessment in behaviouristic and cognitivist paradigms.
- Critical review of current evaluation practices and their assumptions about learning and development
- Clarifying the terms
 - test, measurement, examination, assessment and evaluation
 - formative and summative evaluation
 - continuous and comprehensive assessment
 - grading

Unit 2: Object Context of Assessment

- Dimensions and levels of learning
 - Retention/recall of facts and concepts; application of specific skills
 - manipulating tools and symbols; problem-solving; applying learning to diverse situations
 - Meaning-making propensity; abstraction of ideas from experiences; seeing links and relationships; inference; analysis; reflection
 - originality and initiative; collaborative participation; creativity; flexibility
- Contexts of assessment
 - subject-specific
 - learner-centred

Unit 3: Assessment of subject based learning

- Enlarging notions of 'subject-based learning' in a constructivist perspective
- Assessment tools
 - different kinds of tasks: projects, assignments, performances
 - different kinds of tests and their construction
 - observation of learning processes by self, by peers, by teacher
 - self-assessment and peer-assessment
 - constructing Portfolios
- Quantitative and qualitative aspects of assessment: appropriate tools for each
- Teacher competencies in evolving appropriate assessment tools:
 - visualizing appropriate assessment tools for specific contexts, content, and learner
 - formulating tasks and questions that engage the learner and demonstrate the process of thinking; scope for original responses
 - evolving suitable criteria for assessment
 - organizing and planning for student portfolios and developing rubrics for portfolio assessment
 - using assessment feedback for furthering learning

Unit 4: Data Analysis, Feedback and Reporting

- Statistical tools- percentage, graphical representation, frequency distribution, central tendency, variation, normal distribution, percentile rank, correlation and their interpretation
- Feedback as an essential component of formative assessment
 - use of assessment for feedback; for taking pedagogic decisions such as for selecting teaching methodology, providing additional inputs or giving more time for the understanding of some concepts.
 - Types of teacher feedback (oral, written, comments); peer feedback

- Place of marks, grades(absolute and relative) and qualitative descriptions
- Feedback for strengthening self-esteem, motivation and identity of all the learners including Children with Special Needs.
- Developing and maintaining a comprehensive learner profile
- Purposes of reporting: to communicate to students, parents and placement
 - progress on learning and profile of learner
 - certification,
- Reporting a consolidated learner profile
- Issues and challenges involved in reporting on assessment.

Unit 5: Examination Reform: Issues and directions

Examination system:

- Examination for gradation and certification
- Exit Vs Entrance Examination for social selection and placement
- Impact of the prevailing examination system on learning, self- esteem, motivation of students and other stakeholders.
- Entrance tests and their influence on students and school system.
- Sociological and psychological analysis of the related issues

School-based assessment and evaluation: policies, practices and possibilities

- Impact of examination-driven schooling on the social identity and socialization of children
- Policy initiatives to reduce ill effects of examinations on the students:
 - a. Non-detention policy
 - b. Focus on CCE in Right of Children tot Free and Compulsory Education Act 2009
- Multiple tools and techniques as alternatives to paper pencil tests.
- De-linking school-based assessment from examinations: some possibilities and alternate practices

Examination reform efforts in as a follow up of:

- 1 Secondary Education Commission (1952-53)
- 2 Kothari Commission (1964-66)
- 3 National Policy on Education (1986) and Programme of Action (1992)
- 4 National Curriculum Frameworks -1975,1988,2000 1nd 2005 developed for school education
(Discussion should cover analysis of recommendations, implementations and the emerging concerns)

Directions for examination reform:

- Introducing flexibility in examination-in view of the needs of the studentsa and other stakeholders
- Improving quality and range of questions in exam papers
- Including school-based credits
- Assessement and Examinations for vocational courses
- Alternative modes of certification
- Examination Management
- Role of ICT in Examination
- On-demand and on-line examinations
- Capacity building of paper setters and evaluators
- Addressing issues and challenges of high stake testing, comercialisation of assessment and competitive ranking and also teacher accountability in assessment

Suggested Redeaings

- Kay Burke (2006) From Standards to Rubrics in 6 Steps, Tools for Assessing Student Learning, K-8, Corwing Press, A Sage Publications Company, California.
- NCERT(1985). Curriculum and Evaluation, New Delhi:NCERT
- Norris N.(1990) Understanding Educational Evaluation, Kogan Page Ltd.
- Singh H.S. (1974) Modern Educational Testing. New Delhi: Sterling Publication
- Thorndike RL and Hagen (1977). Measurement and Evaluation in Psychology and Education.
- Baker, B, Costa, A., & Shalit, S. (1997). The norms of collaboration: Attaining communication competence. In A. Costa & R. Liebmann (Eds.), The process-centered school: Sustaining a renaissance community (pp. 119-142). Thousand Oaks, CA: Corwin.
- Barell, J. (2003). Developing more curious minds. Alexandria, VA: Association for Supervision and Curriculum Development.
- Black, P., Harrison, C., Lee, C., Marshall, B, & William, D. (2004). Working inside the black box: Assessment for learning in the classroom. Phi Delta Kappan, 86 (1), 8- 21.
- Bransford, J., Brown, A.L., & Cocking, R.R. (Eds.). (2000). How people learn: Brain, mind, experience, and school. Washington, DC: National Academy Press.
- Brooks, J.G. (2002). Schooling for life: Reclaiming the essence of learning Alexandria, VA: Association for Supervision and Curriculum Development.
- Burke, K. (2005). How to assess authentic learning (4th ed.), Thousand Oaks, CA
- Corwin, Burke, K, Fogarty, R., & Belgrad, S (2002). The portfolio connection: Student work linked to standards (2nd ed.) Thousand Oaks, CA: Corwin.
- Carr, J.F., & Harris, D.E. (2001), Succeeding with standards: Linking curriculum, assessment and action planning. Alexandria, VA: Association for Supervision and Curriculum Development.
- Conzemius, A., & O'Neill, J. (2001). Building shared responsibility for student learning, Alexandria, VA: Association for Supervision and Curriculum Development.
- Danielson, C. (2002). Enhancing student achievement: A framework for school improvement. Alexandria, VA: Association for Supervision and Curriculum Development.
- Depka, E. (2001). Designing rubrics for mathematics: Standards, performance tasks, check-lists, students-created rubrics. Thousands Oaks, CA: Corwin.
- Gentile, J.R. & Lalley, J.P. (2003). Standards and mastery learning: Aligning teaching and assessment so all children can learn. Thousand Oaks, CA: Corwin.
- Guskey, T.R. (2003). How classroom assessments improve learning. Educational Leadership, 60(5), 7-11.
- Guskey, T.R., & Bailey, J.M. (2001). Developing grading and reporting systems for student learning. Thousand Oaks, CA. Corwin.
- Newman, F.M. (1996). Authentic achievement: Restructuring schools for intellectual quality. San Francisco, CA: Jossey-Bass.
- Nitko, A.J. (2001). Educational assessment of students (3rd ed.). Upper Saddle River, NJ:PrenticeHall.

Subject Name: DRAMA AND ART IN EDUCATION (P)

Unit I: Visual Arts and Crafts

- Experimentation with different materials of Visual Art, such as pastel, poster, pen and ink, rangoli materials, clay, etc.
- Exploration and experimentation with different methods of Visual Arts like Painting, block printing, collage, clay modelling, paper cutting and folding, etc.
- Paper framing and display of Art works.

Unit II: Performing Arts: Dance, Music, Theatre and Puppetry

- Listening/viewing and exploring Regional Art forms of Music, Dance, Theatre and Puppetry.
- Viewing/listening to live and recorded performances of Classical and Regional Art forms

- Participation and performance in any one of the Regional Arts forms keeping in mind the integrated approach
- Planning a stage-setting for a performance/presentation by the student-teacher.

Unit III: Appreciation of Arts

- Meaning and concepts of Arts and Aesthetics and its significance at secondary level of School Education.
- Difference between Education in Arts and Arts in Education
- Identification of different performing Art forms and artists; Dance, Music and Musical Instruments, Theatre, Puppetry (based on a set of slides, videos, documentaries selected for the purpose)
- Knowledge of Indian Craft Traditions and its relevance in education (based on a set of slides, Videos Films, Documentaries selected for the purpose)
- Knowledge of Indian Contemporary Arts and Artists; Visual Arts based on the videos, Films and Documentaries selected for the purpose
- Indian festivals and its Artistic significance.

Unit IV Engagement in Analysis and Activities:

- Initiation into the craft of Drama and related activities for engagement in schools with learners
- Theme-based projects from any one of the curricular areas covering its social, economic, cultural and scientific aspects integrating various Arts and Craft forms.

Textbook analysis to find scope to integrate Art forms either in the text or activities or exercises; Documentation of the processes of any one Art or Craft form with the pedagogical basis such as weaving or printing of textiles, making of musical instruments, folk performances in the community, etc. How does the artist design their products, manage their resources, including raw materials, its marketing, problems they face, to make them aware of these aspects of historical, social, economic, scientific and environmental concerns?