





**B.Sc. Under Graduate Semester wise Syllabus**

(W.e.f. session 2016 onwards)

**Class:-B.Sc.**

**Semester: - IV Semester**

**Subject:-Botany (BSB401T)**

**Paper:-Plant Ecology, Biodiversity and Phytogeography**

**Marks 85+15 CCE**

**UNIT:- I Ecosystems:** Structure and types, Biotic and Abiotic components, Trophic levels, Food chain, Food web, Ecological pyramids, Energy flow; Biogeochemical cycles: Concept, Gaseous and Sedimentary cycles, Carbon, Nitrogen, Phosphorus and Sulfur cycle.

**UNIT:-II Ecological adaptations:** Morphological, Anatomical and Physiological responses Water adaptation (Hydrophytes and Xerophytes Temperature adaptation (Thermoperiodism and Vernalization), Light adaptation(Heliophytes and Sciophytes), Plant Succession: causes, trends and processes, Types of succession - Hydrosere and Xerosere.

**UNIT:-III Population Ecology:** Distribution patterns, Density, Natality, Mortality, Growth curves, Ecotypes and Ecads; Community Ecology: Frequency, Density, Abundance, Cover and Life forms. Biodiversity: Basic concept, definition, Importance, Biodiversity of India, Hotspots, *in situ* and *ex situ* conservation. , Biosphere reserves, Sancturaries and National parks of Madhya Pradesh. Endangered and Threatended species, red data book.

**UNIT:-IV Soil:** Physico-chemical properties, Soil formation, Development of Soil Profile, Soil classification, Soil composition, Soil factors; Pollution: Definition, Types & Causes; Global warming, Climate change and Ozone hole.

**UNIT:-V Phytogeography:** Phytogeographical regions of India, Vegetation types of Madhya Pradesh. Natural resources – definition and classification. Conservation and management of natural resources. Land resources management, Water and Wet land resource management.

**The Atmosphere:** Composition and stratification; radiation flux; role of electromagnetic radiations, UV, visible spectrum; variations in temperature; wind as a factor.



**SUGGESTED READINGS:-**

- Banerjee, S.1998. Bio diversity conservation- Agrobotamica, Bikaner.
- Kumar, U.K 2006. Bio diversity principles and conservation, Agrobios, Jodhpur.
- Odum, E.P. 5<sup>th</sup> ed. 2004 .Fundamentals of Ecology. Natraj Publisher, Dehradun.
- Puri, G.S. 1960. Indian Forest Ecology.
- Sharma, P.D. 7<sup>th</sup> ed. 1998.Ecology and Environment, Rastogi Publication, Shivaji Road. Meerut, 250002. India.
- Shukla, R. S. & Chandel, P.S. 2006. A Text book of Plant Ecology.



**Class:-B.Sc.**

**Semester: - IV Semester**

**Subject:-Botany (BSB401P)**

**Objectives:**

- i) To enable the students to understand the plant in relation to environment.
- ii) To develop the knowledge of different types of vegetation.
- iii) To familiarize the students with conservation practices.

**Practical Scheme**

**Semester- IV**

**Scheme of practical examination**

**Marks: 50**

1-Exercise based on Ecology	10
2- Soil Test	5
3- Exercise based on Ecological adaptation	5
4-To comment upon Phytogeographic region (model/ charts) and National Parks (Photographs).	5
5-Spotting (1-5)	10
6-Viva- voce	5
7-Sessional	10
<b>Total:</b>	<b>50</b>



**B.Sc. Under Graduate Semester wise Syllabus**

(W.e.f. session 2016 onwards)

**Class: - B.Sc.**

**Semester: - IV Semester**

**Subject: - Chemistry (BSC402T)**

**Marks 85+15 CCE**

**UNIT-I**

**A. Phase equilibrium:** statement and the meaning of terms: phase, component and the degree of freedom, thermodynamic derivation of the Gibbs phase rule, one component system: water, CO<sub>2</sub> and S system, two component system: solid-liquid equilibrium, simple eutectic system: Bi-Cd; Pb-Ag system, Desilverisation of lead.

**B. Solid solution:** Systems in which compound formation with congruent melting point (Zn-Mg) and incongruent melting point, (NaCl-H<sub>2</sub>O) and (CuSO<sub>4</sub>-H<sub>2</sub>O) system, Freezing Mixtures: acetone-dry ice.

**C. Liquid- Liquid mixtures:** Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system, azeotropes; HCl-H<sub>2</sub>O and ethanol water system.

**D. Partial miscible liquids:** Phenol-water, trimethylamine - water and nicotine-water system. Lower and upper consolute temperature. Immiscible Liquids, steam distillation, Nernst distribution law: thermodynamic derivation, applications.

**UNIT II**

**Electrochemistry**

**A. Electrical transport:** conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, variation of specific conductance and equivalent conductance with dilution, Migration of ions and Kohlrausch-law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel Onsager's equation for strong electrolytes (elementary treatment only). Transport number: Definition and determination by Hittorf method and moving boundary method.

**B. Types of reversible electrodes:** Gas metal ion, metal-metal ion, metal-insoluble salt anion and redox electrodes. Electrode reactions, Nernst equation, derivation of cell EMF and single electrode potential, standard hydrogen electrode- reference electrodes-standard electrode, standard electrode potential. EMF of a cell and its measurements, computation of cell EMF, calculation of thermodynamic quantities of cell reaction (DG, DH, K). Solubility product and activity coefficient, potentiometric



and conductometric titration. Definition of pH and pK, determination of pH using hydrogen, quinhydrone and glass electrodes by potentiometric methods.

### **UNIT-III**

**A. Aldehydes and Ketones :** Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes and ketones 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 with particular emphasis on 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 ketones, Cannizzaro reaction. Meerwein Ponderoff- Verley, Clemmensen, Wolf Kishner,  $\text{LiAlH}_4$  and  $\text{NaBH}_4$  reduction.

**B. Carboxylic acids:** Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic, reaction of carboxylic acids. Hell Volhard Zelinsky reaction. Synthesis of acid chlorides  
ester and amides reduction of carboxylic acids, mechanism of decarboxylation.

### **UNIT IV**

**A. Carboxylic acids derivatives:** structure and nomenclature of acid chlorides, esters amides and acid anhydrides. Physical properties, interconversion of acid derivative by nucleophilic acyl substitution, preparation of carboxylic acid derivatives, chemical reactions. Mechanism of esterification and hydrolysis (acidic and basic).

**B. Coordination Chemistry:** MOT (molecular orbital theory) diagram for tetrahedral, square planar and octahedral complexes.

**C. Green Chemistry:** Principles, 12 tenets, their description with examples.

### **UNIT V**

**A. Chemistry of Lanthanides:** Electronic structure, oxidation states, ionic radii and lanthanide contraction, complex formation, occurrence and isolation of lanthanide compounds.

**B. 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. Lectures

## **Suggested Books**



1. Physical Chemistry-Puri, Sharma and Pathania, Vikas Publications, New Delhi
2. Physical Chemistry- G.M. Barrow, International Student Edition, McGraw Hill.
3. The Elements of Physical Chemistry, P.W. Atkins, Oxford University Press
4. Physical Chemistry, R.A. Alberty, Wiley Eastern Ltd.
5. Physical Chemistry Through problems, S.K. Dogra and S. Dogra, Wiley Eastern
6. Organic Chemistry, Morrison and Boyd, Prentice Hall.
7. Organic Chemistry, L.G. Wade Jr. Prentice Hall
8. Fundamentals of Organic Chemistry Solomons, John Wiley.
9. Organic Chemistry, Vol. I, II, III S.M. Mukherji, S.P. Singh and R.P. Kapoor,
10. Organic Chemistry, F.A. Carey, McGraw-Hill Inc.
11. Introduction to Organic Chemistry, Streitwiesser, Heathcock and Kosover, Macmillan.
12. Vogel's Qualitative & Quantitative Analysis Vol- 1, 2, 3, ELBS.
13. Advanced Organic chemistry, I. L. Finar, ELBS.
14. Basic Concepts of Analytical chemistry, S M Khopker, New Age International Publishers.
15. Analytical Chemistry, R.M. Verma, CBS Publication.
16. Analytical Chemistry, Skoog & West, Wiley International.
17. Essentials of Physical Chemistry, B.S. Bahl, Arun Bahl & G.D. Tuli, S. Chand & Company Ltd.
18. Atomic structure and Molecular spectroscopy, Manas Chanda, New Age International Publishers.
19. Molecular Spectroscopy, Sukumar, MJP Publishers.
20. Organic Chemistry, Mac Murrey, Pearson Education
21. Inorganic Chemistry - J.D. Lee, John Wiley
22. Inorganic Chemistry - Cotton and Wilkinson, John Wiley



Class : B.Sc. Semester IV  
Subject : Chemistry  
Paper : Practical

**M.M. 50**

**Time : 6 hour**

**Organic Chemistry** **12 Marks**

**Qualitative analysis**

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

**Physical Chemistry** **12 Marks**

**A. Transition temperature**

1. Determination of transition temperature of given substance by thermometric, dilatometric method (e.g.) ( $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$ / $\text{SrBr}_2 \cdot 2\text{H}_2\text{O}$ )

**B. Phase equilibrium**

1. To study the effect of solute (e.g. NaCl, succinic acid) on the critical solution temperature of two partially miscible liquid (e.g., phenol water system).
2. To construct the phase diagram of two component (e.g., diphenylamine benzophenone) by cooling curve method.

**C. Thermochemistry**

1. To determine the enthalpy of neutralization of weak acid/weak base versus strong acid/strong base and determine the enthalpy of ionization of the weak acid/base.

**Inorganic chemistry-Quantitative Volumetric Analysis 12 Marks**

1. Estimation of ferrous and ferric by dichromate method.
2. Estimation of copper using thiosulphate.

**Viva** **6 Marks**

**Record** **8 M**





**B.Sc. Under Graduate Semester wise Syllabus**  
(W.e.f. session 2016 onwards)

**Class: - B.Sc.**

**Semester: - IV Semester**

**Subject:-Zoology (BSZ 304T)**

**Title of Paper: Genetics**

Marks 85+15 CCE

**Unit I: Heredity & Variation, Gene and Genetic Material**

1. Chromosome: The Physical basis of heredity and transmitters of heredity.
2. Types of chromosomes: Lampbrush, salivary gland and Beta Chromosomes
3. Nucleocytoplasmic interactions : Ultra structure of nucleus, nucleolus, Role of nucleus and nucleolus in nucleocytoplasmic interactions including Synthesis & Export of RNA, transport of proteins
4. Heredity and Variation : Sources of variation, Genotype, phenotype and environmental variations (elementary idea )
  - Mendel's laws of heredity
  - Kinds of variations
  - Genetic basis of variation.
5. (a) Chemistry of Gene; Nucleic Acids and their structure.  
(b) Concept of DNA replication.  
(c) Nucleosome (Solenoid model).  
(d) Split genes, overlapping genes and Pseudo genes.  
(e) Genetic Code.

**Unit II: Linkage and Chromosomal Aberrations**

1. Gene Linkage: Kinds and Theories of linkage, significance of linkage.
2. Crossing over: Types and mechanism.
3. Theories of sex determination.
4. Sex linked inheritance ( Haemophilia, Colour blindness )

**Unit III: Cytoplasmic Inheritance, Gene Expression and Regulation**

1. Cytoplasmic inheritance: Maternal effect on limnea (Shell Coiling), Kappa particles in Paramecium.
2. Transcription in Prokaryotes and Eukaryotes
3. Translation in Eukaryotes
4. Gene Expression: Regulation of protein synthesis, transcription in Prokaryotes and Eukaryotes.
- 5: Gene Expression: Lac operon model



**Unit IV: Mutation and Applied Genetics**

1. Mutation
2. Structural and numerical changes in chromosomes.
3. Causes of mutation.
4. Mutagens- classification, Types & effects.

**Unit V: Human Genetics & Genetic Engineering**

1. Human chromosomes, Elementary idea of Human Genome Project
2. Common genetic diseases in man (Autosomal syndromes, sex chromosome syndromes, diseases due to mutation-Sickle cell anaemia, Albinism & Alkaptonuria.
3. Multiple factors and blood groups.
5. Techniques used in recombinant DNA technology. Construction of Chimeric DNA, Elementary idea of plasmids & vectors.
6. Gene cloning and Polymerase Chain Reaction (PCR), Gel Electrophoresis, Northern & Southern Blotting.
7. Gene therapy.
8. DNA finger printing.



# Dr. A.P.J. Abdul Kalam University, Indore (M.P)

Class: - B.Sc.

Semester: - IV Semester

Subject: -Zoology (BSZ403P)

1. Identification of spots related to theory.
2. Squash preparation of onion root tip /Chironomous larva salivary gland/grass hopper testis.
3. Study of instruments techniques related to applied genetics - PCR, Gel electrophoresis, DNA fingerprinting etc.
4. Problems based on genetics.
5. Study of chromosomal DNA (Isolation and demonstration)

## Distribution of Marks

Time 3 hours

Maximum Marks: 50

Marks Allotted

1. Spotting ( 5 Spots)	10 Marks
2. Squash preparation	05 Marks
3. Study of instruments / techniques related to applied genetics	05 Marks
4. Problems on Genetics	10 Marks
5. Viva-Voce	05 Marks
6. Extraction of chromosomal DNA	05 Marks
7. Practical Record and Collection	10 Marks
Total	50 Marks