

पं. रविशंकर शुक्ल विश्वविद्यालय
रायपुर (छत्तीसगढ़)



पाठ्यक्रम

बी.एस.सी. भाग-3 (कोड-303)
B. Sc. Part - III (Code - 303)

परीक्षा : 2016-17

कुलसचिव पं. रविशंकर शुक्ल विश्वविद्यालय
रायपुर (छत्तीसगढ़) की ओर से

आधार पाठ्यक्रम

हिन्दी भाषा

(पेपर कोड-0891)

प्रथम प्रश्न पत्र

पूर्णांक - 75

(बी. ए., बी. एस. सी., बी. एच. एस.-सी., बी. काम., तृतीय वर्ष के पुनरीक्षित एकीकृत आधार पाठ्यक्रम एवं पाठ्य सामग्री का संयोजन 2000-2001 से लागू है)

॥ सम्प्रेषण कौशल, हिन्दी भाषा और सामान्य ज्ञान ॥

आधार पाठ्यक्रम की संरचना और अनिवार्य पाठ्य पुस्तक- हिन्दी भाषा एवं समसामयिकी- का संयोजन इस तरह किया गया है कि सामान्य ज्ञान की विषय वस्तु- विकासशील देशों की समस्याओं- के माध्यम और साथ-साथ हिन्दी भाषा का ज्ञान और उसमें सम्प्रेषण कौशल अर्जित किया जा सके । इसी प्रयोजन से व्याकरण की अन्तर्वस्तु को विविध विधाओं को संकलित रचनाओं और सामान्य ज्ञान की पाठ्य सामग्री के साथ अन्तर्गुम्फित किया गया है । अध्ययन-अध्यापन के लिए पूरी पुस्तक को पाठ्य सामग्री है और अभ्यास के लिये विस्तृत प्रश्नावली है । यह प्रश्नपत्र भाषा का है अतः पाठ्य सामग्री का व्याख्यात्मक या आलोचनात्मक अध्ययन अपेक्षित नहीं है । पाठ्यक्रम और पाठ्य सामग्री का संयोजन निम्नलिखित पाँच इकाइयों में किया जाता है । प्रत्येक इकाई को दो भागों में विभक्त किया गया है ।

इकाई - 1 (क) भारत माता : सुमित्रानंदन पंत, परशुराम की प्रतीज्ञा ; रामधारी सिंह दिनकर, बहुत बड़ा सवाल ; मोहन राकेश, संस्कृति और राष्ट्रीय एकीकरण ; योगेश अटल ।

(ख) कथन की शैलियाँ : रचनागत उदाहरण और प्रयोग ।

इकाई -2 (क) विकासशील देशों की समस्याएँ, विकासात्मक पुनर्विचार, और प्रौद्योगिकी एवं नगरिकरण ।
(ख) विभिन्न संरचनाएँ ।

इकाई - 3 (क) आधुनिक तकनीकी सभ्यता, पर्यावरण प्रदूषण तथा धारणीय विकास ।
(ख) कार्यालयीन पत्र और आलेख ।

इकाई - 4 (क) जनसंख्या : भारत के संदर्भ में और गरीबी तथा बेरोजगारी ।
(ख) अनुवाद ।

इकाई - 5 (क) ऊर्जा और शक्तिमानता का अर्थशास्त्र ।
(ख) घटनाओं, समारोहों आदि का प्रतिवेदन और विभिन्न प्रकार के निर्मंत्रण-पत्र ।

मूल्यांक योजना : प्रत्येक इकाई से एक-एक प्रश्न पूछा जायेगा । प्रत्येक प्रश्न में आंतरिक विकल्प होगा । प्रत्येक प्रश्न के 15 अंक होंगे । प्रत्येक इकाई दो-दो खंड (क्रमशः 'क' और 'ख' में) विभक्त है, इसलिए प्रत्येक प्रश्न के भी दो भाग, (क्रमशः 'क' और 'ख') होंगे । 'क' अर्थात् पाठ एवं सामान्य ज्ञान से संबद्ध प्रश्न के अंक 8 एवं 'ख' अर्थात् भाषा एवं सम्प्रेषण कौशल से संबद्ध प्रश्न के अंक 7 होंगे । इस प्रकार पूरे प्रश्न पत्र के पूर्णांक 75 होंगे ।

BHVT - II

(Paper Code-0892)

ENGLISH LANGUAGE

M.M. 75

The question paper for B.A./B.Sc./B.Com./B.H.Sc. III Foundation course, English Language and General Answers shall comprise the following items :

Five question to be attempted, each carrying 3 marks.

| | | |
|-----------------|--|----|
| UNIT-I | Essay type answer in about 200 words. 5 essay type question to be asked three to be attempted. | 15 |
| UNIT-II | Essay writing | 10 |
| UNIT-III | Precis writing | 10 |
| UNIT-IV | (a) Reading comprehension of an unseen passage | 05 |
| | (b) Vocabulary based on text | 10 |
| UNIT-V | Grammar Advanced Exercises | 25 |

Note : Question on unit I and IV (b) shall be asked from the prescribed text. Which will comprise of popular create writing and the following items. Minimum needs housing and transport Geo-economic profile of M.P. communication Educate and culture. Women and Work in Empowerment Development, management of change, physical quality of life. War and human survival, the question of human social value survival, the question of human social value, new Economic Philosophy Recent Liberalisation Method) Democratization decentralisation (with reference to 73, 74 constitutional Amendment.

Books Prescribed :

Aspects of English Language And Development - Published by M.P. Hindi Granth Academy, Bhopal.

CHEMISTRY

The new curriculum will comprise of Three papers of 33,33, & 34 marks each and Practical work of 50 marks. The curriculum is to be completed in 180 working days as per the UGC norms & conforming to the directives of the Govt. of Chhattisgarh. The theory papers are of 60 hrs. each duration & the practical work of 180 hrs. duration.

PAPER - I (Paper Code-0895)

INORGANIC CHEMISTRY

M.M. 33

UNIT-I 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.

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-II MAGNETIC PROPERTIES OF TRANSITION METAL COMPLEXES

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

Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectro-chemical series. Orgel-energy level diagram for d^1 and d^2 states, discussion of the electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ complex ion.

UNIT-III ORGANOMETALLIC CHEMISTRY

Definition, nomenclature and classification of organo metallic compounds. Preparation, properties, bonding and applications of alkyls and aryls of Li, Al, Hg, Sn, & Tl. A brief account of metal-ethylenic complexes and homogeneous hydrogenation, mononuclear carbonyls and nature of bonding in metal carbonyls.

UNIT-IV BIOINORGANIC CHEMISTRY

Essential and trace elements in biological processes, metalloporphyrins with special reference to hemoglobin and myoglobin. Biological role of alkali and alkaline earth metals with special reference to Ca^{2+} , nitrogen fixation.

UNIT-V HARD AND SOFT ACIDS AND BASES (HSAB)

07 HRS.

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

Silicones and Phosphazenes

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

REFERENCE BOOKS :

1. Basic Inorganic Chemistry, F.A. Cotton, G. Wilkinson and P.L. Gaus, Wiley
2. Concise Inorganic Chemistry, J.D. Lee, ELBS.
3. Concepts of models of Inorganic Chemistry, B. Douglas, D. McDaniel and J. Alexander, John Wiley
4. Inorganic Chemistry, D.E. Shriver, P.W. Atkins and C.H. Langford, Oxford.

5. Inorganic Chemistry, W.W. Porterfield, Addison-Wesley.
6. Inorganic Chemistry, A.G. Sharp, EBS.
7. Inorganic Chemistry, G.L. Miessler and D.A. Tarr, Prentice Hall.
8. Advanced Inorganic Chemistry, Satyas Prakash.
9. Advanced Inorganic Chemistry, Agarwal & Agarwal.
10. Advanced Inorganic Chemistry, Puri & Sharma, S. Naginchand
11. Inorganic Chemistry, Madan, S. Chand & Co.
12. Adhunik Akarbanic Rasayan, A.K. Shrivastav & P.C. Jain, Goel Pub.
13. Uchattar Akarbanic Rasayan, Satya Prakash & G.D. Tuli, Shyamal Prakashan
14. Uchattar Akarbanic Rasayan, Puri & Sharma.

PAPER - II (Paper Code-0896)

ORGANIC CHEMISTRY

M.M. 33

UNIT-I A. ORGANOMETALLIC COMPOUNDS

Organomagnesium compounds : Grignard reagents-formation, structure and chemical reactions. Organozinc compounds : formation and chemical reactions. Organolithium compounds : formation and chemical reactions.

B. Organosulphur Compounds

Nomenclature, structural features, methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphoramides and sulphaguridine.

Organic Synthesis via Enolates

Active methylene group alkylation of diethylmalonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate : the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate.

UNIT-II BIOMOLECULES

A. Carbohydrates :

Configuration of monosaccharides, threo and erythro diastereomers. Formation of glycosides ethers and esters Determination of ring size of monosaccharides. Cyclic structure of D(+) glucose. Structure of ribose and deoxyribose. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

B. Proteins and Nucleic acids

Classification and structure of protein levels of protein structure, protein denaturation / renaturation, Constituents of amino acids Ribonucleoside and ribonucleotides, double helical structure of DNA.

UNIT-III A. Synthetic Polymers

Addition or chain growth polymerization. Free radical vinyl polymerization, Ziegler-Natta polymerization, Condensation or Step growth polymerization, Polyesters, polyamides, phenols- formaldehyde resins, urea- formaldehyde resins, epoxy resins and polyurethanes, natural and synthetic rubbers.

B. Synthetic Dyes

Colour and constitution (Electronic Concept). Classification of Dyes. Chemistry of dyes. Chemistry and synthesis of Methyl Orange, Congo Red, Malachite Green, Crystal Violet, Phenolphthalein, fluorescein, Alizarine and Indigo.

UNIT-IV SPECTROSCOPY

A. Mass spectroscopy : mass spectrum fragmentation of functional groups.

- B. **Infrared Spectroscopy** : IR absorption Band their position and intensity, identification of IR spectra.
 - C. **UV-Visible Spectroscopy** : Beer Lambert's law, effect of Conjugation max Visible spectrum and colour.
 - D. Anthocyanin as natural colouring matter (Introduction only)
 - E. Application of Mass, IR, UV-Visible Spectroscopy to organic molecules.
- UNIT-V**
- A. **NMR Spectroscopy** : Introduction to NMR. Shielding and Number of signal in NMR, Chemical shift and characteristic values, splitting of Signals and Coupling constant. Application to organic molecules.
 - B. **¹³C-NMR Spectroscopy** : Principal & Application.
 - C. **Magnetic Resonance Imaging (MRI)**- Introductory idea.

REFERENCE BOOKS :

1. Organic Chemistry, Morrison and Boyd, Prentice-Hall
2. Organic Chemistry, L.G. Wade Jr., Prentice-Hall
3. Fundamentals of Organic Chemistry, Solomons, John Wiley
4. Organic Chemistry, Vol. I, II, III, S.M. Mitharjee, S.P. Singh and R.P. Kapoor, Wiley-Eastern (New-Age)
5. Organic Chemistry, P.A. Carey, McGraw Hill
6. Introduction to Organic Chemistry, Streitwieser, Heathcock and Kosover, Macmillan
7. Organic Chemistry, P.L. Soni
8. Organic Chemistry, Bahl & Bahl
9. Organic Chemistry, Joginder Singh
10. Carbonic Rasayan, Bahl & Bahl
11. Carbonic Rasayan, R.N. Singh, S.M.I. Gupta, M.M. Bakodia & S.K. Wadwa
12. Carbonic Rasayan, Joginder Singh.
13. Carbonic Rasayan, P.L., Soni.
14. Carbonic Rasayan, Bhagchandani, Sahitya Bhawan Publication.
15. Rasayan Vigyan, Bhatnagar, Arun Prakashan.

BHSE - III (Paper Code-0897)

PHYSICAL CHEMISTRY

M.M. 34

UNIT-I QUANTUM MECHANICS

Black body radiation, Plank's radiation law, photoelectric effect, Compton effect. DeBroglie's idea of matter waves, experimental verification Heisenberg's uncertainty principle, Sinusoidal wave equation, Operators : Hamiltonian operator, angular momentum operator, Laplacian operators postulate of quantum mechanics Eigen values, Eigen function. Schrodinger time independent wave equation physical significance of ψ and ψ^2 . Applications of schrodinger wave equation : particle in one dimensional box Hydrogenation (separation into three equation's) radial wave function and angular wave function.

UNIT-II QUANTUM MECHANICS-II

Quantum mechanical approach of molecular orbit theory; basic idea criteria for forming M.O and A.O, LCAO approximation, formation of H_2^+ ion, calculation of energy levels from wave functions bonding and antibonding wave functions concept of σ and π

orbitals and their characteristics, Hybrid orbital : sp , sp^2 , sp^3 , Calculation of coefficients A_i used in these hybrid orbitals.

Introduction to valence bond model of H_2 , Comparison of M.O. and V.B. model, Hückle theory, application of huckel theory to ethane propene etc.

UNIT-III SPECTROSCOPY-I

- A. Introduction, characterization of electromagnetic radiation, regions of the spectrum, representation of spectra width and intensity of spectral transition, rotational spectra of calculated diatomic molecules, energy level of rigid rotator, selection rule, determination of bond length qualitative description of non - rigid rotator isotopic effect.
- B. Vibrational spectra - Fundamental vibrational and their symmetry, vibrating diatomic molecules, energy levels of simple harmonic oscillator. Selection Rule, Pure vibrational Spectrum, determination of force constant, diatomic vibrating operator. Anharmonic Oscillator.
- C. Raman Spectra : Concept of polarizability, quantum theory of Raman spectra stokes and anti stokes lines pure rotational and vibrational Raman spectra, Application of Raman spectra stokes and anti stokes lines, pure rotational and vibrational Raman spectra, Applications of Raman spectra.

UNIT-IV SPECTROSCOPY-II

- A. Electronic Spectra : Electronic Spectra of diatomic molecule, Frank London principle, types of electronic transitions. Applications of electronic spectra.
- B. Photo-chemistry : Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry. Grothus-Draper law, Stark-Einstein law, Jablonski diagram depicting various process occurring in the excited state, qualitative description of fluorescence, occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield photosensitized reactions energy transfer processes (simple examples).

UNIT-V A. Thermodynamics

- Energy referred to absolute zero, third law of thermodynamics Test of III law of thermodynamics Nerst heat theorem application and limitation of Nerst heat theorem.
- B. Physical properties and molecular structure : polarization of molecules, (Classius-Moseotti equation. orientation of dipoles in an electric field. Dipol moment, induced dipole moment, measurement of dipole moment. Temperature methods and refractivity methods. Dipole moment and molecular structure.
- C. Magnetic Properties : Paramagnetism diamagnetism, ferromagnetism. Determination of magnetic susceptibility, elucidation of molecular structure.

REFERENCE BOOKS :

1. Physical Chemistry, G.M. Barrow, International student edition, McGraw Hill
2. Basic programming with application, V.K. Jain, Tata McGraw-Hill
3. Computers & Common sense, R. Hunt & Shelly, Prentice-Hall
4. University general chemistry, C.N.R. Rao, Macmillan.
5. Physical Chemistry, R.A. Alberty, Wiley Eastern
6. The elements of Physical Chemistry, P.W. Atkins, Oxford

7. Physical Chemistry through problems, S.K. Dogra & S. Dogra, Wiley Eastern
8. Physical Chemistry, B.D. Khosla
9. Physical Chemistry, Puri & Sharma
10. Bhoutic Rasayan, Puri & Sharma
11. Bhoutic Rasayan, P.L. Soni
12. Bhoutic Rasayan, Bahl & Tuli

**PAPER-IV
LABORATORY COURSE**

180 Hrs.

Inorganic Chemistry

Synthesis Analysis

- (a) Preparation of Sodium tricalato ferrate (III), $\text{Na}_3[\text{Fe}(\text{C}_2\text{O}_4)_3]$ and determination of its composition by permanganometry.
- (b) Preparation of Ni-DMG complex, $[\text{Ni}(\text{DMG})_2]$
- (c) Preparation of copper tetraammine complex, $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$.
- (d) Preparation of cis-and trans-bisoxalato diaqua chromate (III) ion.

Gravimetric Analysis

Analysis of Cu as CuSCN or CuO , Ni as $[\text{Ni}(\text{DMG})_2]$, Ba as BaSO_4 and Fe as Fe_2O_3 .

Organic Chemistry

Laboratory Techniques

A Steam Distillation

Napthalene from its suspension in water

Clove oil from cloves

Separation of ortho and para-nitrophenols.

B Column Chromatography

Separation of Fluorescein and methylene blue

Separation of leaf pigments from spinach leaves

Resolution of racemic mixture of (+,-) mandelic acid.

Qualitative Analysis

Analysis of an organic mixture containing two solid components using water, NaHCO_3 , NaOH for separation and preparation of suitable derivatives.

Synthesis of Organic Compounds

- (a) Acetylation of salicylic acid, aniline, glucose and hydroquinone. Benzoylation of aniline and phenol.
- (b) Aliphatic electrophilic substitution- Preparation of iodoform from ethanol and acetone.
- (c) Aromatic electrophilic substitution-
Nitration-Preparation of m-dinitrobenzene, p-nitroacetanilide
Halogenation- Preparation of p-bromoacetanilide, 2,4,6 tribromophenol
Diazotization/Coupling- Preparation of methyl orange and methyl red
- (d) Oxidation- Preparation of benzoic acid from toluene
- (e) Reduction- Preparation of aniline from nitrobenzene, m-nitroaniline from m-dinitrobenzene.

Physical Chemistry

Electrochemistry

- (a) To determine strength of given acid conductometrically using standard alkali solution.
- (b) To determine solubility and solubility product of a sparingly soluble electrolyte conductometrically.

- (d) To study saponification of ethyl acetate conductometrically.
- (e) Determine the ionization constant of a weak acid conductometrically.
- (f) To titrate potentiometrically the given ferrous ammonium sulphate using $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ as titrant and calculate the redox potential of $\text{Fe}^{2+}/\text{Fe}^{3+}$ system on the hydrogen scale.

Refractometry and Polarimetry

- (a) To verify law of refraction of mixtures (e.g. of glycerol and water) using Abbe's refractometer.
- (b) To determine the specific rotation of a given optically active compound.

Molecular Weight Determination

- (a) Determination of molecular weight of a non-volatile solute by Rast method/Beckmann freezing point method.
- (b) Determination of the apparent degree of dissociation of an electrolyte (e.g., NaCl) in aqueous solution at different concentrations by ebullioscopy.

Colorimetry

To verify Beer-Lambert law for $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ and determine the concentration of the given solution of the substance.

REFERENCE BOOKS :

1. Vogel's qualitative Analysis, revised, Svehla, Orient Longman
2. Standard methods of chemical analysis, W.W. Scott, The Technical Press
3. Experimental Organic Chemistry, Vol. I & II, P.R. Singh, D.S. Gupta and K.S. Bajpai, tata McGraw Hill.
4. Laboratory Manual in Organic Chemistry, R.K. Bansal, Wiley Eastern
5. Vogel's Text Book of Practical Organic Chemistry, B.S. Puri, A.J. Hannaford, V. Rogers, P.W.G. Smith and A.R. Tatchel, ELBS
6. Experiments in general chemistry, C.N.R. Rao & U.C. Agrawal
7. Experiments in Physical Chemistry, R.C. Das & Behra, Tata McGraw Hill
8. Advanced Practical Physical Chemistry, J.B. Yadav, Goel Publishing House.

8 Hrs

PRACTICAL EXAMINATION

M.M.50.

Five experiments are to be performed.

1. Inorganic - Two experiments to be performed.
Gravimetric estimation compulsory carrying 08 marks. (Manipulation 3 marks).
Any one experiment from synthesis and analysis carrying 04 marks.
2. Organic-Two experiments to be performed.
Qualitative analysis of organic mixture containing two solid components.
compulsory carrying 08 marks (03 marks for each compound and two marks for separation).
One experiment from synthesis of organic compound (Single step) carrying 04 marks.
3. Physical-One physical experiment carrying 12 marks.
4. Sessional 04 marks.
5. Viva Voce 10 marks.

In case of Ex-Students one mark each will be added to Gravimetric analysis and Qualitative analysis of organic mixture and two marks in Physical experiment.

BOTANY

PAPER-I (Paper Code-0915)

PLANT PHYSIOLOGY, BIOCHEMISTRY AND BIOTECHNOLOGY

M.M. : 50

- UNIT-I** Plant-water relations : Importance of water to plant life ; physical properties of water; diffusion and osmosis; absorption, transport of water and transpiration ; physiology of stomata.
Mineral nutrition : Essential macro and micro-elements and their role ; mineral uptake; deficiency and toxicity symptoms.
- UNIT-II** Transport of organic substances : Mechanism of phloem transport ; source-sink relationship ; factors affecting translocation.
Basic of enzymology : Discovery and nomenclature ; characteristics of enzymes ; concept of holoenzyme apoenzyme, coenzyme and cofactors ; regulation of enzyme activity, mechanism of action.
Photosynthesis : Significance ; historical aspects ; photosynthetic pigments ; action spectra and enhancement effects ; concept of two photosystems; Z-scheme ; photo-phosphorylation ; Calvin cycle ; C4 pathway ; C3M plants ; photorespiration.
- UNIT-III** Respiration : ATP - the biological energy currency ; aerobic and anaerobic respiration; Krebs's cycle, electron transport mechanism (chemi-osmotic theory) ; redox potential; oxidative phosphorylation ; pentose phosphate pathway.
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 ; Beta-oxidation ; saturated and unsaturated fatty acids; storage and mobilization of fatty acids.
- UNIT-IV** 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 ; plant hormones auxins, gibberellins, cytokinins, abscisic acid and ethylene, history of their discovery, biosynthesis and mechanism of action ; photomorphogenesis ; phytochromes and cryptochromes, their discovery, physiological role and mechanism of action.
- UNIT-IV** Genetic engineering : Tools and techniques of recombinant DNA technology ; cloning vectors ; genomic and cDNA library ; transposable elements ; techniques of gene mapping and chromosome walking.
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.

PAPER-II (Paper Code-0916)

ECOLOGY AND UTILIZATION OF PLANTS M.M. : 50

- UNIT-I** Plants 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.
Morphological, anatomical and physiological responses of plants to water (hydrophytes and xerophytes), temperature (thermoperiodicity), light (photoperiodism, heliophytes and sciophytes) and salinity.

- UNIT-II** Community Ecology : Community characteristics, frequency, density, cover, life forms biological spectrum ; ecological succession.
Ecosystems : Structure, abiotic and biotic components ; food chain, food web, ecological pyramids, energy flow ; biogeochemical cycles of carbon, nitrogen and phosphorus.
- UNIT-III** Population ecology : Growth curves ; ecotypes ; ecads.
Biogeographical regions of India.
Vegetation types of India : Forests and grasslands.
- UNIT-IV** Utilization of Plants
Food plants : Rice, wheat, maize, potato, sugarcane.
Fibres : Cotton and jute.
Vegetable oils : Groundnut, mustard and coconut.
General account of sources of firewood, timber and bamboos.
- UNIT-V** Spices : General account.
Medicinal plants : General account.
Beverages : Tea and coffee.
Rubber.

PRACTICAL SCHEME

M.M. 50

| | |
|----------------------------------|-----------|
| 01. Physiology | 08 |
| 02. Ecology | 08 |
| 03. Utilization of Plants | 05 |
| 04. Biochemistry / Biotechnology | 05 |
| 05. Spotting (1-5 spots) | 10 |
| 06. Project work | 04 |
| 07. Viva V. | 05 |
| 08. Sessional | 05 |
| | 50 |

Suggested Laboratory Exercises

- To study the permeability of plasma membrane using different concentrations of organicsolvents.
- To study the effect of temperature on permeability of plasma membrane.
- To prepare the standard curve of protein and determine the protein content in unknown samples.
- To study the enzyme activity of catalase and peroxidase as influenced by pH and temperature.
- Comparison of the rate of respiration of various plant parts.
- Separation of chloroplast pigment by solvents method.
- Determining the osmotic potential of vacuolar sap by plasmolytic method.
- Determining the water potential of any tuber.
- Separation of amino acids in a mixture by paper chromatography and their identification by comparison with standards.
- Bioassay of auxin, cytokinin, GA, ABA and ethylene using appropriate plant material.
- Demonstration of the technique of micropropagation by using different explants, e.g. axillary buds, shoot meristems.
- Demonstration of the technique of anther culture.
- Isolation of protoplasts from different tissues using commercially available enzymes.
- Demonstration of root and shoot formation from the apical and basal portion of stem segments in liquid medium containing different hormones.

Suggested Laboratory Exercises (Biology)

1. To determine minimum number of quadrats required for reliable estimate of biomass in grasslands.
2. To study the frequency of herbaceous species in grassland and to compare the frequency distribution with Raunkiair's Standard Frequency Diagram.
3. To estimate Importance Value Index for grassland species on the basis of relative frequency, relative density and relative biomass in protected and grazed grassland.
4. To measure the vegetation cover of grassland through point frame method.
5. To measure the aboveground plant biomass in a grassland.
6. To determine Kemp's constant for dicot and monocot leaves and to estimate the leaf area index of a grassland community.
7. To determine diversity indices (richness, Simpson, Shannon-Wiener) in grazed and protected grassland.
8. To estimate bulk density and porosity of grassland and woodland soils.
9. To determine moisture content and water holding capacity of grassland and woodland soil.
10. To study the vegetation structure through profile diagram.
11. To estimate transparency, pH and temperature of different water bodies.
12. To measure dissolved oxygen content in polluted and unpolluted water samples.
13. To estimate salinity of different water samples.
14. To determine the percent leaf area injury of different leaf samples collected around polluted sites.
15. To estimate dust holding capacity of the leaves of different plant species.

PRACTICAL

Suggested Laboratory Exercises (for Utilization of Plants)

1. Food Plants : Study of the morphology, structure and simple microchemical tests of the food storing tissues in rice, wheat, maize, potato and sugarcane, Microscopic estimation of starch in these plants (excepting sugarcane)
2. Fibres : Study of cotton flowers, sectioning of the cotton ovules/developing seeds to trace the origin and development of cotton fibres. Microscopic study of cotton and test for cellulose. Sectioning and staining of jute stem to show the location and development of fibres. Microscopic structure. Test for lignocellulose.
3. Vegetable oils : Study of hand sections of groundnut, mustard and coconut and staining of oil droplets by Sudan III and Sudan Black.
4. Field visits : To study sources of firewood (10 plants), timber-yielding trees (10 trees) and bamboos. A list to be prepared mentioning special features.
5. Spices : Examine black pepper, cloves, cinnamon (hand sections) and opened fruits of cardamom and describe them briefly.
6. Preparation of an illustrated inventory of 10 medicinal plants used in indigenous systems of medicine or allopathy : Write their botanical and common names, parts used and disease/disorders for which they are prescribed.
7. Beverages : Cut Sections of boiled coffee beans and tea leaves to study the characteristic structural features.
8. Rubber : Collect illustrative materials of *Hevea brasiliensis* ; morphology of the plant and tapping practice, history of rubber. List the many uses of rubber.

ZOOLOGY

Paper-I (Paper Code-0917)

Ecology, Environmental-biology ; Toxicology ; Microbiology and Medical Zoology.

2 Attempting one question from each unit will be compulsory. 100% choice be given.

UNIT-I (ECOLOGY)

1. Aims and scopes of Ecology.
2. Major ecosystems of the world-Brief introduction
3. Population- Characteristics and regulation of densities.
4. Communities and Ecosystems.
5. Biogeochemical cycles
6. Air and water pollution
7. Ecological succession

UNIT-II (ENVIRONMENTAL BIOLOGY)

1. Laws of limiting factors
2. Food chain in a freshwater ecosystem.
3. Energy flow in ecosystem-Trophic levels
4. Conservation of Natural resources
5. Environmental Impact Assessment

UNIT-III (TOXICOLOGY)

1. Definition of Toxicity
2. Classification of toxicants
3. Principle of systematic toxicology
4. Toxic agents and their action- Metallic and inorganic agents
5. Animal poisons - Snake-venom, Scorpion and bee poisoning
6. Food poisoning

UNIT-IV (MICROBIOLOGY)

1. General and Applied microbiology.
2. Microbiology of Domestic water and sewage
3. Microbiology of milk and milk products
4. Industrial microbiology

UNIT-V (MEDICAL MICROBIOLOGY)

1. Brief introduction to pathogenic micro-organisms, Rickettsia, Spirochaetes and Bacteria.
2. Brief account of life-history and pathogenicity of the following pathogens with reference to man ; Prophylaxis and treatment -
 - (a) Pathogenic Protozoans - Entamoeba, Trypanosoma, and Giardia
 - (b) Pathogenic helminths - Schistosoma
 - (c) Nematode Pathogenic parasites of man
3. Vector insects

PAPER-II
(Paper Code-0918)

(GENETIC'S, CELL PHYSIOLOGY, BIOCHEMISTRY, BIOTECHNOLOGY AND BIOTECHNIQUES)

Note : Attempting one question from each unit will be compulsory, 100% choice be given.

UNIT-I (GENETIC'S)

1. Linkage and Linkage maps
2. Varieties of gene expression - Multiple alleles ; lethogenesis ; Pleiotropic genes; gene interaction ; epistasis.
3. Sexchromosome systems, and sex-linkage.
4. Mutation and chromosomal alterations ; meiotic consequences.
5. Human genetics - chromosomal and single gene disorders (somatic cell genetics)

UNIT-II (CELL PHYSIOLOGY)

1. General idea about pH and Buffer.
2. Transport across membrane - cell membrane; Mitochondria and Endoplasmic reticulum.
3. Active transport and its mechanism; Active transport in Mitochondria and Endoplasmic reticulum.
4. Hydrolytic enzymes - Their chemical nature, Activation and specificity.

UNIT-III (BIOCHEMISTRY)

1. Amino acids and Peptides - Basic structure and biological function.
2. Carbohydrate and its metabolism - Glycogenesis; Gluconeogenesis; glycolysis, Glycogenolysis; Cost-cycle.
3. Lipid metabolism - Oxidation of glycerol; oxidation of fatty acid.
4. Protein metabolism - Dehydration, Transamination, Transmethylation; Biosynthesis of Protein;

UNIT-IV (BIOTECHNOLOGY)

1. Biotechnology - Scope and importance.
2. Recombinant DNA and Gene cloning.
3. Cloned genes and other tools of biotechnology.
4. Applications of biotechnology in (i) Pharmaceutical industry, and (ii) Food processing industry.

UNIT-V (BIOTECHNIQUE)

Principles and techniques about the following

1. pH meter
2. Colorimeter
3. Microscopy-Light microscopes, Phase contrast and Electron microscopes.
4. Centrifugation
5. Separation of biomolecules by chromatography, and Electrophoresis
6. Bistochemical methods for determination of Protein, Lipids, and carbohydrate

PRACTICAL WORK

The Practical work in general shall be based on syllabus prescribed in theory. The candidates will be required to show knowledge of the following :

1. Estimation of population density, Percentage frequency, Relative density.
2. Analysis of Producers and consumers in grassland.
3. Detection of gram-negative and gram-positive bacteria.
4. Blood group detection (A,B, AB & O).
5. R.B.C., W.B.C. count.
6. Blood coagulation time.
7. Preparation of Hematin crystals from blood of rat.
8. Observation of Drosophila, wild and mutant.
9. Chromatography-Paper or gel.
10. Colorimetric estimation of hemoglobin.
11. Mitosis in onion root tip.
12. Biochemical detection of Carbohydrate, Protein and Lipid.
13. Study of Permanent slides of Parasites, based on theory paper.
14. Working Principles of pH meter, Colorimeter, centrifuge and microscopes.

SCHEDULE FOR PRACTICAL EXAMINATION

| Duration : 4 Hrs. | Max Marks : 50 |
|--|----------------|
| 1. Haematological Experiment : (R.B.Cs./W.B.Cs. Counting/Blood group detection) | 08 marks |
| 2. Ecological Experiment : (Estimation of Population Density/Frequency/relative Density) | 06 marks |
| 3. Staining of Gram +ve and Gram -ve Bacteria/cytological experiment : Mitosis in onion root tip | 05 marks |
| 4. Biochemical Experiment : (Biochemical detection of carbohydrate/protein lipid) | 06 marks |
| 5. Chromatography | 05 marks |
| 6. Spotting : Study of permanent slides of Parasites : 3 Comments on working Principles of pH meter / Colorimeter / centrifuge and Microscope : | 10 marks |
| 7. Viva Voce | 05 marks |
| 8. Sessional : | 05 marks |
