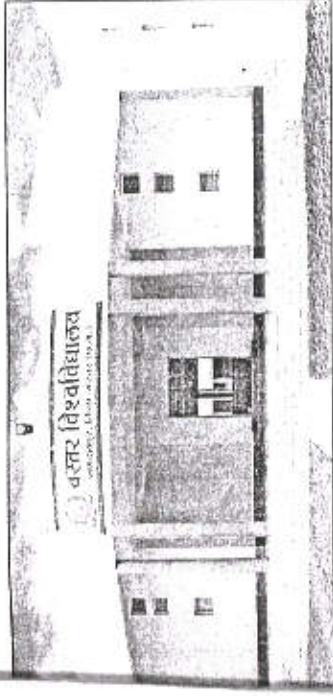


बस्तर विश्वविद्यालय
पुर (धरमपुरा), जिला-बस्तर (छत्तीसगढ़)
www.bvvjdp.ac.in



पाठ्यक्रम

बी.एस.सी. भाग - 3 (कोड-083)

B. Sc. Part - III (Code-083)

परीक्षा : 2011

कुलसचिव

बस्तर विश्वविद्यालय, जगदलपुर
छत्तीसगढ़ की ओर से

अधिकृत मुद्रक एवं प्रकाशक :



गीता पब्लिकेशन

महामाईपारा, रायपुर (छत्तीसगढ़)

मूल्य : 25/-

बस्तर विश्वविद्यालय
जगदलपुर (धरमपुरा), जिला-बस्तर (छत्तीसगढ़)



पाठ्यक्रम

बी.एस.सी. भाग - 3 (कोड-083)
B. Sc. Part - III (Code-083)

परीक्षा : 2011

कुलसचिव
बस्तर विश्वविद्यालय, जगदलपुर
छत्तीसगढ़ की ओर से



अधिकृत मुद्रक एवं प्रकाशक :

गीता पब्लिकेशन

महामाईगारा, रायपुर (छत्तीसगढ़)

REVISED ORDINANCE NO.21
(As per State U.G.C. Scheme)
BACHELOR OF SCIENCE

The Three year course has been broken up into three Parts. Part-I known as B.Sc. Part-I examination at the end of the first year, Part-II known as B.Sc. Part-II examination at the end of the second year and Part-III known as B.Sc. Part-III examination at the end of the third year.

A candidate who, after passing (10+2) Higher Secondary or Intermediate Examination of C.G. Board of Secondary Education Raipur or any other Examination recognised by the University or C.G. Board of Secondary Education as equivalent thereto, has attended a regular course of study in an affiliated College or in the Teaching Department of the University for one academic year shall be eligible for appearing at the B.Sc. Part-I examination.

A candidate who, after passing the B.Sc. Part-I examination of the University or any other examination recognised by the University as equivalent thereto, has attended a regular course of study for one academic year in an affiliated college or in the Teaching Department of the University shall be eligible for appearing at the B.Sc. Part-II examination.

A candidate who, after passing the B.Sc. Part-II examination of the University, has completed a regular course of study for one academic year in an affiliated college or in the Teaching Department of the University shall be eligible for appearing at the B.Sc. Part-III examination.

Besides regular students, subject to their compliance with this Ordinance ex-student and non-collegiate students shall be eligible for admission to the examinations as per provisions of Ordinance No. 6 relating to Examinations (General). Provided that non-collegiate candidates shall be permitted to offer only such subjects/papers as are taught to the regular student at any of the University Teaching Department or College.

Every candidate appearing in B.Sc. Part-I, Part-II and Part-III examination shall be examined in -

- (i) Foundation Course :
- (ii) Any one of the following combinations of three subjects:
 1. Physics, Chemistry & Mathematics.
 2. Chemistry, Botany & Zoology.
 3. Chemistry, Physics & Geology.
 4. Chemistry, Botany & Geology.
 5. Chemistry, Zoology & Geology.
 6. Geology, Physics & Mathematics.
 7. Chemistry, Mathematics & Geology.
 8. Chemistry, Botany & Defence Studies.
 9. Chemistry, Zoology & Defence Studies.
 10. Physics, Mathematics & Defence Studies.
 11. Chemistry, Geology & Defence Studies.
 12. Physics, Mathematics & Statistics.
 13. Physics, Chemistry & Statistics.
 14. Chemistry, Mathematics & Statistics.
 15. Chemistry, Zoology & Anthropology.

SCHEME OF EXAMINATION

Subject	Paper	Max. Marks	Total Marks	Min. Marks
(A) Compulsory Subject Foundation Course				
1) Hindi Language	I	75	150	50
2) English Language	II	75		
(B) Three Elective Subject :				
2. Chemistry	I	33	100	33
	II	33		
	III	34		
	Practical		50	17
1. Physics	I	50	100	33
	II	50		
	Practical		50	17
3. Mathematics	I	50	150	50
	II	50		
	III	50		
	I	50	100	33
	II	50		
	Practical		50	17
5. Zoology	I	50	100	33
	II	50		
	Practical		50	17
6. Geology	I	50	100	33
	II	50		
	Practical		50	17
7. Statistics	I	50	100	33
	II	50		
	Practical		50	17
8. Anthropology	I	50	100	33
	II	50		
	Practical		50	17
9. Ind. chemistry	I	Practical	100	33
	II	34		
	III	33		
	Practical		50	17

B.Sc.-III

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16. Chemistry, Botany & Anthropology.
17. Chemistry, Geology & Anthropology.
18. Chemistry, Mathematics & Anthropology.
19. Chemistry, Anthropology & Defence Studies.
20. Geology, Mathematics & Statistics.
21. Mathematics, Defence Studies & Statistics.
22. Anthropology, Mathematics & Statistics.
23. Chemistry, Anthropology & Applied Statistics.
24. Zoology, Botany & Anthropology.
25. Physics, Mathematics & Electronics.
26. Physics, Mathematics & Computer Application/Information Technologies.
27. Chemistry, Mathematics & Computer Application/Information Technologies.
28. Chemistry, Bio-Chemistry & Pharmacy.
29. Chemistry, Zoology & Fisheries.
30. Chemistry, Zoology & Agriculture.
31. Chemistry, Zoology & Sericulture.
32. Chemistry, Botany & Environmental Biology.
33. Chemistry, Botany & Microbiology.
34. Chemistry, Zoology & Microbiology.
35. Chemistry, Industrial Chemistry, Mathematics.
36. Chemistry, Industrial Chemistry, Zoology.

(iii) Practicals in case prescribed for core subjects.

7. Any candidate who has passed the B.Sc. examination of the University shall be allowed to present himself for examination in any of the additional subjects prescribed for the B.Sc. examination and not taken by him at the degree examination. Such candidate will have to first appear and pass the B.Sc. Part I examination in the subjects which he proposes to offer and then the B.Sc. Part II and Part III examination in the same subject. Successful candidates will be given a certificate to that effect.
8. In order to pass at any part of the three year degree course examination an examinee must obtain not less than 33% of the total marks in each subject/group of subjects. In subject/group of subjects where both theory and practical examination are provided an examinee must pass in both theory and practical parts of the examination separately. Candidate will have to pass separately at the Part I, Part II and Part III examinations. No division shall be assigned on the result of the Part I and Part II examinations. In determining the division of the final examination, total marks obtained by the examinees in their Part-I, Part II and Part III examination in the aggregate shall be taken in to account. Provided in case of candidate who has passed the examination through supplementary examination having failed in one subject/group only, the total aggregate marks being carried over for determining the division shall include actual marks obtained in the subject/group in which he appeared at the supplementary examination.
10. Successful examinee at the Part-III examination obtaining 60% or more marks shall be placed in the First Division, those obtaining less than 60% but not less than 45% marks in the Second Division and other successful examinees in the Third Division.

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आधार पाठ्यक्रम

हिन्दी भाषा

(पेपर कोड-0891)

प्रथम प्रश्न पत्र

पूर्णांक - 75

(बी.ए., बी.एस.सी., बी.ए.एस.सी., बी.कॉम., तृतीय वर्ष के पुनरीक्षित एकीकृत आधार पाठ्यक्रम

एवं पाठ्य सामग्री का संयोजन 2000-2001 से लागू है)

II सम्प्रेषण कौशल, हिन्दी भाषा और सामान्य ज्ञान II

आधार पाठ्यक्रम की संरचना और अनिवार्य पाठ्य पुस्तक- हिन्दी भाषा एवं समाजविधि- 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 की संकलित रचनाओं और सामान्य ज्ञान की पाठ्य सामग्री के साथ अन्तर्गुम्भित किया गया है। अध्यायन-अध्यापन के लिए पूरी पुस्तक की पाठ्य सामग्री है और अध्यास 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 षीच इकाइयों में किया जाता है। प्रत्येक इकाई को दो भागों में विभक्त किया गया है।

इकाई - 1 (क) भारत गता : सुमित्रानंदन पंत, परशुराम की प्रतीक्षा : रामधारी सिंह दिग्बर, बहुत बड़ा सवाल : मोहन राकेश, संस्कृति और राष्ट्रीय एकीकरण : योगेश अटल।

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

इकाई - 2 (क) विकासशील देशों की समस्यायें, विकासोन्मुख पुनर्विचार, और प्रौद्योगिकी एवं नगरीकरण।

(ख) विभिन्न संरचनाएँ।

इकाई - 3 (क) आधुनिक तकनीकी सभ्यता, पर्यावरण प्रदूषण तथा भारतीय विकास।

(ख) कार्यालयीन पत्र और आलेख।

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

(ख) अनुवाद।

इकाई - 5 (क) अर्वा और शक्तिमानता का अर्थशास्त्र।

(ख) घटनाओं, समारोहों आदि का प्रतिवेदन और विभिन्न प्रकार के निमंत्रण-पत्र।

मूल्यांकन योजना : प्रत्येक इकाई से एक-एक प्रश्न पूछा जाएगा। प्रत्येक प्रश्न में आंतरिक विकल्प होगा। प्रत्येक प्रश्न के 15 अंक होंगे। प्रत्येक इकाई दो-दो खंड (ब्रह्मणः 'क' और 'ख' में) विभक्त है, इसलिए प्रत्येक प्रश्न के भी दो भाग, (ब्रह्मणः '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।

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Subject	Paper	Max. Marks	Min. Marks
10. Defence Studies	I	50	33
	II	50	
	Practical	50	
11. Micro Biology	I	50	33
	II	50	
	Practical	50	
12. Electronics	I	50	33
	II	50	
	Practical	50	
13. I.T.	I	50	33
	II	50	
	Practical	50	
14. Computer Science	I	50	33
	II	50	
	Practical	50	
15. Biochemistry	I	50	33
	II	50	
	Practical	50	

USE OF CALCULATORS

The Students of Degree/P.G. Classes will be permitted to use of Calculators in the examination hall from annual 1986 examination on the following conditions as per decision of the standing committee of the Academic Council at its meeting held on 31-1-1986.

1. Student will bring their own Calculators.
2. Calculators will not be provided either by the University or examination centres.
3. Calculators with, memory and following variables be permitted +, -, x, square, reciprocal, exponentials log, square root, trigonometric functions, wize, sine, cosine, tangent etc. factorial summation, xy, yx and in the light of objective approval of merits and demerits of the viva only will be allowed.

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PART - 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 questions 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 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 Worm 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 Diberallation Method) Demoration docontralisation (with reference to 73, 74 constitutional Amendment.

Books Prescribed :

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

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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_s 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 $[Ti(H_2O)_6]^{3+}$ 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, & Ti. A brief account of metal-ethylene complexes and homogeneous hydrogenation, mononuclear carbonyls and nature of bonding in metal carbonyls.

UNIT-IV BIONORGANIC 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.

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5. Inorganic Chemistry, W.W. Porterfield, Addison-Wesley.
6. Inorganic Chemistry, A.G. Sharp, ELBS.
7. Inorganic Chemistry, G.L. Messler 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, Gool Pub.
13. Uchhattar Akarbanic Rasayan, Satya Prakash & G.D. Tuli, Shyamal Prakashan
14. Uchhattar Akarbanic Rasayan, Puri & Sharma

PAPER - II (Paper Code-0896)

ORGANIC CHEMISTRY

M.M. 33

UNIT-I A. ORGANOMETALLIC COMPOUNDS

Organometallic 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, sulphonamides and sulphaguanidine.

Organic Synthesis via Enolates

Active methylene groupalkylation 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 Ribonucleic acids 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.

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- 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 λ_{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 PMR. Chemical shift and characteristic values, splitting of Signals and Coupling constant. Application to organic molecules.

B. ¹³CMR 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. Wado Jr., Prentice-Hall
3. Fundamentals of Organic Chemistry, Solomons, John Wiley
4. Organic Chemistry, Vol.I, II, III, S.M. Mukherjee, S.P. Singh and R.P. Kapoor, Wiley-Eastern (New-Age)
5. Organic Chemistry, F.A. Carey, McGraw Hill
6. Introduction to Organic Chemistry, Streiweisser, Heathcock and Kosover, Macmillan
7. Organic Chemistry, P.L. Soni
8. Organic Chemistry, Bahl & Bahl
9. Organic Chemistry, Joginder Singh
10. Carbanic Rasayan, Bahl & Bahl
11. Carbanic Rasayan, R.N. Singh, S.M.I. Gupta, M.M. Bakodia & S.K. Wadhwa
12. Carbanic Rasayan, P.L. Soni.
13. Carbanic Rasayan, Bhagchandani, Sanitya Bhawan Publication.
14. Rasayan Vigyan, Bhatnagar, Arun Prakashan.

PAPER - III (Paper Code-0897)

PHYSICAL CHEMISTRY

M.M. 34

UNIT-I QUANTUM MECHANICS

Black body radiation, Planck's radiation law, photoelectric effect, Compton effect. DeBroglie's idea of matter waves, experimental verification Heisenberg's uncertainty principle, Sinosoidal 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 , σ^* , π and

B.Sc.-II

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π^* orbitals and their characteristics, Hybrid orbital : SP, SP², SP³, SP³, Calculation of coefficients Ad^s used in these hybrid orbitals.
Introduction to valence bond model of H₂, Comparison of M.O. and V.B. model, Huckle theory, application of huckle theory to ethane propene etc.

UNIT-III SPECTROSCOPY-I

- 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.
- 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.
- 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

- Electronic Spectra : Electronic Spectra of diatomic molecule, Frank London principle, types of electronic transitions, Applications of electronic spectra.
- 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, 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 Neerst heat theorem application and limitation of Neerst heat theorem.
- Physical properties and molecular structure : polarization of molecules, (Classius-Mosotti equation, orientation of dipoles in an electric field. Dipole moment, induced dipole moment, measurement of dipole moment. Temperature methods and refractivity methods. Dipole moment and molecular structure.
 - Magnetic Properties : Paramagnetism diamagnetism, ferromagnetism, Determination of magnetic susceptibility, elucidation of molecular structure.

REFERENCE BOOKS :

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

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- Physical Chemistry through problems, S.K. Dogra & S. Dogra, Wiley Eastern
- Physical Chemistry, B.D. Khosia
- Physical Chemistry, Puri & Sharma
- Bhoutic Rasayan, Puri & Sharma
- Bhoutic Rasayan, P.L. Soti
- Bhoutic Rasayan, Bahl & Tuli

PAPER-IV

LABORATORY COURSE

180 Hrs.

Inorganic Chemistry

Synthesis Analysis

- Preparation of Sodium trioxalato ferrate (III), Na₃[Fe(C₂O₄)₃] and determination of its composition by permanganometry.
- Preparation of Ni-DMG complex, [Ni(DMG)₂]
- Preparation of copper tetraammine complex, [Cu(NH₃)₄]SO₄.
- Preparation of cis and trans-bioxalato diaqua chromate (III) ion.

Gravimetric Analysis

Analysis of Cu as CuSCN or CuO, Ni as Ni(DMG)₂, Ba as BaSO₄ and Fe as Fe₂O₃

Organic Chemistry

Laboratory Techniques

- Steam Distillation
Naphthalene from its suspension in water
Clove oil from cloves
Separation of ortho and para-nitrophenols.
- 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, NaHCO₃, NaOH for separation and preparation of suitable derivatives.

Synthesis of Organic Compounds

- Acetylation of salicylic acid, aniline, glucose and hydroquinone. Benzoylation of aniline and phenol.
- Aliphatic electrophilic substitution- Preparation of iodoforn from ethanol and acetone.
- Aromatic electrophilic substitution- Nitration-Preparation of m-dinitrobenzene, p-nitroacetamide
Halogenation- Preparation of p-bromoacetanilide, 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, m-nitroaniline from m-dinitrobenzene.

Physical Chemistry

Electrochemistry

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

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- (c) To study saponification of ethyl acetate conductometrically.
 (d) Determine the ionization constant of a weak acid conductometrically.
 (e) To titrate potentiometrically the given ferrous ammonium sulphate using $KMnO_4$, $K_2Cr_2O_7$ as titrant and calculate the redox potential of Fe^{3+}/Fe^{2+} 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 $KMnO_4$, $K_2Cr_2O_7$ 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. Furnis, 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. Yadvav, Goel Publishing House.

8 Hrs. PRACTICAL EXAMINATION

Five experiments are to be performed.

1. Inorganic - Two experiments to be performed.
 Gravimetric estimation compulsory carrying 08 marks. (Manipulation 3 marks).
 Anyone 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.

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PHYSICS

Objectives :

Present course is aimed to provide ample knowledge of basics of Physics which are relevant to the understanding of modern trends in higher physics.

The first paper is aimed at preparing the back ground of modern physics which includes the relativistic and quantum ideas mainly concerned with atomic, molecular and nuclear physics. It constitutes an essential pre-requisite for better understanding of any branch of physics.

The second paper is mainly concerned with Solid State Physics, Solid State Devices and Electronics. This course is quite important from the applicational aspects of modern electronic devices. It also forms the basis of advance electronics including communication technology to be covered at higher level.

The experiments are based mostly on the contents of the theory papers so as to provide comprehensive insight of the subject.

Scheme of Examination :

1. There shall be two theory papers of 3 hours duration each and one practical paper of 4 hours duration. Such paper shall carry 50 marks.
2. Each theory paper will comprise of 5 units. Two questions will be in each unit and the student will have the choice to answer one out of the two.
3. Numerical problems of about 30 percent will compulsorily be asked in each theory paper.
4. In practical paper each student has to perform two experiments during examination.
5. Practical examination will be of 4 hours duration. The distribution of practical marks will be as follows.

Experiments : 15 + 15 = 30, Viva-voce : 10

Internal Assessment - 10.

PAPER - I (Paper Code-0893)

RELATIVITY, QUANTUM MECHANICS, ATOMIC MOLECULAR AND NUCLEAR PHYSICS.

UNIT-I Reference systems, inertial frames, Galilean invariance and conservation laws, propagation of light, Michelson-Morley experiment, search for ether.

Postulates for the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition theorem, variation of mass with velocity, mass-energy equivalence, particle with zero rest mass, Compton effect.

UNIT-II Origin of the quantum theory : Failure of classical physics to explain the phenomena such as black-body spectrum, photoelectric effect.

Wave-particle duality and uncertainty principle : de Broglie's hypothesis for matter waves : the concept of wave and group velocities, evidence for diffraction & interference of particles, experimental demonstration of matter waves. Davisson and Germer's experiment.

Consequence of de Broglie's concepts, quantisation in hydrogen atom, energies of a particle in a box, wave packets.

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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 ; CAM plants ; photorespiration.

UNIT-III Respiration : ATP - the biological energy currency ; aerobic and anaerobic respiration; Krebs' 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 regulations ; 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-V Genetic engineering : Tools and techniques of recombinant DNA technology ; cloning vectors ; genomic and cDNA library ; transposable elements ; techniques of gene mapping and chromosome walking.

UNIT-VI 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.

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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

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

M.M. 50

Suggested Laboratory Exercises

- To study the permeability of plasma membrane using different concentrations of organic solvents.
- 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.

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Suggested Laboratory Exercises (Ecology)

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 Raunkjær'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 examination 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 practices, 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)

(GENETICS, CELL PHYSIOLOGY, BIOCHEMISTRY, BIOTECHNOLOGY AND BIOTECHNIQUES)

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

UNIT-I (GENETICS)

1. Linkage and Linkage maps
2. Varieties of gene expression - Multiple alleles ; lithogenesis ; 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; Gluconogenesis; glycolysis. Glycogenolysis; Cose-cycle.
3. Lipid metabolism - Oxidation of glycerol; oxidation of fatty acid.
4. Protein metabolism - Deamination, 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. Colbrimeter
3. Microscopy-Light microscopes, Phase contrast and Electron microscopes.
4. Centrifugation
5. Separation of biomolecules by chromatography, and Electrophoresis
6. Histrochemical 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).
6. 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 haemoglobin.
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.

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**