



शहीद महेन्द्र कर्मा विश्वविद्यालय, बस्तर जगदलपुर (छ.ग.)

**SHAHEED MAHENDRA KARMA VISHWAVIDYALAYA, BASTAR
JAGDALPUR, CHHATTISGARH**

**SYLLABUS
B.Sc. PART-I
SESSION 2021-22**

संशोधित पाठ्यक्रम
बी.ए./बी.एस-सी./बी.कॉम./बी.एच.एस.-सी.
भाग – एक (आधार पाठ्यक्रम)
प्रश्न पत्र— प्रथम (हिन्दी भाषा)

पूर्णांक— 75

नोट :-

1. प्रश्न पत्र 75 अंक का होगा।
2. प्रश्न पत्र अनिवार्य होगा।
3. इसके अंक श्रेणी निर्धारण के लिए जोड़े जायेंगे।
4. प्रत्येक इकाई के अंक समान होंगे।

पाठ्य विषय :-

इकाई—1

- क. पल्लवन, पत्राचार, अनुवाद, पारिभाषिक शब्दावली एवं हिंदी में पदनाम
- ख. ईदगाह (कहानी) – मुंशी प्रेमचंद

इकाई—2

- क. शब्द शुद्धि, वाक्य शुद्धि, शब्द ज्ञान—पर्यायवाची शब्द, विलोम शब्द, अनेकार्थी शब्द, समश्रुत शब्द, अनेक शब्दों के लिए एक शब्द एवं मुहावरे—लोकोक्तियाँ
- ख. भारत वंदना (कविता)— सूर्यकान्त त्रिपाठी निराला

इकाई—3

- क. देवनागरी लिपि – नामकरण, स्वरूप एवं देवनागरी लिपि की विशेषताएँ, हिंदी अपठित गद्यांश, संक्षेपण, हिंदी में संक्षिप्तीकरण
- ख. भोलाराम का जीव (व्यंग्य) – हरिशंकर परसाई

इकाई—4

- क. कम्प्यूटर का परिचय एवं कम्प्यूटर में हिंदी का अनुप्रयोग
- ख. शिकागो से स्वामी विवेकानंद का पत्र

इकाई—5

- क. मानक हिन्दी भाषा का अर्थ, स्वरूप, विशेषताएँ, मानक, उपमानक, अमानक भाषा
- ख. सामाजिक गतिशीलता – प्राचीन काल, मध्यकाल, आधुनिक काल

मूल्यांकन योजना :-

प्रत्येक इकाई से एक-एक प्रश्न पूछा जाएगा। प्रत्येक प्रश्न में आंतरिक विकल्प होगा। प्रत्येक प्रश्न के 15 अंक होंगे। प्रत्येक प्रश्न के दो भाग 'क' और 'ख' होंगे एवं अंक क्रमशः 8 एवं 7 होंगे। प्रश्न-पत्र का पूर्णांक 75 निर्धारित है।

पाठ्यक्रम संशोधन का औचित्य :-

व्याकरण के बुनियादी ज्ञान, संप्रेषण, कौशल, सामाजिक संदेश एवं भाषायी दक्षता को ध्यान में रखते हुए यह पाठ्यक्रम प्रस्तावित है।

**SHAHEED MAHENDRA KARMA VISHWAVIDYALAYA, BASTAR, JAGDALPUR
SESSION 2021-22**

**B.A./B.Sc./B.Com./B.H.Sc. Part-I
FOUNDATION COURSE
PAPER-II
ENGLISH LANGUAGE**

M.M. 75

- UNIT-I** **Basic language skills: Grammar and Usage.**
Grammar and Vocabulary based on the prescribed text.
To be assessed by objective/multiple choice tests.
(Grammar - 20 marks)
Vocabulary - 15 Marks)
- UNINT-II** **Comprehension of an unseen passage.** **05 Marks**
This should imply not only (a) an understanding of the passage in question, but also (b) a grasp of general language skills and issues with reference to words and usage within the passage and (c) the Power of short independent. Composition based on themes and issues raised in the passage.
To be assessed by both objective multiple choice and short answer type tests.
- UNIT-III** **Composition: Paragraph writing** **10 Marks**
- UNIT-IV** **Letter writing** (The formal and one Informal) **10 Marks**
Two letters to be attempted of 5 marks each. One formal and one informal.
- UNIT-V** **Texts:** **15 Marks**
Short prose pieces (Fiction and not fiction) short poems, the pieces should cover a range of authrs, subjects and contexts. With poetry if may sometimes be advisable to include pieces from earlier periods, which are often simpler then modem examples. In all cases, the language should be accessible (with a minumum of explantion and reference to standard dictionaries) to the general body of students schooled in the medium of and Indian language.
Students should be able to grasp the contents of each plece; explain specific words, phrases and allusions; and comment on general points of narrative or argument. Formal Priciples of Literary criticism should not be taken up at this stage.
To be assessed by five short answers of three marks each.

BOOK PRESCRIBED-

English Language and Indian Culture - Published by M.P. Hindi Granth Academy Bhopal.

**B.Sc. Part-I
ANTHROPOLOGY
Paper-I
FOUNDATION OF ANTHROPOLOGY**

Total Marks: 50

Pass Marks: 17

- UNIT-I** Meaning and scope of Anthropology. History of Anthropology. Branches of Anthropology.
- (a) Socio-cultural Anthropology
 - (b) Physical Biological Anthropology
 - (C) Archaeological Anthropology
 - (d) Linguistic Anthropology_
- UNIT-II** Relationship of Anthropology with other disciplines: Life Sciences, Medical Sciences, Social Sciences: History, Economics, Sociology, Psychology, Political Science
- UNIT-III** Foundation in Biological Anthropology
- (a) Human Evolution with respect to Hominid fossils
 - (b) Human Variation: Types and causes
 - (C) Human Genetics: Concept, scope and branches
 - (d) Human growth and development: Definition, scope, methods and factors effecting human growth and development
- UNIT -IV** Fundamentals in Social-Cultural Anthropology.
- (a) Culture, Society, Community, Group, Institution
 - (b) Human Institution:
 - Family: Definiton, types and function of family
 - Marriage: Definition, forms of marriage and its functions
 - Kinship: Definition, types and functions
 - Religion: Theories on the origin of religion
 - (c) Basic techniques of data collection:
 - Observation, Schedule, Questionnaire, Geneology_
- UNIT-V** Fundamentals in Archaeological Anthropology,
- (a) Tool typology & Technology: Paleolithic, Mesolithic & Neolithic
 - (b) Cultural evolution: Broad outlines of cultures (Stone age to metal age)
 - (c) Dating techniques in archaeology

**B.Sc. Part-I
ANTHROPOLOGY
Paper-II
PHYSICAL/ BIOLOGICAL ANTHROPOLOGY**

Total Marks: 50

Pass Marks: 17

- UNIT -I** Meaning, scope, History of Physical Anthropology & its applied aspects
Theories of organic evolution: Lamarckism, Neo-lamarckism, Darwinism, Neo-darwinism & Synthetic theory of evolution
- UNIT-II** Position of Man in animal kingdom, Classification of living primates, Comparative anatomy of Man and Apes (with special reference to skull, pelvis, dentition and long bones)
- UNIT-III** Fossil evidence of human evolution; Ramapithecus, Australopithecus, Pithecanthropus, Sinanthropus, Neanderthal, Cromagnon, Grimaldi man, Chancelade man.
- UNIT-IV** Concept of Race: Race formation and Criteria of racial classification, UNESCO Statement, Racial element in India, Major races of the world.
- UNIT-V** Human Genetics:
a. Structure of Chromosome, DNA & RNA
b. Mendelian principle.
c. Types of Inheritance in Human

**B.Sc. Part-I
ANTHROPOLOGY
Anthropology Practical
OSTEOLOGY AND CRANIOMETRY**

Total Marks: 50

Pass Marks: 17

- i. Identification of bones of human Skeleton. Sketching and labeling of various norms of skull, Overview of Pectoral & Pelvic girdles, Femur & Humerus bone
- ii. Craniometry:
 1. Maximum Cranial length.
 2. Maximum Cranial Breadth.
 3. Maximum frontal Breadth.
 4. Bizygomatic Breadth.
 5. Nasal Height.
 6. Nasal Breadth
 7. Minimum frontal breadth
 8. Bimaxillary Breadth.
 9. Maximum Biorbital Breadth
 10. Length of magnum foramen.
- iii. Craniometric indices:
 1. Cranial Index
 2. Nasal Index

NEW CURRICULUM OF B.Sc. PART-I

CHEMISTRY

The new curriculum will comprise of Three theory papers of 33, 33 and 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 and the practical work of 180 hrs duration.

**PAPER-I
INORGANIC CHEMISTRY**

M.M.33

UNIT-I A. ATOMIC STRUCTURE

Bohr's theory, its limitation and atomic spectrum of hydrogen atom. General idea of de-Broglie matter-waves, Heisenberg uncertainty principle, Schrödinger wave equation, significance of Ψ and Ψ^2 , radial & angular wave functions and probability distribution curves, quantum numbers, Atomic orbital and shapes of s, p, d orbitals, Aufbau and Pauli exclusion principles, Hund's Multiplicity rule, electronic configuration of the elements.

B. PERIODIC PROPERTIES

Detailed discussion of the following periodic properties of the elements, with reference to s and p-block. Trends in periodic table and applications in predicting and explaining the chemical behavior.

- a) Atomic and ionic radii,
- b) Ionization enthalpy,
- c) Electron gain enthalpy,
- d) Electronegativity, Pauling's, Mulliken's, Allred Rochow's scales.
- e) Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table.

UNIT-II CHEMICAL BONDING I

Ionic bond: Ionic Solids - Ionic structures, radius ratio & co-ordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy Born-Haber cycle, Solvation energy and solubility of ionic solids, polarising power &

polarisability of ions, Fajans rule, Ionic character in covalent compounds: Bond moment and dipole moment, Percentage ionic character from dipole moment and electronegativity difference, Metallic bond-free electron, Valence bond & band theories.

UNIT-III CHEMICAL BONDING II

Covalent bond: Lewis structure, Valence bond theory and its limitations, Concept of hybridization, Energetics of hybridization, equivalent and non-equivalent hybrid orbitals. Valence shell electron pair repulsion theory (VSEPR), shapes of the following simple molecules and ions containing lone pairs and bond pairs of electrons: H_2O , NH_3 , PCl_3 , PCl_5 , SF_6 , H_3O^+ , SF_4 , ClF_3 , and ICl_2^- . Molecular orbital theory. Bond order and bond strength, Molecular orbital diagrams of diatomic and simple polyatomic molecules N_2 , O_2 , F_2 , CO , NO .

UNIT-IV A. s-BLOCK ELEMENTS

General concepts on group relationships and gradation properties, Comparative study, salient features of hydrides, solvation & complexation tendencies including their function in biosystems and introduction to alkyl & aryls, Derivatives of alkali and alkaline earth metals

B. p-BLOCK ELEMENTS

General concepts on group relationships and gradation properties. Halides, hydrides, oxides and oxyacids of Boron, Aluminum, Nitrogen and Phosphorus. Boranes, borazines, fullerenes, graphene and silicates, interhalogens and pseudohalogens.

UNIT-V A CHEMISTRY OF NOBLE GASES

Chemical properties of the noble gases, chemistry of xenon, structure, bonding in xenon compounds

B. THEORETICAL PRINCIPLES IN QUALITATIVE ANALYSIS (H₂S SCHEME)

Basic principles involved in the analysis of cations and anions and solubility products, common ion effect. Principles involved in separation of cations into groups and choice of group reagents. Interfering anions (fluoride, borate, oxalate and phosphate) and need to remove them after Group II.

REFERENCE BOOKS:

1. Lee, J. D. Concise Inorganic Chemistry ELBS, 1991.
2. Douglas, B.E. and McDaniel, D.H. Concepts & Models of Inorganic Chemistry Oxford, 1970
3. Atkins, P.W. & Paula, J. Physical Chemistry, 10th Ed., Oxford University Press, 2014.
4. Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications, 1962.
5. Rodger, G.E. Inorganic and Solid State Chemistry, Cengage Learning India Edition, 2002.
6. Puri, B. R., Sharma, L. R. and Kalia, K. C., Principles of Inorganic Chemistry, Milestone Publishers/ Vishal Publishing Co.; 33rd Edition 2016
7. Madan, R. D. Modern Inorganic Chemistry, S Chand Publishing, 1987.

**B.Sc. Part-I
CHEMISTRY
PAPER-II
ORGANIC CHEMISTRY**

UNIT-I BASICS OF ORGANIC CHEMISTRY

Hybridization, Shapes of molecules, Influence of hybridization on bond properties. Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment. Electrophiles and Nucleophiles; Nucleophilicity and basicity; Homolytic and Heterolytic cleavage, Generation, shape and relative stability of Carbocations, Carbanions, Free radicals, Carbenes and Nitrenes. Introduction to types of organic reactions: Addition, Elimination and Substitution reactions.

UNIT-II INTRODUCTION TO STEREOCHEMISTRY

Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two or more chiral-centres, Diastereoisomers, meso compounds, Relative and absolute configuration: Fischer, Newmann and Sawhorse Projection formulae and their interconversions; Erythrose and threose, D/L, d/l system of nomenclature, Cahn-Ingold-Prelog system of nomenclature (C.I.P rules), R/S nomenclature. Geometrical isomerism: cis–trans, syn-anti and E/Z notations.

UNIT-III CONFORMATIONAL ANALYSIS OF ALKANES

Conformational analysis of alkanes, ethane, butane, cyclohexane and sugars. Relative stability and Energy diagrams. Types of cycloalkanes and their relative stability, Baeyer strain theory: Theory of strainless rings, Chair, Boat and Twist boat conformation of cyclohexane with energy diagrams; Relative stability of mono-substituted cycloalkanes and disubstituted cyclohexane.

UNIT-IV CHEMISTRY OF ALIPHATIC HYDROCARBONS

A. Carbon-Carbon sigma (σ) bonds

Chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Wurtz-Fittig Reaction, Free radical substitutions: Halogenation-relative reactivity and selectivity.

B. Carbon-Carbon Pi (π) bonds:

Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations.

Reactions of alkenes: Electrophilic additions and mechanisms (Markownikoff/Anti -Markownikoff addition), mechanism of oxymercuration-demercuration, hydroboration-oxidation, ozonolysis, reduction (catalytic and chemical), syn and anti-hydroxylation (oxidation). 1,2-and 1,4-addition reactions in conjugated dienes and, Diels-Alder reaction; Allylic and benzylic bromination and mechanism, e.g. propene, 1-butene, toluene, ethyl benzene.

Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.

UNIT-V AROMATIC HYDROCARBONS

Aromaticity: Hückel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directive effects of the groups.

REFERENCE BOOKS:

1. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd.(Pearson Education).
2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds, Wiley: London, 1994.
5. Kalsi, P. S. Stereochemistry Conformation and Mechanism, New Age International, 2005.
6. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.
7. Organic Chemistry, Paula Y. Bruice, 2nd Edition, Prentice-Hall, International Edition (1998).
8. A Guide Book of Reaction Mechanism by Peter Sykes.

**B.Sc. Part-I
CHEMISTRY
PAPER - III
PHYSICAL CHEMISTRY**

M.M.34

UNIT-I MATHEMATICAL CONCEPTS FOR CHEMIST

Basic Mathematical Concepts: Logarithmic relations, curve sketching, linear graphs, Properties of straight line, slope and intercept, Functions, Differentiation of functions, maxima and minima; integrals; ordinary differential equations; vectors and matrices; determinants; Permutation and combination and probability theory, Significant figures and their applications.

UNIT-II GASEOUS STATE CHEMISTRY

Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path; Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Joule Thompson effect, Liquification of Gases.

Behaviour of real gases: Deviations from ideal gas behaviour, compressibility factor (Z), and its variation with pressure and temperature for different gases. Causes of deviation from ideal behaviour. van der Waals equation of state, its derivation and application in explaining real gas behaviour, calculation of Boyle temperature. Isotherms of real gases and their comparison with van der Waals isotherms, continuity of states, critical state, relation between critical constants and van der Waals constants, law of corresponding states.

UNIT-III A. LIQUID STATE CHEMISTRY

Intermolecular forces, magnitude of intermolecular force, structure of liquids, Properties of liquids, viscosity and surface tension.

B. COLLOIDS and SURFACE CHEMISTRY

Classification, Optical, Kinetic and Electrical Properties of colloids, Coagulation, Hardy Schulze law, flocculation value, Protection, Gold number, Emulsion, micelles and types, Gel, Syneresis and thixotrophy, Application of colloids.

Physical adsorption, chemisorption, adsorption isotherms (Langmuir and Freundlich). Nature of adsorbed state. Qualitative discussion of BET.

UNIT-IV SOLID STATE CHEMISTRY

Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method. Crystal defects.

UNIT-V A. CHEMICAL KINETICS

Rate of reaction, Factors influencing rate of reaction, rate law, rate constant, Order and molecularity of reactions, rate determining step, Zero, First and Second order reactions, Rate and Rate Law, methods of determining order of reaction, Chain reactions.

Temperature dependence of reaction rate, Arrhenius theory, Physical significance of Activation energy, collision theory, demerits of collision theory, non mathematical concept of transition state theory.

B. CATALYSIS

Homogeneous and Heterogeneous Catalysis, types of catalyst, characteristic of catalyst, Enzyme catalysed reactions, Micellar catalysed reactions, Industrial applications of Catalysis.

REFERENCE BOOKS:

1. Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry 10th Ed., Oxford University Press (2014).
2. Ball, D. W. Physical Chemistry Thomson Press, India (2007).
3. Castellan, G. W. Physical Chemistry 4th Ed. Narosa (2004).
4. Mortimer, R. G. Physical Chemistry 3rd Ed. Elsevier: NOIDA, UP (2009).
5. Engel, T. & Reid, P. Physical Chemistry 3rd Ed. Pearson (2013).
6. Puri, B.R., Sharma, L. R. and Pathania, M.S., Principles of Physical Chemistry, Vishal Publishing Co., 47th Ed. (2016).
7. Bahl, A., Bahl, B.S. and Tuli, G.D. Essentials of Physical Chemistry, S Chand Publishers (2010).
8. Rakshit P.C., Physical Chemistry, Sarat Book House Ed. (2014).
9. Singh B., Mathematics for Chemist, Pragati Publications.

**B.Sc. Part-I
CHEMISTRY
PAPER - IV
LABORATORY COURSE**

A. INORGANIC CHEMISTRY

Semi-micro qualitative analysis (using H₂S or other methods) of mixtures - not more than four ionic species (two anions and two cations, excluding interfering, insoluble salts) out of the following:

Cations : NH₄⁺, Pb²⁺, Bi³⁺, Cu²⁺, Cd²⁺, Fe³⁺, Al³⁺, Co²⁺, Ni²⁺, Mn²⁺, Zn²⁺, Ba²⁺, Sr²⁺, Ca²⁺, Na⁺ Anions : CO₃²⁻, S²⁻, SO₃²⁻, S₂O₃²⁻, NO₂⁻, CH₃COO⁻, Cl⁻, Br⁻, I⁻, NO₃⁻, SO₄²⁻

(Spot tests may be carried out wherever feasible)

B. Acid-Base Titrations

- Standardization of sodium hydroxide by oxalic acid solution.
- Determination of strength of HCl solution using sodium hydroxide as intermediate.
- Estimation of carbonate and hydroxide present together in mixture.
- Estimation of carbonate and bicarbonate present together in a mixture.
- Estimation of free alkali present in different soaps/detergents

C. Redox Titrations

- Standardization of KMnO₄ by oxalic acid solution.
- Estimation of Fe(II) using standardized KMnO₄ solution.
- Estimation of oxalic acid and sodium oxalate in a given mixture.
- Estimation of Fe(II) with K₂Cr₂O₇ using internal (diphenylamine, anthranilic acid) and external indicator.

D. Iodo / Iodimetric Titrations

- Estimation of Cu(II) and K₂Cr₂O₇ using sodium thiosulphate solution iodimetrically.
- Estimation of (a) arsenite and (b) antimony iodimetrically.
- Estimation of available chlorine in bleaching powder iodometrically.
- Estimation of Copper and Iron in mixture by standard solution of K₂Cr₂O₇ using sodium thiosulphate solution as titrants.

ORGANIC CHEMISTRY

1. Demonstration of laboratory Glasswares and Equipments.
2. Calibration of the thermometer. 80°–82° (Naphthalene), 113.5°–114° (Acetanilide), 132.5°–133° (Urea), 100° (Distilled Water).
3. Purification of organic compounds by crystallization using different solvents.
 - Phthalic acid from hot water (using fluted filter paper and stemless funnel).
 - Acetanilide from boiling water.
 - Naphthalene from ethanol.
 - Benzoic acid from water.
4. Determination of the melting points of organic compounds.

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Naphthalene 80°–82°, Benzoic acid 121.5°–122°, Urea 132.5°–133° Succinic acid 184.5°
185°, Cinnamic acid 132.5°–133°, Salicylic acid 157.5°–158°, Acetanilide 113.5°–114°, m
Dinitrobenzene 90°, p-Dichlorobenzene 52°, Aspirin 135°.

5. Effect of impurities on the melting point – mixed melting point of two unknown organic compounds.
 - Urea – Cinnamic acid mixture of various compositions (1:4, 1:1, 4:1).
6. Determination of boiling point of liquid compounds. (boiling point lower than and more than 100 °C by distillation and capillary method).
 - Ethanol 78°, Cyclohexane 81.4°, Toluene 110.6°, Benzene 80°.
 - i. Distillation (Demonstration)
 - Simple distillation of ethanol-water mixture using water condenser.
 - Distillation of nitrobenzene and aniline using air condenser.
 - ii. Sublimation
 - Camphor, Naphthalene, Phthalic acid and Succinic acid.
 - iii. Decolorisation and crystallization using charcoal.
 - Decolorisation of brown sugar with animal charcoal using gravity filtrations crystallization and decolorisation of impure naphthalene (100 g of naphthalene mixed with 0.3 g of Congo red using 1 g of decolorizing carbon) from ethanol.
7. Qualitative Analysis
Detection of elements (N, S and halogens) and functional groups (Phenolic, Carboxylic, Carbonyl, Esters, Carbohydrates, Amines, Amides, Nitro and Anilide) in simple organic compounds.

PHYSICAL CHEMISTRY

1. Surface tension measurements.
 - Determine the surface tension by (i) drop number (ii) drop weight method.
 - Surface tension composition curve for a binary liquid mixture.
2. Viscosity measurement using Ostwald's viscometer.
 - Determination of viscosity of aqueous solutions of (i) sugar (ii) ethanol at room temperature.
 - Study of the variation of viscosity of sucrose solution with the concentration of solute.
 - Viscosity Composition curve for a binary liquid mixture.
3. Chemical Kinetics

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- To determine the specific rate of hydrolysis of methyl/ethyl acetate catalysed by hydrogen ions at room temperature.
- To study the effect of acid strength on the hydrolysis of an ester.
- To compare the strengths of HCl & H₂SO₄ by studying the kinetics of hydrolysis of ethyl acetate.

4. Colloids

- To prepare colloidal solution of silver nanoparticles (reduction method) and other metal nanoparticles using capping agents.

Note: Experiments may be added/ deleted subject to availability of time and facilities

**B.Sc. Part-I
CHEMISTRY
PRACTICAL EXAMINATION**

Three experiments are to be performed

1. Inorganic Mixture Analysis, four radicals two basic & two acid (excluding insoluble, Interfering & combination of acid radicals)

OR

Two Titrations (Acid-Bases, Redox and Iodo/Iodimetry)

12 marks

2. Detection of functional group in the given organic compound and determine its MPt/BPt.

8 marks

OR

Crystallization of any one compound as given in the prospectus along with the determination of mixed MPt.

OR

Decolorisation of brown sugar along with sublimation of camphor/ Naphthlene.

3. Any one physical experiment that can be completed in two hours including calculations.

14 marks

4. Viva

10 marks

5. Sessionals

06 marks

In case of Ex-Students two marks will be added to each of the experiments

REFERENCE TEXT:

1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009.
2. Ahluwalia, V. K., Dhingra, S. and Gulati, A. College practical Chemistry, University Press.
3. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
4. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012)
5. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).
6. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. Experiments in Physical Chemistry 8th Ed.; McGraw-Hill: New York (2003).
7. Halpern, A. M. & McBane, G. C. Experimental Physical Chemistry 3rd Ed.; W.H. Freeman & Co.: New York (2003).

**B.Sc. Part-I
GEOLOGY
PAPER-I**

GEODYNAMICS & GEOMORPHOLOGY

- UNIT-1**
- (i) Geology & its perspectives. Earth in the solar system; size, shape, mass, & density.
 - (ii) Origin of Earth.
 - (iii) Internal structure of Earth, Crust, Mantle and Core.
 - (iv) Age of Earth: with special emphasis on Radioactive dating.
 - (v) Formation & composition of Hydrosphere, & Biosphere & Atmosphere.
- UNIT-2**
- (i) Elementary idea about Plate-Tectonics.
 - (ii) Concept & theories of continental-drift
 - (iii) Concept & theories of Isostasy.
 - (iv) Evidences of Sea-floor spreading.
 - (v) Origin of oceans, continents & mountains.
- UNIT-3**
- (i) Earthquakes, Earthquake Belts, measurement of Earthquakes.
 - (ii) Volcanoes: Types & distribution.
 - (iii) Mid –oceanic- ridges, trenches & island arc; origin, distribution & importance.
 - (iv) Tectonic of continental margins; Active margins & marginal basins.
 - (v) Neo-tectonics; active faults, drainage changes.
- UNIT-4**
- (i) Fundamental concepts of Geomorphology.
 - (ii) Geomorphic agents & processes of rock-weathering.
 - (iii) Geological work of rivers; fluvial land forms.
 - (iv) Geological work of wind; Aeolian land forms.
 - (v) Geological work of Glaciers; glacial land forms.
- UNIT-5**
- (i) Geological work of oceans; coastal land forms.
 - (ii) Geological work of Ground water. Karst topography.
 - (iii) Volcanic land forms.
 - (iv) Earth's heat budget & global climatic changes.
 - (v) Physiographic divisions of India.

PRACTICALS

- (1) Study of models showing various Geomorphic features.
- (2) Numbering, Indexing of topographic maps on various scales.
- (3) Interpretation of various Geomorphic landforms & drainage pattern on topographic maps.
- (4) Plotting of major mountain Ranges, Lakes & rivers on outline map of India.
- (5) Plotting of seismic observatories on outline map of India.

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(6) Plotting of epicenters & magnitude of major earthquakes of Indian subcontinents.

(7) Morphometric analysis.

Suggested Readings:-

| | | |
|-------------------------------------|---|-------------------------------|
| भौतिक-भूविज्ञान | — | डॉ.मुकुल घोष— |
| भौतिक-भूविज्ञान | — | जे.पी. तिवारी एव बी.के. सिंह— |
| भूआकृति-विज्ञान | — | डॉ.सविन्द्र सिंह |
| भूविज्ञान एक परिचय | — | डॉ.विद्यासागर दुबे |
| Physical Geology | - | Miller |
| Principles of physical geology | - | A. Holmes |
| An introduction to physical geology | - | A.K. Dutta |
| Principles of Geomorphology | - | W.D. Thornbury |
| Principles of Geomorphology | - | A.F. Ahmed |

**B.Sc. Part-I
GEOLOGY
PAPER-II**

MINERALOGY CRYSTALLOGRAPHY

- UNIT-1**
- (i) Definition of Mineral and Crystal.
 - (ii) Crystal structures, Unit cells
 - (iii) Elements of crystal. Crystal forms.
 - (iv) Crystallographic axes and axial angles.
 - (v) Parameters and indices of crystal notation
- UNIT-2**
- (i) Laws of Crystallography
 - (ii) Crystal symmetry
 - (iii) Classification and symmetry of normal classes of seven crystal systems
 - (iv) Forms of normal classes.
 - (v) Twinning in crystals
- UNIT-3**
- (i) Nature of light: reflection and refraction of light.
 - (ii) Refractive index. Critical angles. Total internal reflection and Becke effect.
 - (iii) Double refraction. Nicol prism its construction and working.
 - (iv) Polarizing Microscope- its parts & functions.
 - (v) Optical properties of minerals.
- UNIT-4**
- (i) Silicate structures.
 - (ii) Bonding in Minerals.
 - (iii) Isomorphism. Polymorphism and Pseudomorphism.
 - (iv) Solid solution
 - (v) Physical properties of minerals
- UNIT-5**
- Study of Composition, physical and optical properties of the following Mineral groups:
- (i) Olivine, Garnet and Mica groups.
 - (ii) Pyroxenes
 - (iii) Amphiboles
 - (iv) Feldspars
 - (v) Silica

PRACTICALS-

- (1) Study of symmetry elements in crystal models.
- (2) Study of Fundamental forms of normal classes of all seven crystal system.
- (3) Verification of Euler's theorem.

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- (4) Study of Physical properties of rock forming minerals.
- (5) Study of the optical properties of important rock forming minerals using polarizing Microscopes.
- (6) Geological excursion for seven days.

Suggested Readings:

| | | |
|-----------------------------------|---|----------------------|
| Rutley's elements of Mineralogy | : | Read, H.D. |
| Dana's text book of Mineralogy | : | Ford W.E. |
| खनिज तथा क्रिस्टल विज्ञान | — | डॉ.बी.सी. जैश |
| खनिज विज्ञान के सिद्धांत | — | डॉ. ए.सी. अग्रवाल |
| प्रायोगिक भू-विज्ञान (भाग-1) | — | डॉ. र. प्र. मांजरेकर |
| प्रकाशीय खनिज विज्ञान के मूल तत्व | — | विंचेल |

**B.Sc.Part-I
BIOTECHNOLOGY
PAPER-I
BIOCHEMISTRY, BIOSTATISTICS AND COMPUTERS**

UNIT-I

1. Introduction to Biochemistry: History, Scope and Development.
2. Carbohydrates: Classification, Structure and Function of Mono, Oligo and Polysaccharides.
3. Lipids: Structure, Classification and Function.

UNIT-II

1. Amino acids and Proteins: Classification, Structure and Properties of amino acids, Types of Proteins and their Classification and Function.
2. Enzymes: Nomenclature and Classification of enzyme, Mechanism of enzyme action, Enzyme Kinetics and Factors affecting the enzymes action. Immobilization of enzyme and their application.

UNIT-III

1. Hormones: Plant Hormone-Auxin and Gibberellins and Animal Hormone-Pancreas and Thyroid.
2. Carbohydrates, Proteins and Lipid Metabolism - Glycolysis, Glycogenesis, Glyconeogenesis, Glycogenolysis and Krebs cycle. Electron Transport Chain and β -oxidation of Fatty acids.

UNIT-IV

1. Scope of Biostatistics, Samples and Population concept, Collection of data-sampling techniques, Processing and Presentation of data.
2. Measures of Central Tendency: Mean, Median and Mode and Standard Deviation.
3. Probability Calculation: Definition of probability, Theorem on total and compound probability.

UNIT-V

1. Computers - General introduction, Organization of computer, Digital and Analogue Computers and Computer Algorithm.
2. Concept of Hardware and Software, Input and Output Devices.
3. Application of computer in co-ordination of solute concentration, pH and Temperature etc., of a Fermenter in operation and Internet application.

List of Books

1. Nelson and Cox (2005) Principles of Biochemistry, Fourth Edition
2. Todd and Howards Mason (2004) Text book of Biochemistry, Fourth Edition

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3. Lubert Stryer and Berg ((2004) Biochemistry, Fifth Edition
4. Diana Rain, Marni Ayers Barby - (2006) Textbook on Q level Programming. 4th Edition.
5. Karl Schwartz: (2006) Guide of Micro Soft. Marina Raod, 4th Edition.
6. E Balaguruswamy by Programming in BASIC (1991).
7. RC Campbell by Statistics for Biologists. .
8. P Cassel et al by Inside Microsoft Office,
9. Statistical Methods, GW Snedecor and WG Cochran.
10. AC Wardlaw by Practical Statistics for Experimental Biologists,
11. JHZar by Bio-statistical analysis
12. RR Sokal FJ Rohlf by Introduction to Biostatistics
13. L Y Kun (2003) Microbial Biotechnology: Principles and applications
14. Khan and Khanum (1994) Fundamental of Biostastics

**B.Sc.Part-I
BIOTECHNOLOGY
PAPER-II
CELL BIOLOGY, GENETICS AND MICROBIOLOGY**

UNIT-I

1. Concept of life, Cell as a basic unit of living system and Cell theory.
2. Diversity of Cell shape and size.
3. Prokaryotic cell structure: Function and ultra structure of cell (Gram positive and Gram negative Bacteria), Plasma membrane, Flagella, Pilli, Endospore and Capsule.
4. Eukaryotic cell: Plant cell wall and Plasma membrane.

UNIT-II

1. Cytoplasm: Structure and Functions of Endoplasmic reticulum, Ribosome, Golgi complex, Lysosomes, Nucleus, Mitochondria and Chloroplast.
2. Cytoskeleton: Microtubules, Microfilaments and Intermediate filaments.
3. Cell division: Mitosis and Meiosis.
4. Programmed Cell Death.

UNIT-III

1. Mendel's Laws of Inheritance.
2. Linkage and Crossing over.
3. Chromosome variation in number and structure: Deletion, Duplication, Translocation, Inversion and Aneuploidy, Euploidy (Monoploidy and Polyploidy and its importance).

UNIT-IV

1. History, Scope and Development of Microbiology.
2. Basic techniques of Microbial Culture
3. Microbial Growth & Nutrition of Bacteria: Isolation, media sterilization- physical and chemical agents, pure culture-pour plate method, streak plate method and spread plate method.
4. General features and Economic importance of Fungi, Algae and Protozoa etc.

UNIT-V

1. Bacterial Reproduction: Conjugation, Transduction and Transformation.
2. Mycoplasma – History, Classification, Structure reproduction & Diseases.
3. Viruses – Basic features, Structure, Classification, Multiplication, Bacteriophages (Morphology, life cycle, infection and medicinal importance)

List of Books

1. C.B. Power- Cell biology, First Edition (2005), Himalaya Publishing House.
2. Gereld Karp - Dell and molecular biology, 4th Edition (2005)
3. P.K. Gupta - Cell and molecular biology, Second Edition (2003), Restogi publications.
4. C.B., Oowar - Cell biology, Third Edition (2005) Himalaya Publishing Hosue.
5. S.S. Purohit - Microbiology : Fundamentals and Applications, 6th Edition (2004)
6. R.C. Dubey and D.K. Maheshwari: Practical Microbiology. S.Chand Publication.
7. R.C. Dubey and D.K. Maheshwari, Microbiology (2006). S.Chand Publication.
8. Tortora, Funke and Case - Microbiology, An introduction, sixth Edition (1995), Benjamin/Cummings Publishing Company.

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9. Prescott, Harley and Klein - Microbiology, Third Edition, Wm. C. Brown Publishers (1996).
10. P. Chakraoborthy - Textbook of microbiology, Second Edition (2007).
11. Prescott, Harley and Klein - Microbiology. Third Edition. Wm. C. Brown.
12. Microbial Genetics, David Freifelder, John F Cronan, Stanley R Maloy, Jones and Bartlett Publishers.
13. Elements of Human Genetics. I.I. cavalla-Sfoeza, WA Benjamin Advanced Book Program.
14. S.K Jadhav and P.K. Mahish (2018) Prayogtmak Jaivprodyogiki awam Sukshmjivigyan-Chhattisgarh Hindi Granth Academy, Raipur.

**B.Sc. Part-I
BIOTECHNOLOGY
List of Practical's
MICROBIOLOGY AND BIOCHEMICAL TECHNIQUES**

- (1) Laboratory rules, Tools, Equipment and Other requirements in Microbiological laboratory.**
- (2) Micrometry – Use of ocular & stage Micrometrer.**
- (3) Counting of bacteria by counting chamber, by plate count.**
- (4) Preparation of media and cultivation techniques:**
 - (a) Basic liquid media (broth)
 - (b) Basic Solid media, (agar slants and deep tubes)
 - (c) Demonstration of selective and differential media
 - (d) Isolation and enumeration of micro organisms
 - (e) Isolation from air and Soil
- (5) Smears and staining methods:**
 - (a) Preparation of bacterial smear
 - (b) Gram Negative & Positive staining
- (6) Methods of obtaining pure cultures**
 - (a) Streak plate method
 - (b) Pure plate method
 - (c) Spread plate method
 - (d) Broth cultures
- (7) Growth & Biochemical techniques**
 - (a) Determination of bacterial growth curve
 - (b) Amylase production test
 - (c) Cellulose production test
 - (d) Estimation of Sugar in given solution
 - (e) Extraction and separation of lipids
 - (f) Estimation of proteins
 - (g) Mitosis and Meiosis
- (8) Biostatistics:**
 - (a) By Manual and by computer.
 - (b) Problems on mean, mode and median.

SCHEME OF PRACTICAL EXAMINATION

Time – 4 hrs.

| | |
|---|------------------------------|
| 1. Experiment based on culture of micro-organisms | M. M.: 50 15 Marks |
| 2. Bacterial growth/Staining techniques | 10 Marks |
| 3. Biochemical techniques | 05 Marks |
| 4. Bio statistics | 05 Marks |
| 5. Spotting | 05 Marks |
| 6. Viva – Voce | 05 Marks |
| 7. Record/Sessional | 05 Marks |

**B.Sc. Part-I
BOTANY
PAPER-I**

BACTERIA, VIRUSES, FUNGI, LICHENS AND ALGAE

- UNIT-I** **VIRUSES:** General characteristics, types of viruses based on structure and genetic material. Multiplication of viruses (General account), Lytic and Lysogenic cycle. Economic importance. Structure and multiplication of Bacteriophages. General account of Viroids, Virusoids, Prions, and Cyanophages. Mycorrhiza-Types and Significance.
- UNIT-II** **BACTERIA:** General characteristics and classification (on the basis of morphology), fine structure of bacterial cell, Gram positive and Gram negative bacteria, mode of nutrition and reproduction vegetative, asexual and recombination (Conjugation, transformation and transduction), Economic importance. Microbial Biotechnology, *Rhizobium*, *Azotobactor*, *Anabena*.
- UNIT-III** **FUNGI:** General account of habit and habitat, structure (range of thallus organization), cell wall composition, nutrition and reproduction in fungi. Heterothallism and Parasexuality. Outlines of classification of fungi. Economic importance of fungi. Life cycles of *Saprolegnia*, *Albugo*, *Aspergillus*, *Peziza*, *Agaricus*, *Ustilago*, *Puccinia*, *Alternaria* and *Cercospora*. VAM Fungi
- UNIT-IV** **ALGAE:** Algae: General characters, range of thallus organization, Gaidukov phenomenon, reproduction, life cycle patterns and economic importance. Classification, Systematic position, occurrence, structure and life cycle of following genera: *Nostoc*, *Gloeocapsa*, *Volvox*, *Oedogonium*, *Vaucheria*, *Chara*, *Ectocarpus*, *Polysiphonia*.
- UNIT-V** Lichens- General account, types, structure, nutrition, reproduction and economic importance. Mycoplasma: Structure and importance. Blue Green Algae (BGA) in nitrogen economy of soil and reclamation of Ushar land. Mushroom Biotechnology.

Books Recommended:

- Dubey R.C. and Maheshwari D.K. *A text book of Microbiology*, S. Chand Publishing, New Delhi
- Presscott, L. Harley, J. and Klein, D. *Microbiology*, 7th edition, Tata Mc Graw-Hill Co. New Delhi.
- Sharma P.D., *Microbiology and Plant pathology*, Rastogi Publication. New Delhi.
- Alexopolous, C.J. Mims, C.W. and Blackwell, MM. *Introduction to Mycology*, John Wiley & Sons.
- Dubey H.C. *An Introduction to Fungi*, Vikas Publishing, New Delhi
- Mehrotra R.S. & Agrawal A., *Plant Pathology*, Tata McGraw, New Delhi
- Sharma P.D. *Plant Pathology*, Rastogi Publishers, Meruth.
- Sristava, H.N. *Fungi*, Pradeep Publications, Jalandhar
- Webster, J. & Weber, R. *Introduction to Fungi*, Cambridge University Press, Cambridge

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Kumar H.D. *Introduction to phycology*, Aff. East-west Press, New Delhi

Lee RE, *Phycology*, Cambridge University Press U.K.

Srivastava, H.N., *Algae*, Pradeep Publications, Jalandhar

Pandey S.K. Quick *Concept of Botany*, Lambert Academic publishing, Germany

Pandey S.N., Mishra S.P. & Trivedi P.S. *A Text Book of Botany* (Vol.-I), Vikas Publishing, New Delhi

Singh, Pandey and Jain, *A Text book of Botany*, Rastogi Publication, Meerut.

**B.Sc.Part-I
BOTANY
PAPER-II**

BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY

- UNIT –I** **BRYOPHYTA:** General characteristics, affinities, range of thallus organization, general classification and economic & ecological importance, Systematic position, occurrence, morphology anatomy and reproductive structure in *Riccia*, *Marchantia*, *Pellia*, *Anthoceros*, *Funaria*. Vegetative reproduction in Bryophytes, Evolution of sporophytes.
- UNIT-II** **PTERIDOPHYTES:** General characteristics, affinities, economic importance and classification, Heterospory and seed habit, stellar system in Pteridophytes, Aposory and apogamy, Telome theory, *Azolla* as Biofertilizer.
- UNIT-III** Systematic position, occurrence. Morphology, anatomy and reproductive structure of *Psilotum*, *Lycopodium*, *selaginella*, *Equisetum*, *Marsilea*.
- UNIT-IV** Gymnosperm: General characteristics, affinities, economic importance and classification, Morphology, anatomy and reproduction in *Cycas*, *Pinus* and *Ephedra*.
- UNIT-V** PALAEOBOTANY: Geological time scale, types of fossils and fossilization, Rhynia, study of some fossil gymnosperms. *Lygenopteris*

Books Recommended:

Parihar, N.S. *The Biology and Morphology of Pteridophytes*, Central Book Depot, Allahabad.

Parihar,N.S. *An introduction to Bryophyta Vol.I:Bryophytes* Central Book Depot, Allahabad.

Sambamurty,AVSS, *A textbook of Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany*, IK International Publishers.

Pandey SN, Mishra SP and Trivedi PS *A text Book of Botany (Vol.II)*, Vikas Publishing, New Delhi

Bhatanagar, SP and Moitra, A. *Gymnosperm*, New Age International (P) Ltd., Publishers, New Delhi

Biswas C. and Johri BM, *The Gymnosperms*, Springer-Verlag, Germany.

Srivastava, HN, *Palaeobotany*, Pradeep Publications Jalandhar

Srivastava, HN, *Bryophyta*, Pradeep Publications Jalandhar

Singh, Pandey and Jain, *A Text Book of Botany*, Rastogi Publication, Meerut

Sristava, HN, *Fundamentals of Pteridophytes*, Pradeep Publications, Jalandhar

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**B.Sc. Part-I
BOTANY
PRACTICAL**

Study of external (Morphological) and internal (microscopic/anatomical) features of representative genera given in the theory.

1. Algae: Gloeocapsa, Scytonema, Gloeotrichia, Volvox, Oedogonium, Vaucheria, Chara, Ectocarpus, Sargassum, Batrachospermum
2. Gram staining
3. Fungi: Albugo, Aspergillus, Peziza, Agaricus, Puccinia, Alternaria and Cercospora
4. Bryophyta: Riccia, Marchantia, Pellia, Anthoceros, Sphagnum, Funaria
5. Pteridophyta: Lycopodium, Selaginella, Equisetum, Marsilea.
6. Gymnosperm: Cycas, Pinus, Ephedra.

PRACTICAL SCHEME

TIME: 4 Hrs.

M.M.: 50

- | | |
|------------------------------|----|
| 1. Algae/Fungi/Gram Staining | 10 |
| 2. Bryophyta/Pteridophyta | 10 |
| 3. Gymnosperm | 10 |
| 4. Spotting | 10 |
| 5. Viva-Voce | 05 |
| 6. Sessional | 05 |

**B.Sc. Part-I
COMPUTER SCIENCE
PAPER-I
COMPUTER FUNDAMENTAL**

Max Marks: 50

NOTE: The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

- UNIT-I Classification and Organization of Computers**
History of computer, Generation of computer, Calculator vs. Computer, Digital and Analog computers and its evolution Major components of digital computers, Memory addressing capability of CPU. Word length and processing speed of computers, Microprocessors, Single chip Microcomputer, Large and small computers, Users interface. Hardware, software and firmware, multi programming multi user system, Dumb smart and intelligent terminals, computer network and multi processing, LAN parallel processing, Flynn's classification of computers, Control flow and data flow computers
- UNIT-II Central Processing Unit**
Parts of CPU- ALU, Control Unit, Registers Architecture of Intel 8085 microprocessor, Instructions for Intel 8085 microprocessor, Instruction Word size, Various addressing mode, Interrupts Some special Control signals, Instruction cycle, fetch and execute operation, Timing Diagram, Instruction flow and data flow.
- UNIT-III Memory**
Memory hierarchy, Primary and Secondary Memory. Cache memory, Virtual Memory Direct Access Storage Devices (DASD), Destructive and Nondestructive Readout, Program and data Memory, Memory Management Unit (MMU), PCMCIA Cards and Slots.
- UNIT-IV I/O Devices**
I/O devices- Keyboard, Mouse, Monitor, Impact and Non-Impact Printers, Plotter, Scanner, other Input/output devices: Scan method of Display- Raster Scan, Vector Scan, Bit Mapped Scan, CRT Controller, I/O Port Programmable and Non Programmable I/O ports, Inbuilt I/O ports- Parallel and Serial ports, USB, IEEE 1394, AGP, Serial data transfer scheme, Micro controller, Signal Processor, I/O processor, Arithmetic Processor
- UNIT-V SOFTWARE AND PROGRAMMING TECHNIQUES** Application and System Software: Introduction, Example, Difference etc., Introduction to Open Source Software such as Unix/Linux Ubuntu), Libre office etc., Introduction to Machine Language, Assembly Language and High Level Language: Programming Techniques, Stack, Subroutine, Debugging of programs, Macro, Program Design, Software development, Flow Chart, Multi programming, Multiuser, Multitasking Protection, Operating system and Utility programs. Application packages.

TEXT BOOKS:

1. Computer Fundamentals, P. K. Sinha, BPB Publications, Sixth Edition.
2. Computer Fundamentals Architecture and Organization, B. Ram, New Age International Publishers, Fial Edition.

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3. Fundamentals of Computers, V. Rajaraman, PHI, Sixth Edition,
4. Computers Today, Donald H. Sanders, McGraw-Hill, Third Edition
5. IBM PC and Clones, B Govindarajalu, McGraw-Hill, Second Edition
6. UNIX Concepts and Applications, Sumitabha Das, Tata McGraw-Hill Fourth Edition,

B.Sc. Part-I
COMPUTER SCIENCE
PAPER-II
PROGRAMMING IN 'C' LANGUAGE

Max Marks: 50

NOTE: The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT-I Fundamentals of C Programming:

Overview of C: History of 'C'. Structure of 'C' program. Keywords, Tokens, Data types, Constants, Literals and Variables, Operators and Expressions: Arithmetic operators, Relational operator, Logical operators, Expressions, Operator: operator precedence and associativity, Type Casting, Console 10 formatting, Unformatted I/O functions: getch (), getch, getch, getco, putco), putchar().

UNIT-II

Control Constructs: If-else, conditional operators, switch and break, nested conditional branching statements, loops: do while, while, for, Nested loops, break and continue, goto and label, exit function. Functions: Definition, function components: Function arguments, return value, function call statement, function prototype, Types of function, Scope and lifetime of variable, Call by value and call by reference. Function using arrays, function with command line argument. User defined function: maths and character functions, Recursive function.

UNIT-III

Array: Array declaration, One and Two dimensional numeric and character arrays, Multidimensional arrays. **String:** String declaration, initialization, string manipulation with/without using library function.

Structure, Union and Enum - Structure: Basics, declaring structure and structure variable, typedef statement, array of structure, array within structure, Nested structure; passing structure to function, function returning structure. Union: basics, declaring union and union variable, **Enum:** declaring enum and enum variable.

UNIT-IV

Pointer: Definition of pointer, Pointer declaration, Using & and * operators. Void pointer, Pointer to pointer, Pointer in math expression, Pointer arithmetic, Pointer comparison, Dynamic memory allocation functions – malloc, calloc, realloc and free, Pointer vs. Array, Array of pointer, Pointer to array, Pointers to function, Function returning pointer, Passing function as Argument to function, Pointer to structure, Dynamic array of structure through pointer to structure.

UNIT-V

File Handling and Miscellaneous Features: File handling: file pointer, File accessing functions. Fopen, fclose, fputc, fgetc, fprintf, fscanf, fread, fwrite, fflush, rewind, fseek, ferror. File handling through command line argument. Introduction to Cpreprocessor #include, #define, Conditional compilation directives: #if, #else, #elif, #endif, #ifndef etc.

TEXT BOOKS:

1. Programming in ANSI C, E Balagurusamy, Tata McGraw-Hill, Third Edition.
2. Let Us C, Yashwant Kanetkar, Infinity Science Press, And Eighth Edition.
3. Mastering C, KR Venugopal, Tata McGraw-Hill.
4. The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, Prentice Hall, Second Edition.

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SESSION 2021-22**

5. Applications Programming in ANSI C, R. Johnsonbaugh, Martin Kalin, Macmillan, Second Edition.
6. The Spirit of C, Mullish Cooper, Jaico publishing House.
7. How to solve it by Computer, R. G Dromev, and Pearson Education.

Practical

At least 20 Practical based on Syllabus of Paper-I and Paper-II

**B.Sc. Part-I
INFORMATION TECHNOLOGY
PAPER-I**

FUNDAMENTAL OF IT, COMPUTER AND PC SOFTWARE

Max Marks: 50

NOTE: The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT-I INFORMATION TECHNOLOGY

Concepts of IT and Information System, Application of IT (in Business, Education, Medicine, Science, Governance and Agriculture), Impact of IT on society and industry, Legal and Ethical aspect of IT, Security and Threats in IT, M-Commerce, Virtual reality, Latest trend in IT, Future of IT.

UNIT-II COMPUTER NETWORK

BASIC CONCEPTS OF COMPUTER NETWORK: Internet concepts, LAN, MAN, WAN, Topology, Protocol, Transmission mode, communication process, Required elements of Data Communication

WIRELESS COMMUNICATION: Mobile Internet, GPS, 3G, 4G, Wi-Fi, Bluetooth, infrared, radio frequency, microwave.

SOCIAL NETWORKING: Evolution of social network sites (YouTube, Facebook, LinkedIn, Twitter), Advantages and Disadvantages of social networking sites.

UNIT-III MS-WORD

Introduction, Word Processing (MS-WORD), Advantage of word processing, Introduction and Installation, Editing a file, using paragraph styles. Newspaper style columns, Using macros, Advance word processing. Headers and footers, Finding text, Setting up printer Mail merge and other applications, Mathematical calculator, Table handling.

UNIT-IV MS-EXCEL

Introduction to spreadsheet (MS-EXCEL), Definition and advantage of electronic worksheet, Working on spread sheets, Range and related operations, Setting saving and retrieving worksheets, Inserting, Deleting, Copying and Moving of data cells, Inserting and deleting rows and column, Protecting cells, Printing a worksheet, Erasing a worksheet in Graphs creation, Types of graphs, Creating a chart sheet 3D, Columns charts, Moving and changing the size of chart, Printing the chart.

UNIT-V MS-POWER POINT AND MS-ACCESS

MS-POWER POINT: Presenting with Power point: Creating presentation, Working with slides, Different types of slides, Setting page layout, Selecting background and applying design Adding graphics to slide, Adding sound and movie, Creating chart and graph, Playing a slide show, Slide transition, Advancing slides, Setting time, Rehearsing timing, Animating slide, Animating objects, Running the show from window. **MS-ACCESS:** Creating tables in access, Defining data types, and Manipulating records.

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TEXT BOOKS:

1. Computer Fundamentals, P. K. Sinha, BPB Publications, Sixth Edition.
2. Introduction to Information Technology, V. Rajaraman, PHI, Second Edition
3. Computer Networks, Forouzan, Tata McGraw-Hill, Second Edition.
4. Microsoft Office 2007 fundamentals, L Story, D Walls.
5. MS Office, S. S. Shrivastava, Firewall Media

**B. Sc. Part-I
INFORMATION TECHNOLOGY
PAPER-II
PROGRAMMING IN 'C' LANGUAGE**

Max Marks: 50

NOTE: The Question Paper setter is advised to prepare unit-wise question with the provision of internal choice.

UNIT-I **Fundamentals of C Programming:** Overview of C: History of 'C', Structure of 'C' program. Keywords, Tokens, Data types, Constants, Literals and Variables, Operators and Expressions: Arithmetic operators, Relational operator, Logical operators, Expressions, Operator: operator precedence and associativity, Type casting, Console I/O formatting, Unformatted I/O functions: getch(), getchar, getche(), getco, putco), putchar().

UNIT-II **Control Constructs:** If-else, conditional operators, switch and break, nested conditional branching statements, loops: do while, while, for, Nested loops, break and continue, goto and label, exit function. Functions: Definition, function components: Function arguments, return value, function call statement, function prototype, Types of function, Scope and lifetime of variable, Call by value and call by reference. Function using arrays, function with command line argument. User defined function: maths and character functions, Recursive function.

UNIT-III **Array:** Array declaration, one and two dimensional numeric and character arrays, Multidimensional arrays.
String: String declaration, initialization, string manipulation with/without using library function. **Structure, Union and Enum** - Structure: Basics, declaring structure and structure variable, typedef statement, array of structure, array within structure, Nested structure, passing structure to function, function returning structure. Union: basics, declaring union and union variable, Enum: declaring enum and enum variable.

UNIT-IV **Pointer:** Definition of pointer, Pointer declaration, Using & and * operators. Void pointer, Pointer to pointer, Pointer in math expression, Pointer arithmetic, Pointer comparison, Dynamic memory allocation functions - malloc, calloc, realloc and free, Pointer vs. Array, Array of pointer, Pointer to array, Pointers to function, Function returning pointer, Passing function as Argument to function, Pointer to structure, Dynamic array of structure through pointer to structure.

UNIT-V **File Handling and Miscellaneous Features:** File handling: file pointer, File accessing functions: fopen, fclose, fputc, fgetc, fprintf, fscanf, fread, fwrite, bcopy, Glush, rewind, fseek, ferror, File handling through command line argument. Introduction to C preprocessor #include, #define, Conditional compilation directives: #if, #else, #elif, #endif, #ifndef etc.

TEXT BOOKS:

1. Programming in ANSI C, E Balagurusamy, Tata McGraw-Hill, Third Edition.
2. Let Us C, Yashwant Kanetkar, Infinity Science Press, And Eighth Edition.
3. Mastering C, KR Venugopal, and Tata McGraw-Hill.

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4. The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, Prentice Hall, Second Edition.
5. Applications Programming in ANSI C, R. Johnsonbaugh, Martin Kalin, Macmillan, Second Edition.
6. The Spirit of C Mullish Cooper Jaico publishing House.
7. How to solve it by Computer, R.G.Dromey, Pearson Education

Practical

At least 20 Practical based on Syllabus of Paper-I and Paper-II.

MATHEMATICS

There shall be three compulsory papers. Each paper of 50 marks is divided into five units and each unit carry equal marks.

B.Sc. Part-I
MATHEMATICS
PAPER-I
ALGEBRA AND TRIGONOMETRY

UNIT-I Elementary operations on matrices, Inverse of a matrix. Linear independence of row and column matrices, Row rank, column rank and rank of a matrix. Equivalence of column and row ranks. Eigenvalues, eigenvectors and the characteristic equations of a matrix. Cayley Hamilton theorem and its use in finding inverse of a matrix.

UNIT-II Application of matrices to a system of linear (both homogeneous and nonhomogeneous) equations. Theorems on consistency of a system of linear equations. Relation between the roots and coefficients of general polynomial equations in one variable. Transformation of equations. Descartes's rule of signs. Solutions of cubic equations (Cardon's method), Biquadratic equation.

UNIT-III Mappings, Equivalence relations and partitions. Congruence modulo n . Definition of a group with examples and simple properties. Subgroups, generation of groups, cyclic groups, coset decomposition, Lagrange's theorem and its consequences. Fermat's and Euler's theorems. Normal subgroups. Quotient group, Permutation groups. Even and odd permutations. The alternating groups A_n . Cayley's theorem.

UNIT-IV Homomorphism and Isomorphism of groups. The fundamental theorems of homomorphism. Introduction, properties and examples of rings, Subrings, Integral domain and fields Characteristic of a ring and Field.

TRIGONOMETRY:

UNIT-V De-Moivre's theorem and its applications. Direct and inverse circular and hyperbolic functions. Logarithm of a complex quantity. Expansion of trigonometrical functions. Gregory's series. Summation of series.

TEXT BOOK:

1. I.N. Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. K.B. Datta, Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd. New Delhi, 2000.
3. Chandrika Prasad, Text-Book on Algebra and Theory of equations, Pothishala Private Ltd., Allahabad.
4. S.L. Loney, Plane Trigonometry Part II, Macmillan and Company, London.

REFERENCES:

8. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, First Course in linear Algebra, Wiley Eastern, New Delhi, 1983.
9. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra (2 edition), Cambridge University Press, Indian Edition, 1997.
10. S.K. Jain, A. Gunawardena and P.B. Bhattacharya, Basic linear Algebra with MATLAB, Key College Publishing (Springer-Verlag), 2001.
11. H.S. Hall and S.R. Knight, Higher Algebra, H.M. Publications, 1994.
12. R.S. Verma and K.S. Shukla, Text Book on Trigonometry, Pothishala Pvt. Ltd., Allahabad.

**B.Sc. Part-I
MATHEMATICS
PAPER-II
CALCULUS**

DIFFERENTIAL CALCULUS:

UNIT-I $\varepsilon - \delta$ definition of the limit of a function. Basic properties of limits. Continuous functions and classification of discontinuities. Differentiability. Successive differentiation. Leibnitz theorem. Maclaurin and Taylor series expansions.

UNIT-II Asymptotes. Curvature. Tests for concavity and convexity. Points of inflexion. Multiple points. Tracing of curves in Cartesian and polar coordinates.

INTEGRAL CALCULUS:

UNIT-III Integration of transcendental functions. Reduction formulae. Definite integrals. Quadrature. Rectification. Volumes and surfaces of solids of revolution.

ORDINARY DIFFERENTIAL EQUATIONS:

UNIT-IV Degree and order of a differential equation. Equations reducible to the linear form. Exact differential equations. First order higher degree equations solvable for x , y , p . Clairaut's form and singular solutions. Geometrical meaning of a differential equation. Orthogonal trajectories. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations.

UNIT-V Linear differential equations of second order. Transformation of the equation by changing the dependent variable/the independent variable. Method of variation of parameters. Ordinary simultaneous differential equations.

TEXT BOOK:

1. Gorakh Prasad, Differential Calculus, Pothishala Private Ltd. Allahabad.
2. Gorakh Prasad, Integral Calculus, Pothishala Private Ltd. Allahabad.
3. D.A. Murray Introductory Course in Differential Equations, Orient Longman (India), 1976.

REFERENCES:

1. Gabriel Klambauer, Mathematical Analysis, Marcel Dekkar, Inc. New York, 1975.
2. Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum's outline series, Schaum Publishing Co. New York.
3. N. Piskunov, Differential and Integral Calculus, Peace Publishers, Moscow.
4. P.K. Jain and S.K. Kaushik, an Introduction to Real Analysis, S. Chand & Co. New Delhi, 2000.
5. G.F. Simmons, Differential Equations, Tata Mc Graw Hill, 1972.
6. E.A. Coddington, an Introduction to Ordinary Differential Equations, Prentics Hall of India, 1961.

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7. H.T.H. Piaggio, Elementary Treatise on Differential Equations and their Applications, C.B.S. Publishe & Distributors, Dehli, 1985.
8. W.E. Boyce and P.O. Diprima, Elementary Differential Equations and Boundary Value Problems, John Wiley, 1986.
9. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 1999.

**B.Sc. Part-I
MATHEMATICS
PAPER-III
VECTOR ANALYSIS AND GEOMETRY**

VECTOR ANALYSIS:

- UNIT-I** Scalar and vector product of three vectors. Product of four vectors. Reciprocal Vectors. Vector differentiation. Gradient, divergence and curl.
- UNIT-II** Vector integration. Theorems of Gauss, Green, Stokes and problems based on these.
- UNIT-III** General equation of second degree. Tracing of conics. System of conics. Confocal conics. Polar equation of a conic.
- UNIT-IV** Sphere. Cone. Cylinder.
- UNIT-V** Central Conicoids. Paraboloids. Plane sections of conicoids. Generating lines. Confocal Conicoids. Reduction of second degree equations.

TEXT BOOKS:

1. N. Saran and S.N. Nigam, Introduction to vector Analysis, Pothishala Pvt. Ltd. Allahabad.
2. Gorakh Prasad and H.C. Gupta, Text Book on Coordinate Geometry, Pothishala Pvt. Ltd., Allahabad.
3. R.J.T. Bell, Elementary Treatise on Coordinate Geometry of three dimensions, Machmillan India Ltd. 1994.

REFERENCES:

1. Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Company, New York.
2. Murray R. Spiegel, Vector Analysis, Schaum Publishing Company, New York.
3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 1999.
4. Shanti Narayan, a Text Book of Vector Calculus, S. Chand & Co., New Delhi.
5. S.L. Loney, the Elements of Coordinate Geometry, Macmillan and Company, London.
6. P.K. Jain and Khalil Ahmad, A Text Book of Analytical Geometry of two Dimensions, Wiley Eastern Ltd., 1994.
7. P.K. Jain and Khalil Ahmad, A Text Book of Analytical Geometry of three Dimensions, Wiley Eastern Ltd., 1999.
8. N. Saran and R.S. Gupta, Analytical Geometry of three Dimensions, Pothishala Pvt. Ltd. Allahabad.

B.Sc. Part-I
MICROBIOLOGY
PAPER-I

GENERAL MICROBIOLOGY & BASIC TECHNIQUE

- UNIT-1** **Fundamental, History & Developments**
Introduction to major groups of microorganisms and fields of Microbiology; Historical development, Contributions of Pioneers (Louis Pasteur, Edward Jenner, Anton Von Leewenhoeck and Alexander Flemming). Beneficial and harmful microbes and its role in daily life.
- UNIT-2** **Basic Microbial Techniques**
Methods of studying microorganism; Sterilization Techniques (Physical & Chemical Sterilization). Pure culture isolation Technique: Streaking, Waksman serial dilution and plating methods. Cultivation, maintenance and preservation of pure cultures. Culture media & conditions for microbial growth. Staining technique: simple staining, Differential (gram staining), negative staining and acid fast staining.
- UNIT-3** **Virology & Bacteriology**
Diversity of microbial world; Principle and classification of Viruses and Bacteria. Structure, Multiplication and Economic importance of viruses (TMV, Influenza virus & T₄-Phage). Structure & Functional organization of Bacteria, Cell wall of Gram Positive & Gram Negative bacteria; Economic importance of Bacteria.
- UNIT-4** **Mycology**
General characteristics and classification of Fungi; Structure and Reproduction of fungi (*Rhizopus*, *Penicillium*, *Aspergillus*, *Yeast* & *Agaricus*). Common fungal disease of crops (Late & Early blight of potato, Smut of Rice, Tikka and Red rot of Sugarcane). Structure, reproduction and economic aspect of Lichens.
- UNIT-5** **Phycology & Protozoology**
General characteristics and classification of Algae and Protozoa; General account & economic importance of Cyanobacteria (*Microcystis*, *Ocillitoria*, *Nostoc* & *Anabaena*) and Protozoa (*Amoeba*, *Paramoecium*, *Euglena* and *plasmodium*).

Text Books Recommended:

1. General microbiology; Vol I & II, Powar C. B. and Daginawala H. I., Himalaypub.house, Bombay.
2. A textbook of Microbiology; Dubey & Maheshwari.
3. Microbiology: An Introduction; G. Tor tora, B. Funke, C. Benjamin Cummings.
4. General Microbiology; Seventh edition by Hans G Schlegel, CambridgeUniversity Press.
5. Practical Microbiology; Dubey and Maheshwari.
6. Handbook of Microbiology; Bisen P.S., Varma K., CBS Publishers and Distributors, Delhi. General Microbiology by Brock.
7. General Microbiology by Pelzar et al.
8. Introduction on Microbial Techniques by Gunasekaran.

**B.Sc. Part-I
MICROBIOLOGY
PAPER-II**

BIOCHEMISTRY AND PHYSIOLOGY

- UNIT-1 CARBOHYDRATES AND PROTEINS**
Structure, classification and properties of Carbohydrates – Monosaccharide, Oligosaccharides (Disaccharides) and Polysaccharides. Structure, classification and properties of Protein - Amino acids, peptides and Proteins (Primary, Secondary, Tertiary and Quaternary structure).
- UNIT-2 LIPIDS AND NUCLEIC ACIDS**
Structure, classification and properties of Lipids; Saturated and Unsaturated fatty acids. Structure and properties of Nucleotides. Structure and forms of DNA; Replication of DNA. Types, Structure and Function of RNA.
- UNIT-3 ENZYMES**
Structure, Nomenclature, Classification and Properties of Enzymes. Mechanism of enzyme action, Enzyme kinetic: Michaelis-Menten. Equation & derivation, Enzyme inhibition, Lineweaver-Burk Plot (LB plot). Co-enzymes and their role; Allosteric enzymes and Isoenzyme. Extracellular enzymes and their role.
- UNIT-4 MICROBIAL METABOLISM**
Bacterial photosynthesis and Chemosynthesis: Glycolysis, TCA cycle and Oxidative Phosphorylation. Anaerobic catabolism of glucose; Fat Biosynthesis, alpha and beta oxidation of fatty acids. Deamination, trans-amination and Urea cycle.
- UNIT-5 GROWTH PHYSIOLOGY & TRANSPORT SYSTEM**
Bacterial cell division, Genome replication and Growth Phases, Conditions for growth. Plasma membrane & Transport system, types of transport (Passive and active). Diffusion (simple & facilitated), Concept of Uniport, Antiport and Symport;

Text Books Recommended:

1. General Biochemistry by A.C. Deb.
2. Biochemistry by Lehninger (Kalyani publication)
3. Biochemistry by U. Satyanarayan.
4. Microbiology by Anantanarayan and Panikar.
5. Fundamentals of Biochemistry; J L Jain, Sunjay Jain, Nitin Jain; S. Chand & Company Ltd
6. Practical Biochemistry: Principles and Techniques; *5th Edition*; Keith Wilson and John Walker
7. Biophysical Biochemistry: Principles and Techniques; AvinashUpadhyay, KakoliUpadhyay and Nirmalendu Nath; Himalaya Publishing House.

**B.Sc. Part-I
MICROBIOLOGY
PRACTICAL**

M. M. 50

Basic information about autoclave, hot air oven, laminar air flow and other laboratory instruments Preparation of solid/liquid culture media.

Isolation of single colonies on solid media.

Enumeration of bacterial numbers by serial dilution and plating. Simple and differential staining.

Measurement of microorganism (micrometry) and camera Lucida drawing of isolated organism.

Determination of bacterial growth by optical density measurement. General and specific qualitative test for carbohydrates

General and specific qualitative test for amino acids General and specific qualitative test for lipids Estimation of protein

Estimation of blood glucose Assay of the activity of amylases

Assay of the activity of Phosphates

Scheme of Practical Examination

Time - 4 hours

M.M. 50

- | | |
|--|----|
| 1. Exercise on Microbiological methods | 10 |
| 2. Exercise on Biochemical tests | 10 |
| 3. Exercise on staining method | 05 |
| 4. Spotting (1-5) | 10 |
| 5. Viva-Voce | 05 |
| 6. Sessional | 10 |

Total 50

**B.Sc. Part-I
PHYSICS**

OBJECTIVES OF THE COURSE

The undergraduate training in physics is aimed at providing the necessary inputs so as to set forth the task of bringing about new and innovative ideas/concepts so that the formulated model curricula in physics becomes in tune with the changing scenario and incorporate new and rapid advancements and multi disciplinary skills, societal relevance, global interface, self sustaining and supportive learning.

It is desired that undergraduate i.e. B.Sc. level besides grasping the basic concepts of physics should in addition have broader vision. Therefore, they should be exposed to societal interface of physics and role of physics in the development of technologies.

EXAMINATION SCHEME:

1. There shall be 2 theory papers of 3 hours duration each and one practical paper of 4 hours duration. Each paper shall carry 50 marks.
2. Numerical problems of at least 30% will compulsorily be asked in each theory paper.
3. In practical paper, each student has to perform two experiments one from each groups as listed in the list of experiments.
4. Practical examination will be of 4 hours duration- one experiment to be completed in 2 hours.

The distribution practical marks as follows:

| | | |
|---------------------|---|----------|
| Experiment | : | 15+15=30 |
| Viva voce | : | 10 |
| Internal assessment | : | 10 |

5. The external examiner should ensure that at least 16 experiments are in working order at the time of examination and submit a certificate to this effect.

B.Sc. Part-I
Paper-I
PHYSICS

MECHANICS, OSCILLATIONS AND PROPERTIES OF MATTER

- UNIT-1** Cartesian, Cylindrical and Spherical coordinate system, Inertial and non-inertial frames of reference, uniformly rotating frame, Coriolis force and its applications. Motion under a central force, Kepler's laws. Effect of Centrifugal and Coriolis forces due to earth's rotation, Center of mass (C.M.), Lab and C.M. frame of reference, motion of C.M. of system of particles subject to external forces, elastic, and inelastic collisions in one and two dimensions, Scattering angle in the laboratory frame of reference, Conservation of linear and angular momentum, Conservation of energy.
- UNIT-2** Rigid body motion, rotational motion, moments of inertia and their products, principal moments & axes, introductory idea of Euler's equations. Potential well and Periodic Oscillations, case of harmonic small oscillations, differential equation and its solution, kinetic and potential energy, examples of simple harmonic oscillations: spring and mass system, simple and compound pendulum, torsional pendulum.
- UNIT-3** Bifilar oscillations, Helmholtz resonator, LC circuit, vibrations of a magnet, oscillations of two masses connected by a spring. Superposition of two simple harmonic motions of the same frequency, Lissajous figures, damped harmonic oscillator, case of different frequencies. Power dissipation, quality factor, examples, driven (forced) harmonic oscillator, transient and steady states, power absorption, resonance.
- UNIT-4** E as an accelerating field, electron gun, case of discharge tube, linear accelerator, E as deflecting field- CRO sensitivity, Transverse B field, 180° deflection, mass spectrograph, curvatures of tracks for energy determination, principle of a cyclotron. Mutually perpendicular E and B fields: velocity selector, its resolution. Parallel E and B fields, positive ray parabolas, discovery of isotopes, elements of mass spectrography, principle of magnetic focusing lens.
- UNIT-5** Elasticity: Strain and stress, elastic limit, Hooke's law, Modulus of rigidity, Poisson's ratio, Bulk modulus, relation connecting different elastic- constants, twisting couple of a cylinder (solid and hollow), Bending moment, Cantilever, Young modulus by bending of beam.
Viscosity: Poiseuille's equation of liquid flow through a narrow tube, equations of continuity. Euler's equation, Bernoulli's theorem, viscous fluids, streamline and turbulent flow. Poiseuille's law, Coefficient of viscosity, Stoke's law, Surface tension and molecular interpretation of surface tension, Surface energy, Angle of contact, wetting.

TEXT AND REFERENCE BOOKS:

1. E M Purcell, Ed Berkely physics course, vol. Mechanics (Mc. Gr. Hill) R P Feynman.
2. R B Lighton and M Sands, the Feynman lectures in physics, vol I (B) publications, Bombay, Delhi, Calcutta, and Madras.
3. D P Khandelwal, Oscillations and waves (Himalaya Publishing House Bombay).

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4. R. K. Ghosh, The Mathematics of waves and vibrations (Macmillan 1975).
5. J.C. Upadhyaya- Mechanics (Hindi and English Edition.)
6. D.S. Mathur- Mechanics and properties of matter.
7. Brijlal and Subramaniam- Oscillations and waves. Resnick and Halliday- Volume I
8. Physics Part –1: Resnick and Halliday.

B.Sc. Part-I
Paper-II
PHYSICS

ELECTRICITY, MAGNETISM AND ELECTROMAGNETIC THEORY

- UNIT-1** Repeated integrals of a function of more than one variable, definition of a double and triple integral. Gradient of a scalar field and its geometrical interpretation, divergence and curl of a vector field, and their geometrical interpretation, line, surface and volume integrals, flux of a vector field. Gauss's divergence theorem, Green's theorem and Stoke's theorem and their physical significance. Kirchoff's law, Ideal Constant-voltage and Constant-current Sources. Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem and Maximum Power Transfer theorem.
- UNIT-2** Coulomb's law in vacuum expressed in Vector forms, calculations of E for simple distributions of charges at rest, dipole and quadrupole fields. Work done on a charge in a electrostatic field expressed as a line integral, conservative nature of the electrostatic field. Relation between Electric potential and Electric field, torque on a dipole in a uniform electric field and its energy, flux of the electric field.
Gauss's law and its application: E due to (1) an Infinite Line of Charge, (2) a Charged Cylindrical Conductor, (3) an Infinite Sheet of Charge and Two Parallel Charged Sheets, capacitors, electrostatic field energy, force per unit area of the surface of a conductor in an electric field, conducting sphere in a uniform electric field.
- UNIT-3** Dielectric constant, Polar and Non Polar dielectrics, Dielectrics and Gauss's Law, Dielectric Polarization, Electric Polarization vector P, Electric displacement vector D. Relation between three electric vectors, Dielectric susceptibility and permittivity, Polarizability and mechanism of Polarization, Lorentz local field, Clausius Mossotti equation, Debye equation,
Ferroelectric and Paraelectric dielectrics, Steady current, current density J, non-steady currents and continuity equation, rise and decay of current in LR, CR and LCR circuits, decay constants, AC circuits, complex numbers and their applications in solving AC circuit problems, complex impedance and reactance, series and parallel resonance, Q factor, power consumed by an a AC circuit, power factor.
- UNIT-4** Magnetization Current and magnetization vector M, three magnetic vectors and their relationship, Magnetic permeability and susceptibility, Diamagnetic, paramagnetic and ferromagnetic substances. B.H. Curve, cycle of magnetization and hysteresis, Hysteresis loss.
Biot-Savart's Law and its applications: B due to (1) a Straight Current Carrying Conductor and (2) Current Loop. Current Loop as a Magnetic Dipole and its Dipole Moment (Analogy with Electric Dipole). Ampere's Circuital law (Integral and Differential Forms).
- UNIT-5** Electromagnetic induction, Faraday's law, electromotive force, integral and differential forms of Faraday's law Mutual and self inductance, Transformers, energy in a static magnetic field. Maxwell's displacement current, Maxwell's

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equations, electromagnetic field energy density. The wave equation satisfied by E and B , plane electromagnetic waves in vacuum, Poynting's vector.

TEXT AND REFERENCE BOOKS:

1. Berkeley Physics Course, Electricity and Magnetism, Ed. E.M. Purcell (Mc Graw - Hill).
2. Halliday and Resnik, Physics, Vol. 2.
3. D J Griffith, Introduction to Electrodynamics (Prentice-Hall of India).
4. Raitz and Milford, Electricity and Magnetism (Addison-Wesley).
5. A S Mahajan and A A Rangwala, Electricity and Magnetism (Tata Mc Graw-hill).
6. A M Portis, Electromagnetic fields.
7. Pugh & Pugh, Principles of Electricity and Magnetism (Addison-Wesley).
8. Panofsky and Phillips, Classical Electricity and Magnetism, (India Book House).
9. S S Atwood, Electricity and Magnetism (Dover).

B.Sc. Part-I
PHYSICS
PRACTICALS

Minimum 16 (Eight from each group)

Experiments out of the following or similar experiments of equal standard

GROUP-A

1. Study of laws of parallel and perpendicular axes for moment of inertia.
2. Moment of inertia of Fly wheel.
3. Moment of inertia of irregular bodies by inertia table.
4. Study of conservation of momentum in two dimensional oscillations.
5. Study of a compound pendulum.
6. Study of damping of a bar pendulum under various mechanics.
7. Study of oscillations under a bifilar suspension.
8. Study of modulus of rigidity by Maxwell's needle.
9. Determination of Y , k , η by Searl's apparatus.
10. To study the oscillation of a rubber band and hence to draw a potential energy curve from it.
11. Study of oscillation of a mass under different combinations of springs.
12. Study of torsion of wire (static and dynamic method).
13. Poisson's ratio of rubber tube.
14. Study of bending of a cantilever or a beam.
15. Study of flow of liquids through capillaries.
16. Determination of surface tension of a liquid.
17. Study of viscosity of a fluid by different methods.

GROUP-B

1. Use of a vibration magnetometer to study a field.
2. Study of magnetic field B due to a current.
3. Measurement of low resistance by Carey-Foster Bridge.
4. Measurement of inductance using impedance at different frequencies.
5. Study of decay of currents in LR and RC circuits.
6. Response curve for LCR circuit and response frequency and quality factor.
7. Study of waveforms using cathode-ray oscilloscope.
8. Characteristics of a choke and Measurement of inductance.
9. Study of Lorentz force.
10. Study of discrete and continuous LC transmission line.
11. Elementary FORTRAN programs, Flowcharts and their interpretation.
18. To find the product of two matrices.
19. Numerical solution of equation of motion.
20. To find the roots of quadratic equation.

TEXT AND REFERENCE BOOKS:

1. B saraf et al Mechanical Systems (Vikas publishing House, New Delhi).
2. D.P. khandelwal, A Laboratory Manual of Physics for Undergraduate classes (Vani Publication House, New Delhi).
3. C G Lambe Elements of statistics (Longmans Green and Co London New York, Tprpnto).
4. C Dixon, Numerical analysis.
5. S Lipsdutz and A Poe, schaum's outline of theory and problems of programming with Fortran (MC Graw-Hill Book Company, Singapore 1986).

**B.Sc. Part-I
ZOOLOGY
PAPER-I
CELL BIOLOGY AND NON-CHORDATA**

UNIT-I

1. The cell (Prokaryotic and Eukaryotic)
2. Organization of Cell: Extra-nuclear and nuclear
3. Plasma membrane, Mitochondria, Endoplasmic reticulum, Golgi body, Ribosome and Lysosome).
4. Nucleus, Chromosomes, DNA and RNA

UNIT-II

1. Cell division (Mitosis and Meiosis).
2. An elementary idea of Cancer cells And Cell transformation.
3. An elementary idea of Immunity: Innate & Acquired Immunity, Lymphoid organs, Cells of Immune System, Antigen, antibody and their interactions

UNIT-III

1. General characters and classification of Phylum Protozoa, Porifera, and Coelenterata up to order.
2. Protozoa: Type study - Paramecium,
3. Porifera: Type study - Sycon.
4. Coelenterata: Type study - Obelia

UNIT-IV

1. General characters and classification of Phylum Platyhelminthes, Nematelminthes, Annelida and Arthropoda up to order.
2. Platyhelminthes and Nematelminthes: Type Study – Fasciola, Ascaris
3. Annelida: Type Study - Pheretima.
4. Arthropoda: Type Study - Palaemone.

UNIT-V

1. General characters and classification of Phylum Mollusca and Echinodermata up to order.
2. Mollusca: Type Study - Pila.
3. Echinodermata- Type Study- Asterias (Starfish).

**B.Sc. Part-I
ZOOLOGY
PAPER-I**

CHORDATA AND EMBRYOLOGY

UNIT-I

1. Classification of Hemichordata
2. Hemichordata- Type study-Balanoglossus
3. Classification of Chordates upto orders..
4. Protochordata-Type study - Amphioxus.
5. A comparative account of Petromyzon and Myxine.

UNIT-II

1. Fishes-Skin & Scales, migration in fishes, Parental care in fish.
2. Amphibia-Parental care and Neoteny.
3. Reptilia- Poisonous & Non-poisonous Snakes, Poison apparatus, snake venom and Extinct Reptiles

UNIT-III

1. Birds- Flight Adaptation, Migration, and Perching mechanism, Discuss-Birds are glorified reptiles.
2. Mammals-Comparative account of Prototheria, Metatheria, Eutheria and Affinities.
3. Aquatic Mammals and their adaptations.

UNIT-IV

1. **Fertilization**
2. Gametogenesis, Structure of gamete and Types of eggs
3. Cleavage
4. Development of Frog up to formation of three germ layers.
5. Parthenogenesis

UNIT-V

1. Embryonic induction, Differentiation and Regeneration.
2. Development of Chick (a) up to formation of three germ layers, (2) Extra-embryonic
3. membranes.
4. Placenta in mammals.

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**B.Sc. Part-I
Zoology
PRACTICAL**

The practical work will, in general be based on the syllabus prescribed in theory and the candidates will be required to show knowledge of the following:-

- Dissection of Earthworm, Cockroach, Palaemon and Pila
- Minor dissection—appendages of Prawn & hastate plate, mouth parts of insects, radulla of Pila.

(Alternative methods: By Clay/Thermacol/drawing/Model etc.)

- Adaptive characters of Aquatic, terrestrial, aerial and desert animals.
- Museum specimen invertebrate
- Slides- Invertebrates, frog embryology, Chick embryology and cytology,

Scheme of Practical Exam

Time: 3hrs

| | |
|--|----------|
| 1. Major Dissection | 10 Marks |
| 2. Minor Dissection | 05 Marks |
| 3. Comments on Excercise based on Adaptation | 04 Marks |
| 4. Cytological Preparation | 05 Marks |
| 5. Spots-8 (Slides-4, Specimens-4) | 16 Marks |
| 6. Sessional | 10 Marks |

**B.Sc. Part-I
FORESTRY
PAPER-I**

**Maximum Marks – 50
Time – 3 Hours**

UNIT-I The Forest & Forestry (An introduction)

- Definition of forest & forestry
- Component of forest
- Classification of forest
- Growth and changes in the seeding, sapling, pole and trees.

UNIT-II Principle of silviculture

- Introduction, Definition, Scope and objective of silviculture, Relation of silviculture with forestry and its branches.
- Influence of forest on Environment.
- Factors of Locality.

UNIT-III Forest Vegetation & its distribution.

- Botanical area of India.
- Distribution descriptions of forest type in India.
- Forest & climate.

UNIT-IV Plantation forestry

- Nursery and its establishment.
- Method of sowing & Plantation.
- Industrial Plantation & Energy Plantation
- Protection of Plantation

UNIT-V Geology & Forest soil

- Definition & Introduction of Geology and Pedology.
- Soil Profile & soil Group.
- Soil Formation.
- Soil Properties.

**SHAHEED MAHENDRA KARMA VISHWAVIDYALAYA, BASTAR, JAGDALPUR
SESSION 2021-22**

**B.Sc. Part-I
FORESTRY
PAPER-II**

**Maximum Marks – 50
Time – 3 Hours**

UNIT-I Regeneration of Forest

- Natural regeneration
- Artificial regeneration
- Tending operation

UNIT-II Silviculture System

Introduction of the following system:

- High Forest system.
- Coppice system
- Improvement Felling.

UNIT-III Silvics of important tree species

- Sal
- Teak
- Sissoo
- Bamboo
- Pine
- Casuarina
- Khamer
- Eucalyptus

UNIT-IV Watershed & Afforestation

- Introduction to soil erosion & importance of Soil and water conservation.
- Concept & characteristics of watershed.
- Choice of Species to problematic areas such as Ravine lands, saline & alkaline areas, mined areas & wet lands.

UNIT-V Handling of Forestry seeds.

- Fruit & seed collection & Processing.
- Storage of seeds.
- Seed dormancy & seed testing.

**B.Sc. Part-I
FORESTRY
LIST OF PRACTICALS**

Maximum Marks – 50

1. Measurement of Diameter, Girth, Height etc.
2. Nursery Management.
3. Identification of Forest spp. And their economic importance.
4. Visit to Forest areas.
5. Regeneration surveys.
6. Reforestation.
7. Handling of Nursery stock.
8. Field planting methods.

Reference Books

1. Principles and Practices of Silvicultures - L.S. Khanna, A.P. Dwivedi.
2. Systematic Botany - M.P. Shilva, R.S. Mathur.
3. Forest Types of India - Champion & Seth.
4. Forestry in India - V.P. Agrawal, K.P. Sagria
5. Hand book of Forestry - S.S. Negi.
6. Forest Plantation - R.K. Luna & Chakravarti
7. Forest Nursery.