

THIRD YEAR SCIENCE, 2006-2007

BOTANY

Papers	No. of Papers	No. of Periods per week	Maximum Marks	Min. pass Marks
Paper I	3	3	50	
Paper II	3	3	50	54
Paper III	3	3	50	
PRACTICALS	6	5	75	27

There shall be three written papers of three hours duration each. The candidates will be required to pass in theory and practical examinations separately.

THEORY

Paper I : Environmental Biology and Phytogeography	50
Paper II : Plant Physiology and Biochemistry	50
Paper III : Molecular Biology and Biotechnology	50

PRACTICALS :

Duration of each Theory Paper	3 hours
Duration of Practicals (in one day)	5 hours

PAPER-I ENVIRONMENTAL BIOLOGY AND PHYTOGEOGRAPHY

Unit-1

Definition, scope and aims of ecological studies, relation with other sciences; factors affecting plant growth and distribution - climatic, edaphic, biotic and topographic.

Unit-2

Plant population - natality, mortality, age and sex ratio, growth rate, biotic potential. Plant Community - concept and characters; Plant succession - xerosere, hydrosere. Ecosystem concept - structure and function : food chain, food web, trophic levels, ecological pyramids, energy flow and biogeochemical cycles.

Unit-3

Pollution : air, water, land, noise and their control. Conservation and management of natural resources, endangered plants and their conservation; biosphere reserves, National Parks and sanctuaries; Chipko movement.

Unit-4

Plant responses to diverse conditions - hydrophytes, xerophytes, halophytes; natural vegetation of Rajasthan. Plant indicators.

Unit-5

Phytogeography - definition, aims, objectives, scope and relation with other disciplines; phytogeographical regions of world and India; continuous and discontinuous distributions, endemism, continental drift theory, land bridges, centres of origin, age and area hypothesis, migration.

Note :

The paper setter is required to set questions of 3 types contained in 3 Sections (**Section A**- 10 questions, **Section B**- 10 questions and **Section C**- 4 questions) from the 5 units of each paper. There will be 10 questions in **Section A** which will be asked from all the 5 units, i.e., 2 questions from each unit. These questions have to be answered in one word or a few words only. Each question will be of half mark . All the questions in **Section A** are compulsory. In **Section B**, 10 questions will be set from the 5 units, i.e., 2 questions from each unit. Students are required to attempt at least 1 question from each unit. Each question will carry 5 marks. The answers of each question should be given in about 250 words. In **Section C** there will be 4 descriptive type questions set from all the 5 units, not more than 1 question from each unit. These questions may also have subdivisions. The students are required to answer 2 questions, each in approximately 500 words. Each question will carry 10 marks .

In short, pattern of question paper and distribution of marks for UG classes will be as under :

Section A : 10 questions, 2 questions from each unit, short answer, all questions compulsory.

Total marks : **05**

Section B : 10 questions, 2 question from each unit, 5 question to be attempted, at least 1 from each unit, answer approximately in 250 words. Total marks : **25**

Section C : 04 questions (question may have subdivision), not more than 1 question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted. Total marks : **20**

PAPER-II
PLANT PHYSIOLOGY AND BIOCHEMISTRY

Unit-1

Different models of cell membrane to explain structure and function, concept of water potential. Mechanism and factors affecting transpiration, role of macro and microelements, carrier concept of ion absorption.

Unit-2

Photosynthesis - photosynthetic pigments; light absorption and mechanism of carbon fixation, C₃ and C₄ plants. Brief account of CAM, photorespiration, CO₂ compensation point. Factors affecting photosynthesis. Enzymes : general characteristics, classification and mode of action.

Unit-3

Respiration - glycolysis, Krebs cycle, electron transport system and oxidative phosphorylation, factors affecting respiration. Synthesis and degradation of fatty acids.

Unit-4

Plant Growth Regulators : auxins, gibberellins, cytokinins, ethylene and abscisic acid, their physiological effects and application in agriculture and horticulture; Seed dormancy, senescence, photoperiodism and vernalization.

Unit-5

Principles and use of following techniques : pH metry, centrifugation, colorimetry, chromatography. Microscopy: light and compound; scanning electron microscopy.

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Section C : 04 questions (question may have sub-division), not more than 1 question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted. Total marks : **20**

PAPER-III

MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Unit-1

Bacterial genome. Methods of genetic recombination in bacteria (Transformation, Transduction and Conjugation). Principles of recombinant DNA technology. Basic tools and techniques. *Neurospora* genetics. Molecular aspects of biological nitrogen fixation.

Unit-2

Structure, chemistry and types of nucleic acids. Replication of DNA. Central dogma, transcription and translation, genetic code. Gene regulation - operon model.

Unit-3

History of plant tissue culture, contribution made by Haberlandt, White, Nobecourt, Gautheret, Steward, Teinert, Morel and Vasil. Highlights of work done by Indian Scientists.

Basic tools and techniques of plant tissue culture, maintenance of aseptic conditions, Laminar Air Flow Chamber, Autoclave, Growth Chamber, methods of sterilization, culture media and their preparation.

Unit-4

Explant types, initiation of cultures, maintenance of cultures, callus and liquid culture, single cell culture, protoplast isolation, purification, culture and regen-

eration. Regeneration *in vitro* through organogenesis, somatic embryogenesis, androgenesis and related basic concepts.

Unit-5

Plasmids and their use in gene transfer. Direct gene transfer, microinjection, electroporation, particle - gun technology, liposome mediated gene transfer. Use of laser beams for gene transfer.

Plant tissue culture in Industry. Secondary plant products with special reference to alkaloids. Prospects of drug production in cell cultures and Bioreactor.

Note :

The paper setter is required to set questions of 3 types contained in 3 Sections (**Section A**- 10 questions, **Section B**- 10 questions and **Section C**- 4 questions) from the 5 units of each paper. There will be 10 questions in **Section A** which will be asked from all the 5 units, i.e., 2 questions from each unit. These questions have to be answered in one word or a few words only. Each question will be of half mark . All the questions in **Section A** are compulsory. In **Section B**, 10 questions will be set from the 5 units, i.e., 2 questions from each unit. Students are required to attempt at least 1 question from each unit. Each question will carry 5 marks . The answers of each question should be given in about 250 words. In **Section C** there will be 4 descriptive type questions set from all the 5 units, not more than 1 question

from each unit. These questions may also have sub-divisions. The students are required to answer 2 questions, each in approximately 500 words. Each question will carry 10 marks .

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Total marks : **05**

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Section C : 04 questions (question may have sub-division), not more than 1 question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted. Total marks : **20**

PRACTICALS

The practical exercises have been divided into following two groups :

Group-I : Paper I + Exercise 1,2,7 & 8 of Paper III.

Group-II : Paper II + Exercise 3,4,5 & 6 of Paper III.

PAPER - I

A Plant adaptive modifications : Specimens / Slides.

1. Succulents : *Opuntia, Euphorbia*
2. Halophytes : *Tamarix/Salsola*
3. Xerophytes : *Cocoloba, Parkinsonia, Acacia, Capparis, eptadaenia pyrtechnica*
4. Hydrophytes : *Eichhornia, Trapa, Hydrilla*

B Soil analysis

5. Soil texture
6. Soil moisture
7. Water holding capacity
8. Soil pH
9. Qualitative tests of nitrate, phosphate and carbonate.

C Water analysis

10. Hardness of water
11. Water temperature
12. Visibility of light in water column.
13. Carbonate, bicarbonate and chloride test.

D Ecological instruments

14. Maximum/minimum thermometer.
15. Hair hygrometer
16. Anemometer
17. Lux meter
18. Universal moisture meter

Field exercises

19. Determination of frequency, density and abundance of different species present in a plant community by quadrat method.
20. Determination of minimum size of a quadrat by species area curve method.

PAPER-II
PLANT PHYSIOLOGY AND BIOCHEMISTRY

1. Demonstration of following colloidal systems : Suspension, Emulsion, Brownian movement.
2. To observe streaming movement of protoplasm (*Hydrilla*)
3. Demonstration of phenomenon of plasmolysis using *Rhoeo discolor* leaves.
4. Demonstration of phenomenon of osmosis by potato osmoscope.
5. Demonstration of opening and closing of stomata.
6. Demonstration of unequal transpiration using cobalt chloride paper.
7. Effect of various wave-lengths of light on the process of photosynthesis.
8. Demonstrate that light, CO₂ and chlorophyll are necessary for photosynthesis.
9. Determine the value of respiratory quotient (RQ) of different respiratory substrates.
10. Demonstration of respiratory enzymes (Peroxidase, Catalase, Dehydrogenase) in plant tissues.
11. Introduction and demonstration of following instruments/ techniques : pH meter, centrifuge, colorimeter, chromatography.
12. Phytochemical tests of the following : starch, cellulose, sucrose, glucose/ fructose, proteins, fat, oxalic acid, malic acid, citric acid, tannins, ascorbic acid, anthocyanins.

PAPER - III
MOLECULAR BIOLOGY AND BIOTECHNOLOGY

1. Introduction to tools and techniques : Laminar flow bench, Autoclave and Ultrafiltration.
2. Preparation of culture media and solutions of nutrients and growth regulators.
3. Inoculation techniques : explant preparation and aseptic transfer.
4. Anther culture.
5. Preliminary exercise on isolation and culture of plant protoplasts.
6. Exercises for cloning of plants.
7. Tests and separation of secondary metabolites.
8. Experiments on antibiotics resistance.

MARKING SCHEME

	Students	
	Regular	Ex
1. Perform and explain physiology experiment	14	16
2. Ecological method.	10	12
3. Ecological adaptation	10	12
4. Expt. In tissue culture	5	7
5. Phytochemical test (2 tests)	6	8
6. Spots (Five)	10	10
7. Viva-voce.	10	10
8. Record.	10	-
Total	75	75

BOOKS RECOMMENDED

Ambasht, R.S. : A Text-book of Plant Ecology, Studies Friends and Co., Varanasi, 1975.

Bhatia, K.N. and Parasher, A.N. : Plant Physiology, Krishna Brothers, Jullundhur, 1975.

Daubenmire, R.F.: Plants and Environment, John Wiley & Co., London, 1970.

Gopal, B.: Padap Paristhitiki Avam Padap Bhugol Ke Mool Tantra, Rajasthan Hindi Granth Academy, 1977.

Misra, R.: Ecological Workbook, Oxford and IBH Publishing, New Delhi, 1968.

Mishra, R. and Puri, G.S.: Bhartiya Padap Paristhiti Vigyan, Rajasthan Hindi Granth Academy, Jaipur, 1974.

Nair, P.K.G.: Principles of Environmental Biology, Minalaya Publishing House, Delhi, 1990.

Pandey, S.N. and Sinha, B.K.: Plant Physiology, Vikas Publishing House, Delhi, 1996.

Rao, K.N. Partha, T.S. and Rao, G.S.: Outline of Physiology, S. Chand And Co., New Delhi, 1975.

Smith, R.L.: Ecology and Field Biology, Harper and Raw, 1972.

Verma, V: A testbook of Plant Physiology, Emkay Publication, Delhi, 1972.

Noggle, G. Ray and Fritz, J., George : Introductory Plant Physiology, Prentice Hall 1976.

THIRD YEAR SCIENCE, 2006-2007

CHEMISTRY

The examination shall consist of three theory papers and one practical.

<u>Paper & Course</u>	<u>Hrs/week</u>	<u>M. Marks</u>
Paper -I Inorganic Chemistry	2	50
Paper- II Organic Chemistry	2	50
Paper- III Physical Chemistry	2	50
Practicals	4	75

PAPER-I INORGANIC CHEMISTRY

Time-3 Hrs. **M.M. 50**

NOTE : The paper will be divided into THREE sections.

Section-A Ten questions (short type answer) two from each Unit will be asked. Each question will be of half mark and the candidates are required to attempt all questions. **Total 5 marks**

Section-B Five questions (answer not exceeding 250 words) one from each Unit with internal choice will be asked and the candidates are required to attempt all questions. Each question will be of 5 marks.

Total 25 marks

Section-C Four questions may be in parts covering all the five Units (answer not exceeding 500 words) will be asked. The candidates are required to attempt any TWO questions. Each question will be of 10 marks.

Total 20 marks

UNIT-I

Hard and Soft Acids and Bases (HSAB) - Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

Metal - Ligand Bonding in Transition Metal Complexes - Limitation 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, John- Teller effect.

UNIT-II

Magnetic Properties of Transition Metal Complex - Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of m_s and m_{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 rule for d-d transitions, spectroscopic ground states, spectro-

chemical series. Orgel-energy level diagram for d^1 and d^9 states, discussion of the electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ complex ion.

UNIT- III

Bioinorganic Chemistry - Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+} .

Electroanalytical Methods - EMF measurements, pH - determination using hydrogen, glass, quinhydrone, antimony and calomel electrodes, potentiometric titrations.

Volumetric Estimation - Theory of oxidation - reduction titrations. Theory of complexometric titrations.

UNIT- IV

Organometallic Chemistry - Definition, nomenclature and classification of organometallic compounds. Preparation, properties, bonding and applications of alkyl and aryl of Li, Al, Hg, Sn and Ti, a brief account of metal - ethylenic complexes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.

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- V

Molecular Symmetry and Group Theory - Symmetry elements, molecular point groups, group theory and basic properties, similarity transformation and classes, orthogonality theorem, multiplication tables and characters tables of C_{2v} and C_{3v} groups.

Mathematical Techniques - Least square treatment applied to linear equation $y = mx + c$, correlation coefficient, σ_m and σ_c .

Books Recommended:

1. Group theory and its chemical applications: P. K. Bhattacharya.
2. Inorganic chemistry: J. E. Huysse, Principles of structure & Reactivity, 3rd Ed.
3. Selected topics in inorganic chemistry: W. U. Malik, G. D. Tuli and R. Madan.
4. Principles of inorganic chemistry: D. Banerjee.
5. Modern aspect of inorganic chemistry: H. J. Emeleus and A. G. Sharpe.
6. Inorganic chemistry (Hindi Ed.): Ameta, Sharma and Mehta.

PAPER-II
ORGANIC CHEMISTRY

Time-3 Hrs.

M.M. 50

NOTE : The paper will be divided into THREE sections.

Section-A Ten questions (short type answer) two from each Unit will be asked. Each question will be of half mark and the candidates are required to attempt all questions. **Total 5 marks**

Section-B Five questions (answer not exceeding 250 words) one from each Unit with internal choice will be asked and the candidates are required to attempt all questions. Each question will be of 5 marks. **Total 25 marks**

Section-C Four questions may be in parts covering all the five Units (answer not exceeding 500 words) will be asked. The candidates are required to attempt any TWO questions. Each question will be of 10 marks. **Total 20 marks**

UNIT-I

Electromagnetic Spectrum : Absorption Spectra – Ultraviolet (UV) absorption spectroscopy- absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transition, effect of conjugation. Concept of chromo-

phore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones.

Infrared (IR) absorption spectroscopy- molecular vibrations, Hooke's, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.

Nuclear Magnetic Resonance (NMR) spectroscopy: Proton Magnetic Resonance (PMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone.

Problem pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.

UNIT-II

Heterocyclic compounds - Introduction, molecular orbital picture and aromatic characteristics of pyrrole, furane, thiophene and pyridine, method of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives, comparison of basicity of pyridine, piperidine and pyrrole.

Introduction to condensed five and six membered heterocycles, preparation and reactions of indole, quinoline and isoquinoline with special reference to Fischer Indole synthesis, Skraup's synthesis and Bischler - Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

Photochemistry: Principles: electronic excitation, excited states, modes of dissipation of energy, energy transfer and quantum efficiency, photoreduction and photochemistry of butadienes

UNIT - III

Organic Synthesis via Enolates - Acidity of alpha hydrogen, alkylation of diethylmalonate and ethylacetoacetate, synthesis of ethyl acetoacetate, Claisen condensation. Keto - Enol tautomerism of ethyl acetoacetate, alkylation of 1,3-dithianes, alkylation and acylation of enamines.

Carbohydrates - Classification and nomenclature, monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses, configuration of glucose and fructose, erythro and threo diastereomers. Conversion of glucose into mannose, formation of glycosides, ether and esters. Determination of ring size of glucose and fructose, Cyclic structure of D (+) - glucose. Mechanism of mutarotation.

An introduction to disaccharide (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

UNIT - IV

Amino Acids, Peptides, Proteins and Nucleic Acids - Classification, structure and stereochemistry of amino acids, acid-base behavior, isoelectric point and electrophoresis. Preparation and reactions of α -amino acids.

Structure and nomenclature of peptides and proteins, classification of proteins, peptide structure determination, and group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid-phase peptide synthesis. Structures of peptide and proteins. Levels of protein structure. Protein denaturation/renaturation.

Nucleic acids: Introduction, constituents of nucleic acids. Ribonucleosides and ribonucleotides. The double helical structure of DNA.

Fats, Oils and Detergents - Natural Fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils, saponification value, iodine value, acid value, soaps, synthetic detergents, alkyl and aryl sulphonates.

UNIT-V

Synthetic Polymers - Addition or chain - growth polymerization, free radical vinyl polymerization, ionic

- vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers. Condensation or step-growth polymerization, polyesters, polyamides, phenol formaldehyde resins, urea-formaldehyde resins, epoxy resins and polyurethanes, natural and synthetic rubbers.

Synthetic Dyes - Colour and constitution (electronic concept), classification of dyes. Chemistry and synthesis of methyl orange, Congo red, Malachite green, Crystal violet, Phenolphthalein, Fluorescein, Alizarin and Indigo.

Books Recommended:

1. Organic Chemistry, Volume I & II, S. M. Mukherji. S. P. Singh and R. P. Kapoor, Wiley Eastern Ltd.
2. A Text Book, of Organic chemistry, Volume I & II K. S. Tewari, S. N. Mehrortra & N. K. Vishnoi.
3. Organic chemistry, M. K. Jain and S. Sharma
4. A Text Book. of Organic Chemistry, Vol. I & II, O. P. Agarwal,
5. A Text Book of Organic Chemistry, Raj. K. Bansal.
6. Organic Chemistry. Vol. I & II: I. L. Finar,
7. Organic Reaction and their Mechanisms, P.S. Kalsi.
8. Introduction of Petrochemicals, Sukumar Maiti.

9. Organic Chemistry (Hindi Ed.), Suresh Ameta, Punjabi and Sharma.
10. Organic Chemistry, Morrison and Boyd, Prentice-Hall
11. Fundamentals of Organic Chemistry, Solomons, John Wiley.
12. Organic Chemistry, P.L. Soni
13. A Text Book of Organic Chemistry, V.K. Ahluwalia and Maduri Goyal, Narosa Publishing House Pvt. Ltd.

PAPER-III
PHYSICAL CHEMISTRY

Time-3 Hrs.

M.M. 50

NOTE : The paper will be divided into THREE sections.

Section-A Ten questions (short type answer) two from each Unit will be asked. Each question will be of half mark and the candidates are required to attempt all questions. **Total 5 marks**

Section-B Five questions (answer not exceeding 250 words) one from each Unit with internal choice will be asked and the candidates are required to attempt all questions. Each question will be of 5 marks. **Total 25 marks**

Section-C Four questions may be in parts covering all the five Units (answer not exceeding 500 words) will be asked. The candidates are required to attempt any TWO questions. Each question will be of 10 marks. **Total 20 marks**

UNIT-I

Elementary Quantum Mechanics - Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects, Compton effect.

Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in one-dimensional box.

Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave function.

Molecular orbital theory, basic ideas- criteria for forming M. O. from A. O., construction of M. O's by LCAO- H_2^+ ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of σ , σ^* , π , π^* orbitals and their characteristics. Hybrid orbitals- sp , sp^2 , sp^3 , calculation of coefficients of A.O's used in these hybrid orbitals.

Introduction to valence bond model of H_2 , M. O. and V. B. models.

UNIT-II

Spectroscopy - Introduction: electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.

Rotational Spectrum - Diatomic molecules, energy levels of a rigid rotator (semi- classical principles), selection rules, spectral intensity, distribution using

population distribution (Maxwell - Boltzmann distribution) determination of bond length, qualitative description of non-rigid rotor, isotope effect.

Vibrational Spectrum - Infrared spectrum, energy level of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups.

Raman spectrum: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.

Electronic Spectrum - Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck-Condon principle.

Qualitative description of σ , π and n M.O., their energy levels and the respective transitions.

UNIT-III

Photochemistry - Interaction of radiation with matter, difference between thermal and photochemical processes, laws of photochemistry, Grotthus - Drapper law, Stark - Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative process (internal conversion,

intersystem crossing), high and low quantum yields, photosensitization, photochemical equilibrium, photoionization, photodimerisation of anthracene, photoinhibition, chemical actinometry.

Solutions, Dilute Solutions and Colligative Properties - Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution: colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement,

Determination of molecular weight from osmotic pressure, elevation of boiling point and depression of freezing point, thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point, experimental methods for determining various colligative properties, abnormal molar mass, degree of dissociation and association of solute, Vant-Hoff factor.

UNIT-IV

Ionic Conductance - Electrical transport, conduction in metal and electrolytes, solutions, specific conductance, equivalent conductance and molecular conductance, effect of dilution on conductance, migration of ions, Kohlraush's law and its applications, transport numbers and its determination by Hittorf's method and moving boundary methods, ionic mobility, application of conductivity measurement, conductometric titrations.

UNIT-V

Chemical Kinetics and Catalysis - Rate of reaction, factors influencing the rate of reaction, concentration, temperature, pressure, solvent, light and catalysis, order of a reaction, zero-order, first order and second order reaction, half life and mean life, conductometric, potentiometric, polarimetric and spectrophotometric methods of determination of order of reactions, method of integration, half life method and isolation method, experimental methods of kinetics, elementary idea about opposing, parallel, consecutive and chain reaction, effect of temperature on reaction rates. Arrhenius equation, concept of activation energy and its measurement, simple collision's theory (hard sphere model), transition state theory (equilibrium hypothesis) limitation's.

Theory of unimolecular reactions, catalysis, theory and mechanism, classification of catalysis, enzyme catalysis and its mechanism.

Books Recommended :

1. Principle of Physical chemistry: B. R. Puri Sharma and M. S. Pathania,
2. A Text Book of Physical Chemistry: A. S. Negi and S.C. Anand.
3. A Text Book of Physical Chemistry: Kundu and Jain.
4. Physical Chemistry (Hindi Ed.): Suresh Ameta , Khandelwal, Ameta and Vardia.

THIRD YEAR CHEMISTRY PRACTICALS, 2006-2007

TIME - 5 Hrs (one day)

M.M. 75

Distribution of Marks

Experiments	Marks
1. Synthesis of Inorganic complex and organic compound.	15
2. Analysis by Colorimetry/ Solvent extraction/ Ion exchange method	10
3. Qualitative analysis: Organic mixture analysis	15
4. One Physical experiment	15
5. Viva- Voce	10
6. Record	10
Total	75 Marks

List of experiments

1. Synthesis of Inorganic complexes and organic compounds

Any one of the following preparation may be asked in the examination keeping in view that not more than five students are given the same preparation in a batch of 20 students and nature of preparation should be equally distributed both from the organic and inorganic list.

Inorganic Complexes

- (a) Preparation of sodium trisoxalato ferrate (III)
- (b) Preparation of Ni-DMG complex.
- (c) Preparation of copper tetraammine complex.
- (d) Preparation of cis- and trans- bisoxalato diaquo chromate(III) ion.
- (e) Cuprous chloride
- (f) Sodium thiosulphate
- (g) Ferrous sulphate from Kipp's waste
- (h) Mercury tetrathiocyanate

Organic Synthesis

(a) **Acetylation** of salicylic acid, aniline, glucose and hydroquinone, benzoylation of aniline and phenol.

(b) Aliphatic electrophilic substitution -

Preparation of iodoform from ethanol and acetone.

(c) Aromatic electrophilic substitution -

Nitration -

Preparation of m-dinitrobenzene from nitrobenzene.

Preparation of p-nitroacetanilide from acetanilide

Halogenation-

Preparation of p-bromoacetanilide from acetanilide.

Preparation of 2,4,6-tribromophenol from phenol.

(d) Diazotization/coupling -

Preparation of methyl orange and methyl red

(e) Oxidation-

Preparation of benzoic acid from toluene

(f) Reduction-

Preparation of aniline from nitrobenzene.

Preparation of m-nitroaniline from m-dinitrobenzene.

2 (i) Analysis by Colorimetry-

(a) Job's method (b) Mole- ratio method

Adulteration - Food stuffs.

Effluent analysis, water analysis.

(ii) Solvent Extraction - Separation and estimation of Mg (II) and Fe (II).

(iii) Ion Exchange - Separation and estimation of Mg (II) and Zn (II).

3. Qualitative Analysis -

Analysis of an organic mixture containing two solid components separable by water, dil. NaHCO_3 and dil. NaOH .

4. Physical Chemistry experiment - Any one of the experiments may be given in the examination.

Conductometry-

- (i) To determine the strength of the given acid conductometrically using standard alkali solution.
- (ii) To determine the solubility and solubility products of a sparingly soluble electrolyte conductometrically.
- (iii) To study the saponification of ethyl acetate conductometrically.
- (iv) To determine the ionization constant of a weak acid conductometrically.

Potentiometry-

- (i) To titrate potentiometrically the given ferrous ammonium sulphate solution using KMnO_4 / $\text{K}_2\text{Cr}_2\text{O}_7$ as titrant and calculate the redox potential of Fe^{2+} / Fe^{3+} system on the hydrogen scale.
- (ii) To determine the strength of a given solution of HCl / CH_3COOH by titrating with standard NaOH solution potentiometrically/ pH metrically.

Refractometry, Polarimetry-

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

Colourimetry-

- (i) To verify Beer - Lambert law for KMnO_4 / $\text{K}_2\text{Cr}_2\text{O}_7$ and determine the concentration of the given solution of the substances.
- (ii) Estimation of iron colorimetrically.
- (iii) Estimation of phosphate colorimetrically.

Books Recommended:

- 1 Practical chemistry - Giri, Bajpai and Pandey. S. Chand & Co. Ltd. New Delhi
- 2 Laboratory Manual in Organic Chemistry, R.K. Bansal, Willey Eastern
- 3 Experimental Organic Chemistry Vol.I & II, P.R. Singh, D.S. Gupta & K.S. Bajpai, Tata McGraw Hill.
- 4 Experiments in Physical Chemistry- J.C. Ghose, Bharti Bhawan
- 5 Experiments in General Chemistry C.N.R. Rao & U.C. Agarwal, Eastern Press
- 6 Practical Chemistry- Suresh Ameta & P.B. Punjabi, Himanshu Publication.

**B.Sc. THIRD YEAR SCIENCE
2006-2007**

GEOLOGY

The examination shall consist of three theory papers and one practical.

Time: 3 hr **MM 50**

Note: Each paper will be divided into THREE parts.

Part I – Ten questions (short type answer) two from each Unit will be asked. Each question will be of half a mark and the candidates are required to attempt **ALL** questions. **Total 05 marks**

Part II – Five questions (answer not exceeding 250 words) one from each Unit with internal choice will be asked and the candidates are required to attempt **ALL** questions. Each question will be of 05 marks.

Total 25 marks

Part III – Four questions may be in parts covering all five Units (answer not exceeding 500 words) will be asked. The candidates are required to attempt any **TWO** questions. Each question will be of 10 marks.

Total 20 marks

	Hr/ Week	Exam. Hr.	Marks
A. Theory Papers			
Paper I : Mineral Resources	2	3	50
Paper II : Geoexploration and Principles of Mining	2	3	50
Paper III : Geology of Rajasthan and Groundwater Geology	2	3	50
B. Practical:	4	4	75
Total Marks			225

PAPER-I
MINERAL RESOURCES

Time: 3 hr

MM 50

UNIT-I

Magma and its relation with mineral deposits. Elementary ideas of magmatic concentration and hydrothermal process.

UNIT-II

Elementary ideas of processes of ore formation by Sedimentation, Volcanogenic, Evaporation, Oxidation and Supergene Enrichment, Metamorphism, Mechanical and Residual Concentration.

UNIT-III

Brief idea of Contact metasomatism and skarn formation. Coal, Petroleum and Radioactive Mineral Deposits of India.

UNIT-IV

Brief knowledge of mode of occurrence, distribution, uses and origin of important metallic mineral deposits of India - Lead, Zinc, Copper, Iron,

UNIT-V

Brief knowledge of mode of occurrence, distribution, uses and origin of important non-metallic mineral deposits of India - Rock phosphate, Gypsum, Talc, Asbestos, Barytes, Fluorite, Garnet, Kyanite and Sillimanite. Clay deposits of Rajasthan.

PAPER-II
GEOEXPLORATION AND PRINCIPLES OF MINING

Time: 3 hr

MM 50

UNIT-I

Geological techniques and procedures of exploration stages, planning and operation of exploration. Procedure for obtaining a mining lease.

UNIT-II

Geological aspects of drilling: drilling methods, selection of sites, angles and direction of bore holes. Core-logging.

UNIT-III

Methods of sampling, weighing of samples and calculation of average grades. Classification of ore reserves, calculation of cut-off grade. Grade and tonnage. Principles of geochemical and geophysical prospecting.

UNIT-IV

Mineral Economics and its concept, tenor, grade and specifications for important minerals used in industries. Methods of ore reserve estimation. Principles and methods of ore dressing.

UNIT-V

Introduction to remote sensing. Elements of mining methods: Introduction to open cast and underground mining methods.

PAPER-III
GEOLOGY OF RAJASTHAN AND
GROUNDWATER GEOLOGY

Time: 3 hr

MM 50

UNIT-I

Geomorphologic division of Rajasthan and their characteristics. Geologic Time Scale and its equivalents in Rajasthan. Banded Gneissic Complex, Aravalli and Delhi Supergroups, their distribution, classification, lithology, and igneous intrusives.

UNIT-II

Younger Precambrian formations of Rajasthan. Sirohi Group, Sindhrath Group and Malani Igneous Suite Vindhyan and Marwar Supergroups of Rajasthan, their distribution, classification, lithology, fossil content and economic importance.

UNIT-III

Palaeozoic, Mesozoic, Tertiary and Quaternary geology of Rajasthan, their distribution, classification, lithology, fossil content and economic importance.

UNIT-IV

Source and origin of groundwater. Hydrologic cycle. Hydrological properties of rocks: Types of aquifers, porosity, permeability, transmissibility, storage

coefficient, specific yield and specific retention. Water table, and artesian well. Occurrence of ground water in: igneous, metamorphic and sedimentary rocks.

UNIT-V

Ground water prospecting methods, prospecting and Ground water resources in Rajasthan.

B. Sc. THIRD YEAR GEOLOGY PRACTICALS 2006-2007

Examination will be of four hours duration.

Maximum Marks 75

- | | |
|--|----------|
| 1. Mineral Resources: Plotting and spotting | 15 Marks |
| 2. Geoexploration and Principles of Mining: Survey | 10 Marks |
| 3. Geology of Rajasthan And Groundwater Geology: Plotting and identification | 15 Marks |
| 4. Field Work | 15 Marks |
| 5. Viva-Voce | 10 Marks |
| 6. Record | 10 Marks |

Total	75 Marks
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MINERAL RESOURCES :

1. Identification and description of important economic mineral and rocks in hand specimen.
2. Plotting of important economic mineral deposits in the outline map of India.

GEOEXPLORATION AND PRINCIPLES OF MINING :

1. Survey: Chain and Plain Table surveying.

GEOLOGY OF RAJASTHAN AND GROUND WATER:

1. Identification and description of important stratigraphic rocks of Rajasthan and their assignment to respective stratigraphic position.
2. Plotting of important stratigraphic units in the outline map of Rajasthan.

FIELD WORK :

Field work for seven-day for studying different mineral deposits and stratigraphic units in Rajasthan.

Field work is compulsory. Students not attending the field work shall not be allowed to appear in the examination.

Books Suggested, besides the Internet:

B. Sc. Part-III

Arogyaswamy R.N.P.: Courses in Mining Geology, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Chouhan T. S.: Encyclopedia of Rajasthan Vol. I, Vigyan Prakashan, Jodhpur.

Deb, S., 1980: Industrial Minerals and Rocks of India. Allied Publ. New Delhi. pp603.

Garg S. P.: Groundwater and Tube Wells, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Jensen M. L. & Bateman A. M.: Economic Mineral Deposits, John Wiley & Sons, Singapore

Kirshnan M. S.: Geology of India and Burma, CBS Publishers & Distributors, Delhi.

Krishnaswamy S.: India's Mineral Resources, Oxford & IBH Publishing Co. Pvt. Ltd., (Revised by R. K. Sinha) New Delhi.1988, 613 p.

Naqvi S. M. and Rogers J. J. W.: Precambrian Geology of India. Oxford University Press.

Pandey S. N.: Principles and Applications of Photogeology, Wiley Eastern Ltd., New Delhi.

Peters W. C.: Exploration and Mining Geology, John Wiley & sons, New York.

Rao T.C. & Gokhle K. V.: Ore Deposits of India: Their Distribution and Processing.

Ravindra Kumar: Fundamentals of Historical Geology and Stratigraphy of India, Wiley Eastern Ltd., New Delhi.

Todd D.K.: Groundwater Hydrology, John Wiley & Sons, Singapore.

Venkatramaiah C.: Textbook of Surveying, Universities Press (India) Ltd., 3-5-820, Hyderguda, Hyderabad-500029.

THIRD YEAR T.D.C. SCIENCE, 2006-07

ZOOLOGY

The third year TDC examination shall consist of three theory papers, each of three hours duration and a practical examination of five hours duration.

	<u>Marks</u>
Paper-I : Animal Physiology, Biochemistry and Immunology	50
Paper-II : Ecology and Biostatistics	50
Paper-III : Ethology and Evolution	50
Practical :	75

Pattern of question paper in the annual examination and distribution of marks :

Each theory paper in the annual examination shall have three sections i.e. A, B, and C. **In section A**, total 10 questions will be set in the paper, selecting at least two from each unit. These questions to be answered in a word or so. All questions are compulsory. Each question carries 0.5 mark, total 05 marks.

In section B, there shall be total 10 questions, selecting two questions from each unit, five questions to be answered by the student selecting at least one from each unit. Answer should be given in approximately 250 words. Each question carries 05 marks, total 25 marks.

In section C, 04 descriptive type questions will be set in the examination paper from five units of the syllabus of the paper, selecting not more than one question from a unit. Each question may have two sub divisions. Students are required to answer any two questions approximately in 500 words. Each question is of 10 marks, total 20 marks.

THIRD YEAR T.D.C. SCIENCE, 2006-07

ZOOLOGY

PAPER-I ANIMAL PHYSIOLOGY, BIOCHEMISTRY AND IMMUNOLOGY

Duration : 3 hours

M.M.: 50

UNIT-I

- 1 Metabolism of carbohydrates: Glycolysis, decarboxylation of pyruvic acid, Krebs cycle, electron transport system and oxidative phosphorylation; glycogenesis and glycogenolysis.
- 2 Metabolism of Proteins : Essential and non-essential amino acids, metabolism of amino acids, biosynthesis of glutamic acid.
- 3 Metabolism of lipids : Biosynthesis of saturated fatty acids and β -oxidative pathways of fatty acids; formation of ketone bodies.

UNIT-II

- 4 Digestion and absorption of food in alimentary canal, structure and functions of liver and pancreas (exocrine part only)
- 5 Respiration : Mechanism of respiration, vital capacity of lungs, transport of gases, dissociation curve of oxyhaemoglobin and control of respiration, chloride shift.

- 6 Circulatory System : structure and function of blood, ABO blood groups and Rh factor, mechanism of blood clotting.

UNIT-III

- 7 Excretion : Structure and function of nephron, formation of ammonia, urea and uric acid, control of renal function.
- 8 Nerve Physiology : Ultrastructure of neuron, synapse, conduction of nerve impulse and neuromuscular junctions.
- 9 Ultrastructure of cardiac and skeletal muscles. Physiology of muscle contraction.

UNIT-IV

- 10 Reproductive Physiology : Structure of testis and hormonal control of testicular functions, structure of ovary and hormonal control of ovarian functions with reference to estrous and menstrual cycle.
- 11 Implantation, parturition and lactation in mammals.
- 12 Light microscopic structure, functions and disorders of endocrine glands - pituitary, pancreas, adrenal, thyroid and parathyroid.

UNIT-V

- 13 Immunology : Definition, types of immunity, innate and acquired, humoral and cell-mediated.

- 14 Antigen : antigenicity of molecules, haptens.

- 15 Antibody : definition, WHO classification (IgG, IgM, IgD and IgE). Outline idea of properties, structure and functions of each class of immunoglobulins.

- 16 Antigen - antibody reactions, precipitation reaction, agglutination reaction, neutralizing reaction, complementary and lytic reactions and phagocytosis.

- 17 Cells of immunity : macrophages, lymphocytes (B and T types), T-helper cells, T-killer cells, plasma cells and memory cells.

- 18 Mechanism of humoral or antibody mediated immunity.

ZOOLOGY

**PAPER-II
ECOLOGY AND BIostatISTICS**

Duration : 3 hours

M.M.: 50

UNIT-I

- 1 Terminology and scope of Ecology.
- 2 Habitat and niche
- 3 Ecosystem: Components of ecosystem, energy flow and nutrient cycles, food chain, food web and ecological pyramids.
- 4 General idea of population and community ecology

UNIT-II

- 5 Freshwater environment: Physico-chemical features and biotic communities, productivity and eutrophication.
- 6 Marine environment : Characteristics, zonation, fauna and their adaptation, deep sea and estuarine fauna.
- 7 Terrestrial environment : General characteristics of desert, grass land and forest ecosystems.

UNIT-III

- 8 Environmental pollution : Biodegradable and non-biodegradable pollutants.
- 9 Air pollution: Source, nature, prevention and control, green house effect, ozone depletion and global warming.
- 10 Water pollution: Source, nature and abatement.
- 11 General account of noise pollution and radioactive pollution.

UNIT-IV

- 12 Conservation of natural resources : Wild life management, brief idea of national parks and wild life sanctuaries of India. Threatened and endangered species of India.
- 13 Environmental planning and environmental impact assessment.
- 14 Brief account of environmental Acts and Legislations (enacted after 1970).

UNIT-V

- 15 Concepts and applications of Biostatistics.
- 16 Frequency distribution, graphical presentation, mean, mode, median, standard deviation and standard error.
- 17 Correlation, T-test, Chi-square test.
- 18 Shanon and Weiner diversity index.

THIRD YEAR T.D.C. SCIENCE, 2006-07

ZOOLOGY

PAPER-III ETHOLOGY AND EVOLUTION

Duration : 3 hours

M.M. : 50

UNIT-I

- 1 Introduction and history of Ethology.
- 2 Methods of studying behaviour.
- 3 Neuroanatomical, neurophysiological, neuro-chemical, focal and scan sampling techniques.
- 4 Evolutionary approach to behaviour, levels of natural selection.
- 5 Human Ethology, general aspects.
- 6 Orientation taxes and kinesis.
- 7 Brief idea of learning.

UNIT-II

- 8 Social organization with reference to dominance, hierarchy, social competition and territoriality.
- 9 Reproductive behaviour with reference to courtship, mating, parental investment and stickle back fish (sexual dimorphism).

- 10 Elementary idea of role of pheromones and hormones in insects and vertebrates in relation to behaviour.
- 11 Adaptation and behaviour of Tiger.

UNIT-III

- 12 Origin of life
- 13 History of evolutionary thought, Lamarckism and Neo-Lamarckism
- 14 Darwinism and Neo-Darwinism
- 15 Evidences of organic evolution.
- 16 Concept of micro and mega -evolution

UNIT-IV

- 17 Variation: Kinds and sources, role in evolution.
- 18 Isolation and speciation, definition, isolating mechanism, origin of species and processes of speciation.
- 19 Adaptation: Definition, kinds of adaptations, adaptive radiation, convergence and divergence.
- 20 Geological time scale.

UNIT-V

- 21 Brief account of zoogeographical regions of world.
- 22 Fossils and their evolutionary significance.
- 23 Phylogeny of horse.
- 24 Evolution of man.

THIRD YEAR T.D.C. SCIENCE, 2006-07

ZOOLOGY - PRACTICAL

Duration : 5 Hrs.

M.M. : 75

<u>S.No.</u>	<u>Exercise</u>	<u>Regular</u>	<u>Ex-Students</u>
1	Dissection	18	25
2	Ecology/ Ethology exercise	09	12
3	Physiological and Biochemical exercise	08	08
4	Spots (1-10)	20	20
5	Viva-voce	10	10
6	Record	10	—
	Total :	75	75

ETHOLOGY AND EVOLUTION :

- 1 Habituation in earthworm/mosquito larvae.
- 2 Feeding behaviour of housefly/stored product pest.
- 3 Antennal grooming behaviour of cockroach.
- 4 Trial and error and latent learning in rat /mice.
- 5 Phototaxis and chemotactic behaviour in *Paramecium*.
- 6 Visit to a zoo/natural habitat of wild animals.

- 7 Demonstration of social behaviour of honey bee colony.
- 8 Adaptive modifications in the feet of birds.
- 9 Adaptive modification in the beak of birds.
- 10 Adaptive modification in the mouth parts of insects.

BIOCHEMICAL, PHYSIOLOGICAL AND ECOLOGICAL EXERCISES :

- 1 Various biochemical tests of
 - (a) Proteins
 - (b) Carbohydrates
 - (c) Lipids
- 2 Action of salivary amylase.
- 3 RBC and WBC counts.
- 4 Estimation of haemoglobin.
- 5 Blood groups (ABO and Rh).
- 6 Measurement of blood-pressure.
- 7 Abnormal and normal values of constituents of urine.
- 8 Water analysis : pH, alkalinity, dissolved oxygen, chloride and transparency.
- 9 Soil analysis : texture, moisture, organic and inorganic contents.

DISSECTIONS :

Scoliodon : Cranial nerves and brain.

Rana : Cranial nerves and brain.

Rattus : Brain and neck nerves. (exposure of ganglia)

MUSEUM SPECIMENS/SLIDES SHOWING

ADAPTATIONS :

Students are required to write about specific adaptations of following animals in relation to habit and habitat only:

Cursorial : *Acinonyx jubatus, Equus caballus, Moschus moschiferous.*

Flight : *Columba livia, Pteropus, Draco, Exocoetus, Papilio.*

Arboreal : *Chamaeleon, Hyla, Preshytis.*

Aquatic : *Physalia, Chiton, Hydrophis, Labeo, Anguilla, Notopterus*

Fossorial : *Pheretima, Teredo, Chaetopterus, Talpa, Lepus, Ichthyophis, Naja.*

Parasitic : *Taenia, Fasciola, Enterobius, Ascaris, Schistosoma, Hirudinaria, Pediculus, Ixodes.*

REFERENCE BOOKS (LATEST EDITIONS) :

ANIMAL PHYSIOLOGY :

- 1 William S. Hoar, General and Comparative Physiology, Prentice Hall of India Pvt. Ltd.
- 2 Wood, D.W., Principles of Animal Physiology.
- 3 Prosser CL., Comparative Animal Physiology, Satish Book Enterprise.
- 4 Eckert, Animal Physiology. (W.H. Freeman).
- 5 Ganong : Review of Medical Physiology (Lange).

BIOCHEMISTRY :

- 6 Stryer, L : Biochemistry (Freeman)
- 7 Conn et al : Outlines of Biochemistry (Wiley)
- 8 R.K. Murray et al, Harpers Biochemistry, Lang Medical Book.

IMMUNOLOGY

- 9 Roitt I : Essential Immunology (ELBS)
- 10 Kuby : Immunology (W.H. Freeman).

ECOLOGY

- 11 Odum, E.P. : Ecology (Amerind).
- 12 Odum, E.P. : Fundamentals of Ecology (Saunders).
- 13 Ricklefy : Ecology (W.H.Freeman).

BIOSTATISTICS :

- 14 Green, R.H. Sampling design and statistical methods for environmental biologists. John Wiley and Sons, New York.
- 15 Snedecor, G.W. and W.G. Cochran. Statistical methods. Affiliated East-West Press, New Delhi (Indian Ed.)
- 16 P.N.Arora and P.K.Malhan, Biostastics, Himalaya Publishing House, Bombay.

ETHOLOGY

- 17 Drickamer & Vessey: Animal Behaviour, Concepts, Processes and Methods (Wadsworth).
- 18 Grier : Biology of Animal Behaviour (Mosby College)
- 19 Immelmann : Introduction to Ethology (Plenum Press)
- 20 Lorenz : The Foundation of Ethology (Springer-Verlag)
- 21 Manning : An Introduction to Animal Behaviour (Addison-Wesley)
- 22 Reena Mathur : Animal Behaviour, Rastogi Publications, Merrut.

EVOLUTION :

- 23 Dobzhansky, Ayala, Stebbins & Valentine : Evolution (WH Freeman).

- 24 Dobzhansky : Genetics and Origin of species (Columbia University Press)
- 25 Major : Population, Species and Evolution
- 26 White : Animal Cytology and Evolution.
- 27 Moody : Introduction to Evolution
- 28 Savage : Evolution (Holt, Reinhart and Winston).

PRACTICAL :

- 29 Verma, PS, A manual of practical Zoology Vertebrates S.Chand and Co. Ltd., Ram Nagar, New Delhi(English and Hindi Editions).
- 30 Lal, SS : Practical Zoology Vertebrates, Rastogi Publication, Meerut(English and Hindi Editions).
- 31 Verma PS & Srivastava PC, Advanced Practical Zoology, S.Chand & Co.

THIRD YEAR T.D.C. SCIENCE, 2006-07

ENVIRONMENTAL SCIENCES

The third year TDC examination shall consist of three theory papers, each of three hours duration and a practical examination of five hours duration.

Marks

Paper-I : Toxicology	50
Paper-II : Pollution Ecology	50
Paper-III : Resource Conservation, Legislation, Planning and Wild Life	50
Practical :	75

Pattern of question paper in the annual examination and distribution of marks:

Each theory paper in the annual examination shall have three sections i.e. A, B and C. **In Section A**, total 10 questions will be set in the paper, selecting at least two from each unit. These questions to be answered in a word or so. All questions are compulsory. Each question carries 0.5 mark, total 05 marks.

In Section B, there shall be total 10 questions, selecting two questions from each unit, five questions to be answered by the student selecting at least one from each unit. Answer should be given in approximately 250 words. Each question carries 05 marks, total 25 marks.

In Section C, 04 descriptive type questions will be set in the examination paper from five units of the syllabus of the paper, selecting not more than one question from a unit. Each question may have two sub divisions. Students are required to answer any two questions approximately in 500 words. Each question is of 10 marks, total 20 marks.

THIRD YEAR T.D.C. SCIENCE, 2006-07

ENVIRONMENTAL SCIENCES

PAPER-I TOXICOLOGY

Duration: 3 Hrs.

M.M.: 50

UNIT-I

Definition of Toxicology, toxic substances in the environment; Concept of dose-response relationship; acute toxicity, chronic toxicity, lethal concentration, effective concentration, median tolerance limits.

UNIT-II

Metabolism of toxic substances by animals – uptake, excretion, chemical localization and its consequences; hepatic metabolism; Synergistic and Antagonistic effects.

UNIT-III

Metabolism of toxic substances by plant – uptake, translocation, metabolism and excretion, pathogen toxins, herbicides; Atmospheric toxicants and plants; Algal toxins, Mycotoxins.

UNIT-IV

Environmental factors in human health; Occupational hazards and diseases and their prevention. Food

poisoning, toxicity of drugs, antibiotics, pesticides, metals; drug allergies.

UNIT-V

Teratogenicity, carcinogenesis and brief idea of genotoxicity.

Fumacatories and masticatories – sources, uses, effects on human body and evil effects on the society.

ENVIRONMENTAL SCIENCES

**PAPER-II
POLLUTION ECOLOGY**

Duration: 3 Hrs.

M.M.: 50

UNIT-I

Pollution – definition, types.

Air pollution – Sources, gaseous pollutants (SO_2 , NO_2 , CO , O_3 , HF) and particulates; Acid rain, Fly ash, Aerosols, Green House Effect; Effects and control of air pollution; Air quality standards.

UNIT-II

Air Pollution and Meteorology : Principles of air monitoring, Pollution indicators and Biomonitoring . Environmental problems of Rajasthan.

UNIT-III

Water pollution – kinds and sources of water pollutants, municipal water pollution, municipal sewers and sewage; Industrial and commercial water pollution. Safe drinking water; Water quality standards.

UNIT-IV

Land Pollution – Effects of agrochemicals – herbicides, pesticides and fertilizers; Mining and smelting. Radioactive pollution – Radiation and their types – non- ionizing and ionizing radiations; sources in environment, effects on man, animals and plants; Prevention.

UNIT-V

Noise pollution – sources and effects.

Thermal pollution – causes and effects.

Marine spillage – sources and hazards.

THIRD YEAR T.D.C. SCIENCE, 2006-07

ENVIRONMENTAL SCIENCES

PAPER-III

RESOURCE CONSERVATION, LEGISLATION, PLANNING AND WILD LIFE

Duration: 3 Hrs.

M.M.: 50

UNIT-I

Natural resources and their conservation. Forests, minerals, water, aquaculture, sea, range management, land use; soil erosion and conservation.

UNIT-II

Concept of biological diversity, conservation of biological diversity, Endangered species, Red data book, threatened plant species of India; National Herbaria and Botanical Gardens.

UNIT-III

Wild life in India – Status and conservation efforts; protected species; Status of Wild life sanctuaries and National Parks in India; Biosphere Reserves.

UNIT-IV

Brief account of environmental acts and legislation; Role of UNEP, IUCN, ELC and MAB in conservation of

nature and natural resources. Environmental Planning - problems of urban environment and planning; problems of rural environment and efforts for integrated rural development.

UNIT-V

Environmental Impact Assessment. Application of remote sensing for study and management of ecosystem. Concept of recycling and reuse of waste. Eco-conservation of Aravali.

THIRD YEAR T.D.C. SCIENCE, 2006-07

ENVIRONMENTAL SCIENCES

PRACTICALS

Duration : 5 Hrs.

M.M.: 75

	Regular	Ex- Students
1. Major Exercise	15	25
2. Major Exercise	15	15
3. Minor Exercise	10	08
4. Spots	20	20
5. Viva – Voce	10	10
6. Record	05	—
Total :	75	75

THIRD YEAR T.D.C. SCIENCE, 2006-07

ENVIRONMENTAL SCIENCES

PRACTICALS

Duration : 5 Hrs.

M.M.: 75

1. Study of ambient air quality with respect to :
 - a) SPM
 - b) SO₂
 - c) NO₂
 - d) O₃
2. Study of water quality with respect to :
 - a) BOD
 - b) COD
 - c) Colour
 - d) pH
 - e) Dissolved oxygen
 - f) Total hardness
 - g) Alkalinity
 - h) Nitrates
 - i) Phosphates
3. Study of soil characteristics with particular reference to :

- a) Porosity
 - b) Bulk density
 - c) Air content
 - d) Water holding capacity
 - e) pH
 - f) Organic carbon
 - g) Total nitrogen
 - h) Sulphate-sulphur
 - i) Available phosphorus
 - j) Calcium
 - k) Metals
4. Calculation of Lc 50
 5. Study of plankton diversity in lake waters and calculation of similarity index.
 6. Examination of prepared histopathological slides to describe the toxicological effects of various environmental agents.
 7. To study the effect of certain toxicants on the chromosomes of *Tradescantia* / Onion.
 8. Field excursion to a polluted site, Forest and Wild life Sanctuary, National Park and submission of report.
 9. Study of external and internal adaptation and characteristics of important hydrophytes and xerophytes.

THIRD YEAR T.D.C. SCIENCE, 2006-07

ENVIRONMENTAL SCIENCES

BOOKS RECOMMENDED :

- 1 P.D. Sharma : Environmental Toxicology
- 2 K.C. Agarwal : Environmental Pollution - Causes Effects and Control, Nidhi Publishers, Bikaner.
- 3 P.D. Sharma : Ecology and Environment , Rastogi Publications, Meerut.
- 4 F.Ranade (1984) : Ecology of Natural Resources, John Wiley and Sons, Singapore.

PRACTICAL :

- 5 J. Pandey and M.S. Sharma : Environmental Science: Practical and Field Manual, Yash Publications, Bikaner.

**COURSE CURRICULAM AND SYLLABII OF
THREE YEAR DEGREE COURSE 2004-2007**

PHYSICS

COURSE CURRICULAM

Paper- code	Paper	Nomenclature	Lect- ures	Dura- tion	Max. Marks	Min. Marks
3161	I	Quantum Mechanics, Atomic and Molecular Physics	60 hrs	3hrs	50	18
3162	II	Electrodynamics, Electromagnetic Waves and Relativity	60 hrs	3 hrs	50	18
3163	III	Solid State, Nuclear and Particle Physics	60 hrs	3 hrs	50	18
3164	IV	Practicals	120 hrs	6 hrs	75	27

Each theory paper in the annual examination shall have three sections.

Section A shall contain one compulsory question of 5 marks having 10 parts. Two parts shall be set from each unit. The candidate is required to answer each part in about 20 words.

Section B shall contain five compulsory questions of 5 marks each with internal choice. One question with internal choice will be set from each unit. The answer may be given in approximately 250 words.

Section C shall contain four descriptive questions covering all units and candidate has to answer any two questions of ten marks each. The answer may be given in approximately 500 words. There can be two parts in a question from this section.

In total the candidate has to answer eight questions in each theory paper.

**THIRD YEAR T.D.C. SCIENCE
2006-2007**

PAPER-I

**QUANTUM MECHANICS AND ATOMIC &
MOLECULAR PHYSICS**

UNIT-I

Introductory Schrodinger theory :

Rise and fall of Plank-Bohr quantum theory, Duality of radiation and matter, de Broglie's hypothesis, justification for the relation, experimental confirmation.

Phase and group velocities of a wave; formation of a wave packet, illustrations. Uncertainty principle relating to position and momentum, relating to energy and time, application complimentarity principle, photon interpretation of two slit interference, Einstein-de-Broglie relations as a link between particle and wave properties, general equation of wave propagation, propagation of matter waves, time dependent and time independent schrodinger equations, physical meaning of ψ , conditions to be satisfied by schrodinger equation as an operator equation. Postulatory approach to wave mechanics, operators, observable and measurements.

Simple one dimensional problem; particle in a box with rigid walls. Concept of a potential well. Wave functions and energies for the ground and excited states; quantization of energy qualitative discussion of the solutions for a shallow potential well.

UNIT - II

Operator formulation in quantum mechanics

Operators, eigen values and eigen functions; linear operators, product of two operators, commuting and non commuting operators, simultaneous eigen functions, orthogonal functions. Hermitian operators, their eigen values, Hermitian adjoint operators, expectation values of an operator.

Application of Operator methods ; Simple harmonic oscillator, step-up and step-down operators, eigen functions and eigen values of the ground state and excited state, zero point energy, probability density and its variations with degree of excitation ; orthogonality of wave functions.

Other one dimensional problems ; step potential, penetration through rectangular barrier. Transmission coefficients, barriers of special shapes, quantum mechanical tunneling, particle in of three dimensional cubical box, degeneracy.

UNIT-III

Angular momentum and spin

Central force ; orbital angular momentum, operators for its cartesian components, commutation relations, mutual as well as with L^2 , operators L^+ and L^- , their interpretation as step operators eigen values of L_z , half integral values for quantum numbers. Angular momentum operators in spherical polar coordinates;

evaluation of their eigen functions, explicitly in terms of the coordinates, their degeneracy.

Schrodinger equation for hydrogen atom in spherical polar coordinates; separations into radial and angular variation, qualitative discussion of spherical harmonics.

Angular momentum and magnetic moment of electron due to orbital motion Bohr magneton.

UNIT - IV

Mono valent and divalent atoms

Back ground from quantum theory : The four quantum numbers ; spectral terms arising from L-S coupling, s,p,d,f, notation, selection rules. Half life of excited states, width of a spectral line.

Spectra of mono and divalent atoms : Doublet fine structures of hydrogen lines ; screening constant for monovalent atoms, series limits, doublet structure for alkali spectrum. Spectra of helium and alkaline earth atoms, singlet and triplet series.

Effect of magnetic field on energy levels : Gyromagnetic ratios for orbital and spin motions ; vector model, Lande g factor, strong and weak field effects, illustrative cases of H, Na, Ca and Hg.

X-ray spectra : The continuous x-ray spectrum, Duane and Hunt limit. Characteristic x-rays : Mosley's law, doublet fine structure, H-like character of x-ray states, x-ray absorption spectra, absorption edges.

UNIT - V

Diatomic and triatomic molecules

Sharing of electrons : formation of molecular orbitals, H_2^+ ions H_2^- molecule, electronic levels, singlet and triplet characters. Rotational energy levels, inter-nuclear distance.

Vibrational energy levels, force constants, anharmonicity dissociation energy, isotope effects on rotational and vibrational energies. Raman effect.

Spectra of diatomic molecules : Pure rotation spectra ; selection rules, vibration-rotation spectra, selection rules, P, Q and R branches.

Electronic band systems, sequences and progressions

Franck-Condon principle.

Triatomic and complex molecules : Normal modes of a triatomic molecules, selection rules for infrared absorption, molecular orbital in complex molecules, approximations for treating HOC vibrations relative to rest of the molecules.

Recommended Books

1. Quantum mechanics : S.P. Singh, M.K. Bagde and Kamal Singh (S.Chand and Co)
2. Quantum mechanics A listair I M Rac. ELBS (Low Price edition)

3. Quantum mechanics , S. N. Biswas, Books and Allied, Calcutta (P) Ltd.
4. Atomic and Nuclear Physics ; A.B. Gupta, New central book agency pvt. Ltd.
5. Introduction to Modern Physics, H S Mans and G K Mehta

PAPER-II
ELECTRODYNAMICS, ELECTROMAGNETIC
WAVES AND RELATIVITY

UNIT - I

Motion of charged particles in **E** and **B** fields: Case of cathode ray oscillograph, positive ray parabola, velocity selector, magnetic focusing, cyclotron and betatron, mass spectrography.

Faraday's law for electromagnetic induction: Faraday's law integral and differential forms; self-inductance of a solenoid and of a straight conductor, energy stored in an inductor and in the magnetic field. Displacement current; modified Ampere's law, Maxwell's equation for time-dependent electromagnetic field in vacuum and in material media, boundary conditions.

UNIT - II

Electromagnetic potentials: Magnetic vector potential **A** and scalar potential. Poisson's equation for **A** in terms of current density, solutions for line surface currents. Coulomb and Lorentz gauge transformations, Lorentz law in terms of potentials.

Maxwell's equations and electromagnetic waves: Plane-wave solution for Maxwell's equation; orthogonality of **E**, **B** and propagation vector. Poynting vector; energy and momentum propagation, reflection and transmission at dielectric boundaries (normal incidence), polarization by reflection, Brewster's angle.

UNIT - III

Electromagnetic waves in conductors: Modified field equation; attenuation of the wave, reflection at and transmission through a conducting surface. Total internal reflection

Radiation from accelerated charges: Modification of Coulomb's law to include velocity and acceleration dependent terms in **E** field. Radiation from an oscillating dipole and its polarization. Radial and spherical power of electromagnetic radiation, Radiation pressure equation in free space and medium

UNIT - IV

The Lorentz transformations: Galilean transformations; Newtonian relativity, instances of their failure; electromagnetism, aberration of light, Michelson-Morley experiment; Einstein's basic postulates and geometric derivation of Lorentz transformations; invariance of Maxwell's equations, length contraction, simultaneity, synchronization and time dilation, Einstein's velocity addition rule, Doppler effect in light. Relativistic gravitational Red Shift

UNIT - V

Relativistic dynamics: Variation of mass with velocity, mass energy equivalence, relativistic formulae for momentum and energy.

The structure of space-time: Four vectors; invariance of an interval, time-like, space-like and light-like intervals, Minkowski space.

Relativistic electrodynamics: Electric field of a point charge in uniform motion; transverse components, magnetism as a relativistic phenomenon, transformation of **E** and **B** fields.

Text and Reference Books :

1. D.J. Griffiths: Introduction to Electrodynamics, Prentice Hall of India, 1989.
2. Reitz and Milford : Introduction to Electrodynamics, Addison-Wesley.
3. A.M. Portis: Electromagnetic Fields
4. J.B. Marion: Classical Electromagnetic radiation (Academic Press)
5. R.P. Feynmann, R.B. Leighton and M. Sands: The Feynmann lectures in physics, Vol. II (B.I. Publications).
6. B. Saraf et al. : Physics through experiments Vol.I – EMF, constant and varying, Vikas Publishing House.
7. D.R. Corson and P. Lorrain: Introduction to Electromagnetic fields and waves, Freeman-Taraporevala, Bombay, 1970.
8. E.C. Jordan and K.G. Balmain: Electromagnetic waves and radiating systems, 2nd Ed., Prentice Hall of India, New Delhi, 1971.

PAPER-III

SOLID STATE, NUCLEAR AND PARTICLE PHYSICS

UNIT - I

Crystal geometry: crystal lattice, crystal planes and Miller indices, unit cells. Typical crystal structures, coordination number, packing fraction, symmetry elements, rotation, inversion and reflection, point groups and crystal classes, space groups.

Crystallography: Bloch functions, Bloch's theorem, diffraction of X-rays by a crystal lattice. Laue's formulation of X-ray diffraction, reciprocal lattice, Brillouin zones, Laue spots, rotating crystal and Debye-Scherrer methods.

UNIT - II

Types of binding in solids: covalent binding and its origin, ionic binding, energy of binding, transition between covalent and ionic binding, metallic binding, Van der Waal's binding, hydrogen bond.

Conduction in metals : Drude's theory, DC conductivity, AC conductivity, plasma frequency, thermal conductivity of metals, Fermi-Dirac distribution, thermal properties of free-electron gas, Sommerfeld's theory of conduction in metals.

UNIT - III

Conduction in semiconductor: Bands in solids, metals, insulators and semiconductors. Motion of free

electrons on a chain of atoms, effective mass, electrons and holes, donor and acceptor impurities, donor impurity levels. Thermal excitation of carriers, electrical conductivity. Elementary ideas of Hall effect in metals and semiconductors and magneto resistance.

Charge transport in semi-conductors: Ionization energy of impurity atoms, carrier concentration in doped semiconductors at high and low temperatures, control of conductivity of semiconductors by impurities and current flow in semi-conductors.

UNIT - IV

Structure of nucleus: discovery of the nucleus, composition. Basic properties: charge, mass, size, spin, magnetic moment, electric quadrupole moment, binding energy, binding energy per nucleon and its observed variation with mass number of the nucleus. Coulomb energy, volume energy, surface energy, other corrections, explanation of the binding energy curve. Liquid drop model of the nucleus.

Nuclear forces: two-nucleon system, deuteron problem, binding energy, nuclear potential well, results of p-p and n-p scattering experiments, meson theory of nuclear forces e.g. Bartlett, Heisenberg, Majorana forces and potentials.

Radioactivity: decay constant and half-life, spectra of emitters, Geiger-Nuttal law, Gamow's explanation. Beta decay: elementary Fermi's theory. Antineutrino. Nuclear radiation, energy levels.

UNIT - V

Detectors for charged particles: Ion chamber, Geiger counter, resolving time, cloud chamber.

Accelerators: Need for accelerators; cyclic accelerators, cyclotron, synchrocyclotron, variable energy cyclotron, phase stability.

Rutherford scattering formula, different types of nuclear reactions.

Artificial radioactivity: Nuclear fission, neutron reactions, Fermi and transuranic elements, chain reaction, criticality, moderators.

Discovery of cosmic rays: hard and soft components, discovery of muon, pion, heavy mesons and hyperons, mass and life time determination for muon and pion. Primary cosmic rays: Extensive air showers, solar modulation of primary cosmic rays, effect of earth's magnetic field on the cosmic ray trajectories.

Resonant particles: discovery and important properties. Strangeness, conservation of strangeness in particle interactions, quark hypothesis, high energy electron scattering from protons, basic interactions of quarks and leptons, interrelation between particle physics and cosmology.

Text and Reference books:

- 1 D.J. Griffiths: Introduction to Electrodynamics, Prentice Hall of India, 1989.

- 2 Reitz and Milford: Introduction to Electrodynamics, Addison-Wesley.
- 3 A.M. Portis: Electromagnetic Fields
- 4 J.B. Marion: Classical Electromagnetic radiation (Academic Press)
- 5 R.P. Feynmann, R.B. Leighton and M. Sands: The Feynmann lectures in physics, Vol. II (B.I. Publications).
- 6 B. Saraf et al. : Physics through experiments Vol.I – EMF, constant and varying, Vikas Publishing House.
- 7 D.R. Corson and P. Lorrain: Introduction to Electromagnetic fields and waves, Freeman-Taraporevala, Bombay, 1970.
- 8 E.C. Jordan and K.G. Balmain: Electromagnetic waves and radiating systems, 2nd Ed., Prentice Hall of India, New Delhi, 1971.

PAPER-IV

PHYSICS PRACTICALS

Note : Students are required to do any sixteen experiments from two sections in all taking eight experiment from each section. One experiment from section A and one from section B shall be set in the examination paper.

The distribution of marks in the practical examination will be as follows:

(i) Two experiments 48 Marks

For each experiment, distribution of marks will be as follows:

Figure :	3
Formula/Theory :	3
Observation :	10
Calculation and Result :	6
Precautions :	2
(ii) Viva voce	12
(iii) Records	15
Total	75 Marks

LIST OF EXPERIMENTS

Section-A

1. Determination of e/m , specific charge of an electron by helical method.
2. Determination of Planck's constant by photo conductivity method.
3. Determination of refractive index of air using Jamin's interferometer.
4. Determination of wave length of a monochromatic light using Michelsons Interferometer.
5. Verification of Fresnel's law of reflection by a plane surface.
6. To analyze elliptically polarized light by photo-electric cell/Babinet's compensator.
7. Determination of viscosity of a fluid by rotation viscometer.
8. Study of ferromagnetic material by plotting hysteresis curve of the specimen by Ballistic galvanometer/ CRO.
9. Study of Photoelectric effect and to determine electronic charge and work function
10. Determination of ultrasonic wave velocity in a liquid
11. Determination of Surface tension by Ferguson-Kennedy method.
12. Wave length of spectral lines of Hg lamp by Constant Deviation Spectrometer (Visual)

Section-B

1. Study frequency response of a common emitter current series negative feedback amplifier.
2. Study the characteristics of a Field effect Transistor and to determine mutual conductance, output resistance and voltage gain.
3. Study voltage wave forms of a transistorized monostable and bistable multivibrator.
5. Study clipping and clamping using diode.
6. Study detection efficiency of a diode by direct method.
7. Study amplitude modulation with the help of CRO
8. Study frequency response of an inverting and non-inverting operational amplifier
9. Study variation of output power with load impedance in Push-Pull amplifier.
10. Study of Hartley oscillator and determination of Q of a standard coil.
11. Study frequency response of a transformer coupled amplifier.
12. Study of field emission as a tunneling phenomenon.
13. Numerical simulation of wave functions of simple harmonic oscillator.
14. Computation of wave function and their interpretation for various potentials.

15. Computation of transmission coefficients for barriers of different shapes.
16. Simulation of wave functions for a particle in a critical box.
17. Study of fine structure in a doublet spectrum and its quantum mechanical interpretation.
18. Interpretation of angular wavefunctions of hydrogen atom and its application to the study of pure rotation spectra of molecules.
19. Study of Paschen - Back effect and its quantum mechanical interpretation.
20. Flame spectra of some salt.
21. Spectrum of atomic hydrogen and Rydeberg constant.
22. Absorption spectrum of a coloured solution or fluorescence spectrum of a salt.(e.g. uranyl nitrate)
23. Interpreting a given Zeeman spectrum with a polaroid.
24. Absorption spectrum of Iodine vapour.
25. Studying the Raman spectrum of a sample (may use laser excitation).
26. Studying the linear dispersion in a given prism or a grating spectrometer.
27. Studying the life time of a phosphor through decay study.
28. Study of induced emf for a magnet crossing a coil(CDPE Jaipur experiment)

THIRD YEAR SCIENCE, 2006-2007

COMPUTER SCIENCE

PAPER-I

OPERATING SYSTEM AND FUNDAMENTALS OF C PROGRAMMING

M.M.: 50

UNIT-I

Familiarity with terms : Application and System software, common system softwares: compiler, interpreter, assembler, operating system, loader, linker.

Operating system : Generation of operating systems, concepts - process, file, directory, shell, functions of operating system.

Memory management : Single contiguous allocation, partitioned allocation, relocatable partition, paged allocation, segmented allocation.

UNIT-II

Computer Processing Techniques : Batch processing, on-line processing, multiprogramming, time sharing, real time processing.

Single user OS : DOS - History, Booting process, types of commands - internal, external. Concept of files and directories. Batch file processing, editors in DOS, redirection of input and output.

Multi-user OS : UNIX-History, design principles, user programmer interface, file system, processor management, memory management, shell, kernel, UNIX commands, editors in UNIX.

UNIT-III

Language C : Introduction to C, basic structure of a C program, constants, variables, data types and their sizes.

Operators and expressions : Arithmetic, relational, logical, increment, decrement, conditional, bitwise, special operators.

Arithmetic expressions : Evaluation, precedence of operators, type conversions, simple programs based on these concepts.

UNIT-IV

Language C : Control of flow statements and blocks, if-else, else-if, switch. Loops - while, for, do while, break, continue, GOTO, labels, programs using these statements.

Arrays : Introduction to one, two, multidimensional arrays.

User defined functions : Need of user defined functions, multifunction programs categories of function, arguments and their types, return values and their types, recursion, scope and lifetime of variables in function, programs based on above concepts.

UNIT-V

Language C : Structures : Defining and processing structured data types, structure initialization, array of structures, array with structures, array of structures, hierarchical structure, union, size of structure, operations on structure.

Pointers : Understanding pointers, accessing variables through pointers, declaring and initializing pointers, pointer expressions, pointers and arrays, pointers and character strings, pointers and functions, pointers and structures, pointers on pointers.

File management in C : Introduction, Simple processing of sequential and random access files, command line arguments, error handling during I/O Operations.

Suggested Books

1. Donovan J.J, System Programming, McGraw-Hill, International series.
2. Damdhare D.M., Introduction to system software, Tata McGraw-Hill Publishing Company Limited, New Delhi.
3. Deitel H., Operating system, Second Edition, Addison Wesley Publishing Company(International Edition).
4. Rajaraman V., Computer programming in C, Prentice Hall of India Private Limited, New Delhi.
5. Gottfreid, Programming with C, Schaum's Outline Series, 1991 Tata McGraw-Hill Publishing Company Limited, New Delhi.
6. Balguruswamy E., Programming in ANSI C, Second Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.
7. Donovan J., System Programming, Tata McGraw-Hill Publishing Company Limited, New Delhi.

PAPER-II
DATABASE MANAGEMENT SYSTEM

M.M.: 50

UNIT-I

Database concepts - Database design, design philosophies, conceptual, logical and physical models.

Database management system : Goals and objectives, classical data models : Relational, Network and Hierarchical models.

UNIT-II

Schema and sub-schema, Data definition and data manipulation languages : introduction, brief idea of CODASYL DDL. Study of relational model : E-R model, reducing of E.R diagram to tables and design of Relational database based on E-R model.

UNIT-III

File Organization : Logical and physical file organization, sequential, random, hierarchical, inverted, multilinked. Indexing and hashing files.

UNIT-IV

RDBMS Concepts: Relationals, domains, attributes, scheme, keys, relational algebra, Simple relational and domain relational calculus.

UNIT-V

Introduction to SQL languages. Formulation of queries in SQL Language and query by example.

Suggested Books

1. Martin James : Computer database organization, Second Edition, Prentice Hall of India Private Limited, New Delhi.
2. Date, C.J. : An introduction to database system, Third Edition, Vol. I, Narosa Publishing House, New Delhi.
3. Ulman J.D. : Principles of database management system, Second Edition, Galgotia Publishers Private Limited, New Delhi.
4. Awad E. : System Analysis and Design, Galgotia Publications Private Limited., New Delhi.
5. Clifton H.D. : System analysis for business data processing, Prentice Hall of India Private Limited, New Delhi.

PAPER-III
COMPUTER GRAPHICS

M.M.: 50

UNIT-I

Geometry and line generation : points and lines, planes and coordinates, line segments, vector generation algorithms, pixels and frame buffer, character generation.

UNIT-II

Graphic primitives : Display devices, display file structure and interpreters, device coordinates, polygons, interfacing algorithms, filling of polygons.

UNIT-III

Transformation matrices : scaling, rotation and translation transformations, shear transformations, translations, display procedure.

UNIT-IV

Segmentation : Segment creation, renaming, deletion, closing of segments, image transformations, saving and showing segments, windowing and viewing transformations, clipping of line and polygons.

UNIT-V

Interactive devices : Introduction to positioning and pointing devices, principle and working of joy stick, light pen and mouse.

Introduction to 3D graphics : Geometrical, coordinate transformations, rotation about arbitrary axis, 2D projections : parallel and perspective projections, viewing parameters, special projection, introduction to 3d clipping and elementary algorithms.

Suggested Books

1. Harrington S., Computer Graphics : A programming approach, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Newman and Sproul, Principles of interactive computer graphics, Tata McGraw-Hill Publishing Company Limited.
3. Hearn D. and Baker, Computer graphics, 1993, Prentice Hall of India Private Limited.

COMPUTER SCIENCE - PRACTICALS

Duration : 5 Hrs.

M.M.: 75

Note : Students are required to attempt two exercises one from each part.

Marks Distribution :

Part A : 24

Algorithm and flowchart : 8

Program Coding : 8

Program execution, result and documentation : 8

Part B : 24

Algorithm and flow chart : 8

Program coding : 8

Program execution, result and documentation : 8

Viva : 12

Record : 15

PART-A

Numerical methods implementation using any programming language.

1. Program for addition, subtraction, multiplication of matrices.
2. Program to find transpose, inverse of matrix.
3. Program to test symmetry of matrix.
4. Program to find root of an equation by
 - a) Bisection method
 - b) False position method
 - c) Newton Raphson method.
5. Solution of differential equation by -
 - a) Runge Kutta method
 - b) Predictor corrector method
6. To solve simultaneous equations by
 - a) Gauss Siedel method
 - b) Gauss elimination method
7. To find integral of a function using
 - a) Trapezoidal method
 - b) Simpson method
8. To interpolate a function using Langrange's interpolation method.

9. To find complex roots of an equation using Bairstow's method.
10. To fit linear and exponential curves using least square fit method.

PART-B

Programming in C

1. Simple program to show structure of C.
2. Program on various conditional and looping statements.
3. Programs on control statements.
4. Programs on single and multi-dimensional arrays.
5. Programs using functions.
6. Programs using enumerated data types.
7. Programs using structures, array of structures.
8. Programs on pointer data and applications.
9. Programs on processing of strings.
10. Programs on file processing.
11. Programs to plot line, circle and ellipse
12. Implementation of two dimensional transformation and clipping algorithm.

B.A./B.Sc. THIRD YEAR, 2006 - 2007

MATHEMATICS

PAPER - I ANALYSIS

Note : The question paper will be divided into three section A, B and C as follows:

Section A : In this section, questions will be set taking two questions from each unit. Each question will be of short answer type not exceeding 20 words and will carry 3/4 mark. The candidate will be required to attempt all the questions. (aggregating 7.5 marks).

Section B : In this section, ten questions will be set taking two questions from each unit. The answer of each will not exceed 250 words or two and a half page., Each question will be of 7.5 marks. The candidate will be required to attempt five questions in all. taking one question from each unit, (aggregating 37.5 marks).

Section C : In this section, four questions will be set covering all the five units and whose answers shall not exceed 500 words or five pages each. Each question may have sub-parts in it and will carry 15 marks. The candidate will be required to attempt any two questions (aggregating 30 marks).

UNIT - I

Real number system :

- (i) Field, ordered field, upper and lower bounds of a set in an ordered field. Supremum and infimum of a set and their properties.

Completeness, archimedean and denseness properties of an ordered field, the set \mathbb{Q} of rational numbers as a non-complete dense.

Archimedean ordered field and the set \mathbb{R} of real numbers as a complete dense Archimedean ordered field,

- (ii) Equivalent sets and their examples, nature of the relations of equivalence. Denumerable and non denumerable sets, countable and uncountable sets, Nature of subsets of a countable set and that of a denumerable (countable) sets, union of denumerable (countable) sets, Denumerability of the sets of integers and rational numbers and non denumerability of the closed unit interval $[0, 1]$ and the sets of real numbers and irrational numbers.

UNIT - II

- (i) Sequence Bounded sequence, monotonic. sequence, limit of a sequence, convergent sequence, properties of convergent sequence, Cauchy first and second theorems on limits, subsequence and its properties, Cauchy sequence and its properties, Cauchy general principle of convergence, Examples of convergent sequences.

- (ii) Series : Convergence and divergence of an Infinite series of real numbers, the necessary and sufficient conditions, various tests of convergence problems and their illustrations with regard to infinite series of positive terms.

UNIT-III

Series :

Alternating series and Leibnitz test, absolute and semi (or conditional) convergence.

Riemann Integration:

Upper and Lower Darboux sum, Upper and Lower Riemann integrals, Riemann integrability of a bounded function in a closed interval, the necessary and sufficient condition for \mathbb{R} integrability in terms of Darboux sums, properties of \mathbb{R} -integrable functions, Mean value theorems.

Fundamental theorem of integral Calculus.

UNIT - IV

- (i) Uniform convergence of sequences and series of functions, various tests including M_n -test and Weirstrass M-test, relations of uniform convergence with the continuity of the limit and the sum functions and also with term by term differentiation and term by term integration.
- (ii) Fourier series representation of periodic functions which are even and odd or none of these in the full interval or half the interval.

UNIT - V

- (i) Convergence of improper integrals - various tests and their applications, Evaluation of such integrals.
- (ii) Real line \mathbb{R} -Interior points and limit points of a subset of \mathbb{R} , open sets and closed sets in \mathbb{R} and their properties, Bolzano - Weierstrass theorem, Heine Boral theorem, Nested interval property, Compactness and connectedness Properties in the real line.

References :

1. T.M.Apostol : Mathematical Analysis.
2. R.R.Golbegg : Real Analysis
3. Walter Rudin : Principles of Mathematical Analysis
4. P.K. Jain & S.K. Kaushik : An introduction to Real Analysis.
5. D.Somasundaram & B.Chaudhary : A First Course of Mathematical Analysis.
6. G.F. Simmon : Introduction to Topology.
7. Bhargava & Goyal : Real Analysis.
8. Gokhroo & others : Real Analysis.
9. Sharma & Purohit : Elements of Real Analysis.

PAPER - II ABSTRACT ALGEBRA

Note : The question paper will be divided into three section A, B and C as follows:

Section A : In this section, questions will be set taking two questions from each unit. Each question will be of short answer type not exceeding 20 words and will carry 3/4 mark. The candidate will be required to attempt all the questions (aggregating 7.5 marks).

Section B : In this section, ten questions will be set taking two questions from each unit. The answer of each will not exceed 250 words or two and a half page. Each question will be of 7.5 marks. The candidate will be required to attempt five questions in all, taking one question from each unit (aggregating 37.5 marks).

Section C : In this section, four questions will be set covering all the five units and whose answers shall not exceed 500 words or five pages each. Each question may have sub-parts in it and will carry 15 marks. The candidate will be required to attempt any two questions (aggregating 30 marks).

UNIT - I

The three isomorphism theorems of group, simple group, centre of group, Automorphisms and inner automorphisms, Normalizer of an element and that of a subgroup, conjugacy relation, class equation for finite groups, Burnside theorem and nature of groups of order p & p^2 , (p being prime number).

UNIT -II

Maximal, prime and Principal ideals in Commutative rings and their theorems, The three isomorphism theorems in rings ,Embedding of a ring into a ring with unity and also into a ring of endomorphism of some abelian group, Quotient field of an integral domain.

UNIT - III

Definition and various examples of vector spaces, subspaces and examples, Intersection, sum and direct sum of two subspaces, Linear span, Linear dependence, independence and their basic properties and problems.

UNIT - IV

Basis, Dimension and. examples, Finite dimensional vector spaces, Existence theorem for a basis, Extension theorem, Invariance of the number of elements of a basis set, Existence of complementary subspaces of a subspace of a finite dimensional vector space, Dimension of sum (and direct sum) of two subspaces, Quotient space and its dimension.

UNIT - V

Linear transformations, Rank and Nullity of a linear transformation, Sylvester law of nullity, To obtain a matrix from a linear transformation and vice-versa and their problems relating to the same and different bases. The algebra of linear transformations, dual

space and dual basis and dimension of dual space, bidual space and natural isomorphism(Reflexivity).

References

1. Surjeet Singh and : Modern Algebra
Quazi Zarneeruddin
2. I.N.Herstein : Topics in Algebra
3. R.S.Agrawal : Algebra
4. Gokhroo, Saini : Advance Abstract Algebra
5. Shanti Narayan : A Text-Book of Modern
Abstract Algebra
6. Hoffman and : Linear Algebra, (Second
Kunze Edition)
7. Purohit, Pareek, : Linear Algebra
Sharma
8. Halmos, Paul R : Finite - Dimensional Vector
spaces.

PAPER - III
NUMERICAL ANALYSIS AND OPERATION
RESEARCH

Note: The question. Paper will be divided into three section A, B and C as follows:

Section A : In this section, questions will be set taking two questions from each, unit. Each question will be of short answer type not exceeding 20 words and will carry $3/4$ mark. The candidate will, be required to attempt all the questions (aggregating 7.5 Marks).

Section B : In this section, ten questions will be set taking two questions from each unit. The answer of each will not exceed 250 words or two and a half page. Each question will be of 7.5 marks. The candidate will be required to attempt five questions. in all, taking one question from each unit (aggregating 37.5 marks).

Section C : In this section, four questions will be set covering all the five units and whose answers shall not exceed 500 words or five pages each. Each question may have sub-parts in it and will carry 15 marks. The candidate will be required to attempt any two questions (aggregating 30 marks).

UNIT - I

Differences, Relation between differences and derivatives, differences of Polynomial, Newton-Gregory formula for forward and backward interpolation,

divided differences. Newton's General interpolation formula, Lagranges's interpolation formula.

UNIT - II

Gauss's central difference formula, Stirling's and Bessels interpolation formula, Inverse interpolation. Numerical differentiation, Derivatives from Interpolation formulae, Method of operators, Numerical Integration: Newton-cotes Quadrature formula, Trapezoidal, Simpson's one third, Simpson's three-eight rules.

UNIT-III

Gauss Quadrature formulae, Estimation of errors in quadrature formula, location of roots by Descarte's method of sign, Newtons theorem on multiple roots, Numerical solution of Algebraic and Transcendental equations, Bisection method, Regula-Falsi method, Method of integration .

UNIT-IV

Introduction to linear programming problems, Mathematical formulation Graphical method of solution of linear programming problems (Problems of two variables only), Theory of convex sets, Theory of Simplex method and its applications to simple linear programming problems.

UNIT - V

Concepts of duality in linear programming, formation of dual problems, Elementary theorems of duality.

Assignment and transportation problems and their optimum solutions.

References :

1. C. E. Froberg : Introduction to Numerical Analysis.
2. M.K.Jain, S.R.K.: Numerical methods : Problems & solutions.
R.K. Jain
3. G. Hadley : Linear Programming
4. Kanti Swaroop, : Operation Research
P.K.Gupta and Man Mohan
5. H.C. Saxena : Numerical Analysis
6. Goyal, Mittal : Numerical Analysis
7. Bansal, Ojha : Numerical Analysis (Hindi ed.)
8. Gokhroo, Saini : Numerical Analysis (Hindi ed.)
9. Goyal, Mittal : Operations Research
10. S.D.Sharma : Operations Research
11. Gokhroo, Saini : Operations Research (Hindi ed.)
Jain
12. Bhargava, Bhati,: Linear Programming (Hindi ed.)
Sharma
13. Gokhroo, Saini, : Linear Programming (Hindi ed.)
Jain

**B.A./B.Sc. FINAL YEAR
EXAMINATIONS, 2006 - 2007**

STATISTICS

(Common for the Faculties of Arts & Science)

Papers	Periods* per week	Examination Hours	Maximum Marks	
			B.A.	B.Sc.
Theory Papers				
Paper-I	2	3	45	50
Paper-II	2	3	45	50
Paper-III	2	3	45	50
Practicals**	4	4	65	75
Total Marks			200	225

*1 Period = 1 hours

** per batch

N.B.

1. Common, papers will be set for both the Faculties of Arts & Science.
2. Students are allowed to use simple electronic desk calculators (as per University guidelines).
3. Statistical Tables may be used (as per University guidelines).
4. Visit to Local Governments/Organizations, Semi Governments Departments/Organizations, Government Undertaking Organizations, Statistical Institute of repute, Private sector. Statistical Organization and Research Stations within State of Rajasthan may be organized to familiarize students with the practical work done at these centers.

PAPER-I

STATISTICAL INFERENCE

Note The question paper will be divided into three sections A, B and C as follows:

Section A: In this section, ten questions will be set taking two questions from each unit. Each question will be of short answer type not. Exceeding 20 words and will carry 1/2 mark. The candidate will be required to attempt all the questions (aggregating 5 marks).

Section B In this section, ten questions will be set taking two questions from each unit. The answer of each will not exceed 250 words or two and a half page. Each question will be of 5 marks. The candidate will be required to attempt five questions in all taking one question from each unit (aggregating 25 marks).

Section C In this section, four questions will be set covering all the five units and whose answers not shall not exceed 500 words or five pages each. Each question may have sub parts in it and will carry 1.0 mark. The candidate will be required to attempt any two questions (aggregating 20 marks).

UNIT - I

Testing of Hypothesis Null, Alternative, Simple and composite hypotheses, Two types of errors, Power, of the test, Power curves in simple cases, critical region and best critical region (BCR). Most powerful and uniformly most powerful tests. Neyman- Pearson's Lemma, Determination of BCR for testing simple v/s simple hypothesis in uniform and normal populations.

UNIT-II

General theory of test of significance for large samples for testing of means and proportions, Determination of Sample size, Test of significance based on 't' distribution.

UNIT-III

Tests of significance based on Chi-square and F-sampling distributions.

UNIT-IV

Methods of estimation: Method of moments, Method of least squares and Method of maximum likelihood estimation with their properties (without proof).

Elements, of Non-parametric Inference: Sign, Median and run test.

UNIT-V

Elements of Sequential Analysis Construction of sequential probability ratio tests (SPRT), O.C. and A.S.N. functions. Applications of SPRT for testing simple v/s simple hypothesis in case of Bernoulli and Normal populations.

Recommended Books :

1. Gupta, S.C. and : Fundamentals of Mathematical
Kapoor V.K. Statistics, Sultan Chand &
Sons, New Delhi

2. Kapur J.N.and : Mathematical Statistics,
Saxena H.C. S.Chand & Company Ltd., New
Delhi.

Reference Books :

1. Singh, J. : Statistical Inference (Hindi
edition), Madhya Pradesh
Hindi Granth Academy, Bhopal
2. Goon, A.M., : An outline of Statistical
Gupta, M.K. & Theory, Vol.2, The world Press
Das Gupta, B. Publishers Private Ltd. Calcutta
(1980)
3. Rohatgi, V.K. : An Introduction to probability
(1986) theory & Math. Statistics,
Wiley Eastern
4. Mood A.M., : Introduction to the theory of
Graybill, F.A. & Statistics, Third edition
Boes, D.C.(1974) McGraw Hill

PAPER - II
DESIGN OF EXPERIMENTS AND
STATISTICAL QUALITY CONTROL

Note: The question paper will be divided into three sections A, B and C as follows:

Section A: In this section, ten questions will be set taking two questions from each unit. Each question will be of short answer type not exceeding 20 words and will carry 1/2 mark. The candidate will be required to attempt all the questions (aggregating 5 marks).

Section B In this section, ten questions will be set taking two questions from each unit. The answer of each will not exceed 250 words or two and a half page. Each question will be of 5 marks. The candidate will be required to attempt five questions in all taking -one question from each unit (aggregating 25 marks).

Section C: In this section, four questions will be set covering all the five units and whose answers not shall not exceed 500 words or five pages each. Each question may have sub parts in it and will carry 10 marks. The candidate will be required to attempt any two questions (aggregating 20 marks).

UNIT-I

Analysis of variance for one-way and two-way classification (with one observation per cell). Linear model and its different types, Transformations, Basic concepts in design of experiments, Criteria for a good design, Uniformity trials, Size and Shape of block and plots.

UNIT-II

Completely randomized, Randomized block and Latin square designs.

UNIT-III

Efficiency of Randomized block design over Completely randomized design.

Missing plot technique, Estimation of single missing value in Randomized block and Latin square designs.

UNIT-IV

Statistical Quality Control: Process control and Product control, Control charts, 3σ -control limits, Tools for SQC, Control charts for variables and attributes, X and R-charts, X and σ charts, p, np and c-charts. Criterion for detecting lack of control in various charts. Natural tolerance and specification limits, Modified control limits.

UNIT-V

Principles of Acceptance Sampling : Problem of lot acceptance, good and bad lots, producer's & Consumer's risk, single & double sampling plans and their O.C. functions. Concepts of AQL, LTPD, AOQL, Average amount of Inspection and ASN functions.

Recommended Books :

1. Gupta S.C. & Kapoor V.K. : Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.

2. Goon, A.M. : Fundamentals of Statistics, Gupta, M.K. & Dasgupta, B. Vol.II. The World Press Pvt. Ltd. Calcutta
3. Cochran, W.G. : Experimental Designs, John and Cox, G.M Wiley & Sons, New York.

Reference Books :

1. Goulden, C.H. : Methods of Statistical Analysis (Hindi Ed.) Bihar Hindi Granth Academy, Patna
2. Snedecor, G.W. : Statistical Methods (Hindi Ed.) Commission of Scientific & Technical Words, Ministry of Education, Govt. of India
3. Mukhopadhyay, : Applied Statistics, New Central P. (1999) Book Agency Pvt., Ltd. Calcutta
4. Montgomery, : Design and Analysis of D.C.(1991) Experiments, Wiley Eastern.
5. Duncan A.J. : Quality Control and Industrial Statistics. Fourth editions, (1974) Taraporewala & Sons.
6. Montgomery, C. : Introduction to the Statistical Quality Control (Second edition) John Wiley & Sons.

PAPER - III
THEORY OF SAMPLE SURVEYS AND VITAL
STATISTICS

Note: The question paper will be divided into three sections A, B and C as follows:

Section A: In this section, ten questions will be set taking two questions from each unit. Each question will be of short answer type not exceeding 20 words and will carry 1/2 mark. The candidate will be required to attempt all the questions (aggregating 5 marks).

Section B: In this section, ten questions will be set taking two questions from each unit. The answer of each will not exceed 250 words or two and a half page. Each question will be of 5 marks. The candidate will be required to attempt five questions in all taking one question from each unit (aggregating 25 marks).

Section C: In this section, four questions will be set, covering all the five units and whose answers not shall not exceed 500 words or five pages each. Each question may have sub parts in it and will carry 10 marks. The candidate will be required to attempt any two questions (aggregating 20 marks).

UNIT-I

Concepts of population and sample need for sampling.

The principle steps in a sample survey, concept of sampling and non-sampling errors, Advantages of sample survey over complete enumeration, Limitations

of sampling , types of sampling, basic principles of sampling design, procedures of selecting a random sample.

UNIT-II

Simple random sampling with and without replacement for variables and attributes. Stratified random sampling including allocation problems.

UNIT-III

Cluster and two-stage sampling (equal size clusters).

UNIT-IV

Ratio and Regression methods of estimation (expression's for bias only). Systematic sampling estimation of its mean and variance, comparison with SRS and stratified random sampling for a linear trend population.

UNIT-V

Vital Statistics : Uses, of vital statistics, methods of obtaining vital statistics.

Measurement of mortality crude death rate, specific death rates, standardized death rates. Life table, assumptions, description and construction of life table and its uses, Fertility, measurements of fertility, crude, general, specific and total fertility rates.

Measurements of population growth, gross and net reproduction rates.

Recommended Books :

1. Sukhatme P.V., : Sampling theory of Surveys,
Sukhatme B.V. and Applications, Indian
Sukhatme S. Society of Agricultural
and Ashok C. Statistics, New Delhi.
2. Gupta S.C and : Fundamentals of Applied
Kapoor V.K. Statistics, Sultan Chand &
Sons, New Delhi

Reference Books:

1. Goon A.M., : Fundamentals of Statistics,
Gupta M.K & Vol.II, The World Press Pvt.
Dasgupta, B. Ltd., Calcutta.
2. Cochran W.G. : Sampling Techniques (Hindi
and English Edition), Kendriya
Hindi Granth Academy, New
Delhi (Hindi Ed.), Wiley
Eastern Ltd, New Delhi
(English Ed.)
3. Mukhopadhyay : Theory and Methods of Survey
P. (1998) Sampling, Prentice Hall
4. Sampat, S. : Sampling Theory (Narosa).
(2000)
5. Srivastava, : A text book of demogrphy,
O.S. (1983) Vikas Publishing House, New
Delhi
6. Benjamin B. : Health and vital Statistics,
(1959) Allen and unwin.

STATISTICS. PRACTICAL

Duration of Max. Marks.: Arts - 65
Examination- Four Hrs Science - 75

The distribution of marks will be as follows:

	B.A	B.Sc
(a) Practicals	39 Marks	45 Marks
(b) Practical Record	13 Marks	15 Marks
(c) Viva-voce	13 Marks	15 Marks
Total	65 Marks	75 Marks

The following topics are prescribed for practical work:

1. Large sample test of significance for mean, standard deviation and proportion for one and two sample problems.
2. t-test for the significance of single mean and difference of means (paired and unpaired cases).
3. Test for the significance of correlation coefficient and regression coefficients.
4. F-test for equality of two population variances.
5. Chi-square test for (i) goodness of fit (ii) Independence of attributes (iii) significance of single variance (iv) Homogeneity of several correlation coefficients.

6. Confidence interval for (i) Mean in case of large and small samples and (ii) proportion.
7. Sign test, Run Test and Median Test
8. Analysis of variance for (i) One-way classification, (ii) Two-way classification with one observation per cell.
9. Analysis of (i) CRD (ii) RBD and (iii) LSD.
10. Estimation of single missing value In RBD and LSD
11. Statistical Quality Control: (i) \bar{X} & R Charts (ii) \bar{X} and σ charts (iii) p, np and c-charts.
12. Sample Surveys : (i) SRS (ii) Stratified sampling including allocation problems.
13. Vital Statistics : CDR, Age specific death rates, Standardized death rates (ii) CBR, GFR, ASFR, TFR (iii) Standardized birth rate (iv) Crude rate of natural increase GRR and NRR (v) Life tables and to find out certain values with its help.

Note :

1. "Students may be tried to familiarize and utilize statistical packages in solving the relevant statistical practical exercises on Computers".
2. Try to give the practical exercises in such a way that the student decide which experimental design, sampling scheme and which method of vital statistics are to be applied, instead of directly telling them.