

B.Sc. Semester - III

Scheme of examination

Continuous Assessment (CA)	=	15 Marks
Term Test	=	10 Marks
Home Assignment	=	05 Marks
Semester End Examination (SEE)	=	35 Marks
Total	=	50 Marks

B.Sc. Semester III Botany **PAPER CODE 22-3001**

PLANT MORPHOLOGY AND ANATOMY

Scheme of examination:

MM: 35

1. In Semester End Examination the candidate has to answer five questions in all. Each question will be of 7 marks. Candidate has to answer all questions in the main answer book only.
2. Q. No. 1 will be compulsory having 07 short answer type questions (one mark each) covering entire syllabus.
3. Each paper is divided in four units. There will be two questions from each unit. Student has to answer one question from each unit.

UNIT - I

The basic body plan of flowering plants, modular type of growth.

Diversity of plant forms in annuals, biennials and perennials.

convergence of evolution of tree habit in gymnosperms, monocotyledons and dicotyledons,

largest and longest-lived plants. Simple and complex permanent tissues, secretory tissues, tissue systems.

UNIT - II

The shoot system: The shoot apical meristem and its histological organization; vascularization of primary shoot in monocotyledons and dicotyledons; formation of internodes; branching pattern; monopodial and sympodial growth; canopy architecture; cambium and its functions; formation of secondary xylem; a general account of wood structure in relation to conduction of water and minerals;

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characteristics of growth rings; sapwood and heartwood; secondary phloem – structure and function; periderm. Anomalous secondary growth.

UNIT – III

The leaf: origin, development, arrangement and diversity in size and shape. Stomata – structure and types, stomatal index. Vascularization of leaf – nodal structure and venation; internal structure in relation to photosynthesis and water loss. Senescence and abscission. The root system: root apical meristem; differentiation of primary and secondary tissues and their functions; structural modification for storage, respiration, reproduction and for microbial interaction with microbes.

UNIT – IV

Morphology and anatomy of seed (monocotyledons and dicotyledons). Significance of seed, suspended animation; ecological adaptation; unit of genetic recombination and replenishment; dispersal strategies. Vegetative reproduction: Vegetative propagation, grafting; economic aspects.

Suggested readings:

- Cuttler, E.G. 1971. Plant Anatomy. Part III Organs, Edward Arnold Ltd., London.
- Cuttler, E.G. 1969. Plant Anatomy. Part I Cells and Tissue. Edward Arnold Ltd., London.
- Eames, A.J. and MacDaniels, L.H. 1987. An Introduction to Plant Anatomy. Tata MacGraw-Hill Publishing Company Ltd., New Delhi.
- Esau, k. 1985. Plant Anatomy. 2 nd Edition Wiley Eastern, New Delhi.
- Fahn, A. 1997. Plant Anatomy. Aditya Books (P) Ltd., New Delhi. 32
- Fahn, A. 2000. Plant Anatomy. Permagon Press.
- Gifford, E.M. And Foster, A.S. 1989. Morphology and Evolution of Vascular Plants. W.H. Freeman, New York.
- Pandey, S.N. and Chadha, A. 2014. A text book of Botany- Plant anatomy and Economic Botany. Vikas publishing house Pvt. Ltd, New Delhi.
- Vashishta, P.C. 1974. Plant Anatomy. Pradeep Publication, Jalandhar.
- Singh, V.P., Pandey, P.C. and Jain, D.K. 2011. A Text book of Botany- plant Morphology and anatomy. Rastogi Publication, Merrut.

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CELL BIOLOGY AND PLANT BIOCHEMISTRY

Scheme of examination:

MM: 35

1. In Semester End Examination the candidate has to answer five questions in all. Each question will be of 7 marks. Candidate has to answer all questions in the main answer book only.
2. Q. No. 1 will be compulsory having 07 short answer type questions (one mark each) covering entire syllabus.
3. Each paper is divided in four units. There will be two questions from each unit. Student has to answer one question from each unit.

UNIT - I

Cell Biology - Tools and techniques used in cell study; ultrastructure and functions of different cell organelles of eukaryotes and prokaryotes (cell wall, plasma membrane, nucleus, mitochondria, chloroplast, ribosomes, peroxisomes, golgi bodies etc.).

Cell divisions: *cell cycle, mitosis* phases, structure and functions of spindle apparatus; anaphasic chromosomes movement;

Meiosis: phases, synaptonemal complex formation and fate of chiasmata and significance of crossing over.

UNIT - II

Chromosome organization: eukaryotic and prokaryotic, Chromosomes - morphology; centromere, telomere;

specialized types of chromosomes (sex chromosomes, lampbrush chromosomes, polytene chromosomes).

Chromosomal aberrations (Deletion, Duplication, Translocation and Inversion); Aneuploidy and polyploidy.

UNIT - III

Biomolecules:

Carbohydrates: Importance, nomenclature, classification, structure and function of mono-, di- and polysaccharides, their properties, glycosidic linkages and glycoproteins.

15
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Lipids: Importance of fatty acids (Saturated and unsaturated), biosynthesis (alpha and beta oxidation and synthesis).

Secondary metabolites: Concept of Secondary metabolites, classification and significance of Secondary metabolites with special reference to flavonoides, alkaloids and steroids.

UNIT - IV

Proteins: Importance of amino acids, structure, electrochemical properties, peptide bonds, chemical bonds and nomenclature, structure and classification of proteins, protein synthesis, physical and chemical properties, protein changes during seed germination, seedling and senescence.

Enzymes: Discovery, nomenclature, EC number, characteristics of enzymes, enzyme kinetics, mechanism of action, Km value, active sites, holoenzyme, apoenzyme, coenzyme and factors, multienzyme system, regulation of enzyme activity.

Suggested Readings:

- Alberts, B., Johnson, A., Lewis, J., Roff, M., Roberts, K. and Walter, P., 2008. Molecular Biology of the Cell. Garland Publishers, New York.
- De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
- Gupta, P.K. 2009. Cytology, Genetics, Evolution and Plant breeding, Rastogi publication, Meerut.
- Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley and Sons. Inc. New Jersey, USA.
- Lodish, H., Berk, A., Matsudaira, P., Kaiser, C. A., Krieger, M., Scott, P.M., Zipursky, L. and Darnell, J. 2008. Molecular Cell Biology. W. H. Freeman and company, Macmillan publishers, London.
- Roy, S.C. and De, K.K. 1999. Cell biology. New central Book Agency (P) Ltd., Calcutta.
- Verma, P.S. and Agrawal, V.K. 2012. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand and Co. Ltd., New Delhi.



- Berg, J.M., Tymoczko, J.L., Stryer, L. 2006. Biochemistry. 6th Edition, W.H. Freeman and Company, New York.
- Buchanan, B., Gruissem, W. and Jones, R. 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists, USA.
- Conn, E.E., Stumpf, P.K. and Bruening, G. 2006. Outlines of Biochemistry. 4 th Edition, John Wiley and Sons Inc. New Jersey, USA. 28
- Elliot, W.H. and Elliot, D.C. 2009. Biochemistry and Molecular Biology. Oxford
- Voet, D. and Voet, J.G. 2000. Biochemistry, John Wiley, New York.
- Wilson, K. and Walker, J. 2008. Principles and techniques of Biochemistry and Molecular Biology, Cambridge University Press.

B.Sc. Semester - IV

Scheme of examination

Continuous Assessment (CA)	=	15 Marks
Term Test	=	10 Marks
Home Assignment	=	05 Marks
Semester End Examination (SEE)	=	35 Marks
Total	=	50 Marks

B.Sc. Semester IV Botany

PAPER CODE 22-2001

GENETICS AND PLANT BREEDING

Scheme of examination:

MM: 35

1. In Semester End Examination the candidate has to answer five questions in all. Each question will be of 7 marks. Candidate has to answer all questions in the main answer book only.
2. Q. No. 1 will be compulsory having 07 short answer type questions (one mark each) covering entire syllabus.
3. Each paper is divided in four units. There will be two questions from each unit. Student has to answer one question from each unit.

UNIT - I

Experimental basis for DNA as genetic material; nucleic acids

DNA and RNA-their structures, types, replication and functions.

RNA Primers, Okazaki-fragments, ideas about polymerase; exons and introns;

DNA Protein interactions, Nucleosome models.

Structure of Gene; Regulation of gene expression in prokaryotes and eukaryotes;

Genetic code: triplet codes their characteristics and significance.

UNIT II

Genetic inheritance: Mendel's laws of inheritance and their exceptions.

Allelic (complete dominance, co-dominance and incomplete dominance, lethality)

and non-allelic interactions (complementary genes, epistasis and duplicate genes)

Linkage and crossing over. Elementary ideas of chromosome mapping.

UNIT III

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Cytoplasmic inheritance- maternal influence, shell coiling in snails, Kappa particles in Paramecium.

Multiple allelism: characteristics; ABO blood groups in men. Multiple gene inheritance: characteristics; plant height; grain colour in wheat.

Extra nuclear genome: presence and function of mitochondrial and plastid DNA; plasmids; transposons.

UNIT IV

Plant Breeding: Introduction and objectives of plant breeding; general methods of plant breeding (Introduction and acclimatization, selections, hybridizations); hybrid vigour and inbreeding depression.

Role of mutation and polyploidy in plant breeding.

Famous Indian and international plant breeders and their work.

National and international agricultural research institutes.

Plant breeding work done on wheat and rice in India and Green revolution.

Methods of breeding in self-pollinated, cross-pollinated and vegetatively propagated crop plants.

Suggested Readings:

- Brooker, R. J. 1999. Genetics: Analysis and Principles. Addison-Wesley, Boston.
- Choudhary, H. K. 1989. Elementary Principle of Plant Breeding. Oxford and IBM Publishing Co., New Delhi.
- De Robertis, E. D. P. and De Robertis, E. M. F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
- Dnyansagar, V. R. 1986. Cytology and Genetics, Tata Mc Graw - Hill Pub Co. Ltd., New Delhi. 13
- Gardner, E. J., Simmons, M. J. and Snustad, D. P. 2008. Principles of Genetics. 8th Edition, Wiley India.
- Gupta, P. K. 2009. Cytology, Genetics, Evolution and Plant Breeding, Rastogi Publication, Meerut.
- Miglani, G. S. 2000. Advanced genetics. Narosa Publishing House, New Delhi.

- Shukla, R. S. and Chandel, P. S. 2000. Cytogenetics, Evolution and Plant Breeding, S. Chand and Co. Ltd., New Delhi.
- Singh, R. B. 1999. Text Book of Plant Breeding. Kalyani publishers, Ludhiana.

B.Sc. Semester IV Botany

PAPER CODE 22-4002

PLANT PHYSIOLOGY AND METABOLISM

Scheme of examination:

MM: 35

1. In Semester End Examination the candidate has to answer five questions in all. Each question will be of 7 marks. Candidate has to answer all questions in the main answer book only.
2. Q. No. 1 will be compulsory having 07 short answer type questions (one mark each) covering entire syllabus.
3. Each paper is divided in four units. There will be two questions from each unit. Student has to answer one question from each unit.

UNIT - I

Water relations: Water structure, physicochemical properties, importance to plant life, concept of water potential.

Absorption of water and Transport of water: Ascent of sap, Mechanism of process: Transpiration, Guttation, stomatal movement, limiting factors.

Mineral Nutrition: Essential micro and macro nutrients; their uptake, factors affecting, hydroponics and nutrient requirement, deficiency and toxicity symptoms.

Transport of organic substances: Mechanism of phloem transport, factors regulating the translocations of nutrients.

UNIT- II

Photosynthesis: Photosynthetic apparatus, photochemistry, pigments, light reaction, photo system I & II, Z scheme, photophosphorylation, C₃ Calvin cycle, C₄ cycle, photorespiration, Crassulacean acid metabolism and factors affecting the photosynthesis.

UNIT - III

20/12/20


Respiration: ATP-the biological energy currency, aerobic and anaerobic respiration, Krebs's cycle, electron transport system, oxidative phosphorylation, Pentose phosphate pathway, respiratory inhibitors and factors affecting the process.

Nitrogen Metabolism: Biological N₂ fixation by free living organism, symbiotic N₂ fixation, root nodules, nitrogenase and ammonium assimilation.

UNIT- IV

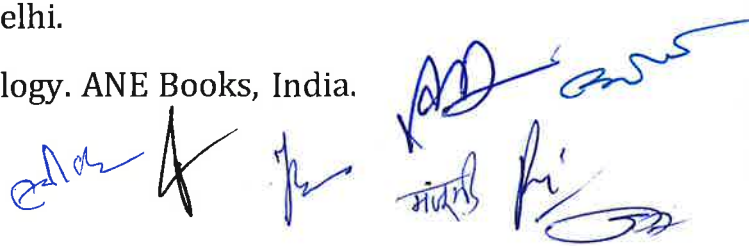
Phases of growth and development: Seed dormancy and germination, plant movement, senescence and biological clock- their regulatory factors.

Photoperiodism & vernalisation, Physiology and mechanism of action, concept of florigen and phytochrome.

Plant hormones: auxins, gibberellins, cytokinins, ethylene and growth retardants; discovery, bioassay & physiology.

Suggested readings:

- Hopkins, W.G. and Huner, P. A. 2008. Introduction to Plant Physiology. John Wiley and Sons, USA.
- Jain, V.K. 2013. Fundamental of Plant Physiology. S. Chand and Company Ltd., New Delhi.
- Malik, C. P. and Srivastava A.K. 1982. Text book of Plant Physiology. Kalyani publication, New Delhi.
- Mukherjee S., Ghosh A. K. 2006. Plant Physiology. New Central Book Agency, Calcutta.
- Parashar, A. N. and Bhatia, K. N. 1985. Plant Physiology. Trueman Book Company, New Delhi.
- Sinha, R. K. 2007. Modern Plant Physiology. 2 nd Edition Tata McGraw, New Delhi.
- Taiz, L. and Zeiger, E. 2006. Plant Physiology. 4 th Edition, Sinauer Associates Inc. Publishers, Massachusetts, USA.
- Verma, S. K. and Verma, M. 2000. A Text book of Plant Physiology, Biochemistry and Biotechnology. S. Chand and co. Ltd., New Delhi.
- Verma, V. 2007. Text Book of Plant Physiology. ANE Books, India.



B. Sc. BOTANY PRACTICAL EXAMINATION

SEMESTER III & IV

SKELETON PAPER

P-22-4001
PAPER CODE

MAX. MARKS: 100

TIME 4 HOURS

Q. No.	Practical	Marks
1.	Prepare T.S./L.S. of the material "A" provided to you and make its double stained glycerine preparation. Draw a well-labelled diagram. Identify giving reasons. Comment on special points of interest.	15
2.	A. Prepare the acetocarmine stained slide of the material "B" provided to you. Draw a well labelled diagram of anyone -stage of nuclear division. Identify it giving reasons. B. Perform the chemical test of the given material "C". Identify and discuss the observation giving reasons.	10 07
3.	Perform the given physiology experiment and write the principle, procedure & conclusions based on the observation of the experiment. Draw the diagram of the experiment set up and write precautions involved in the experiment.	15
4.	Comment and solve the problem of genetics allotted to you along with suitable reasons.	15
5.	Comment upon the spots (1-6), Identify giving reasons (3 Minutes for each Spot)	18
6.	Viva-Voce	10
7.	Practical Record	10
	Total	100

Suggested Laboratory Exercises:

- **Plant morphology and anatomy**

1. Anatomical study of root, stem and leaf (dicotyledons and monocotyledons) by making double stained temporary and permanent slides.
2. Anatomical studies of anomalous secondary structure in stem of *Mirabilis*, *Bignonia*, *Borhavia*, *Nyctanthus*, *Salvadora*, *Leptadenia*, *Dracena* by making temporary and permanent slides.
3. Anatomical study of dicot and monocot seed (*Cicer*, *Maize* and *cotton*)

- **Cell biology**

1. Study of different stages of Mitosis and Meiosis in root tip cells and flower buds respectively of onion.

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- **Biochemistry**

1. To study the activity of catalase, peroxidase and amylase enzymes in plant tissues.
2. Phytochemical test for starch, sugars, protein, fats, tannins and Anthocyanin.

- **Plant Physiology**

1. To determine the osmotic potential of vacuolar sap by plasmolytic method.
2. To study the permeability of plasma membrane using different concentration of organic solvents.
3. To study the effect of temperature on permeability of plasma membrane.
4. To demonstrate the phenomenon of the osmosis by the use of potato osmometer.
5. To study the phenomenon of plasmolysis and deplasmolysis using Tradescantia / Rhoeo discolor leaves and different concentrations of sugar.
6. To demonstrate the rate of transpiration by use of potometers (Ganong's/Farmers)
7. To study the relative rate of transpiration from the leaf surfaces of the different plants using cobalt chloride paper.
8. To demonstrate that oxygen is evolved during the photosynthesis by inverted funnel method.
9. To demonstrate that light is necessary for photosynthesis.
10. To demonstrate the carbon-dioxide, light, water and chlorophyll are essential for photosynthesis by moll's experiment.
11. To compare the rate of photosynthesis under different condition by using Wilmott's bubbler.
12. Separation of chlorophyll pigments by the solvent method.
13. Separation of chlorophyll pigments by the paper chromatography.
14. comparison of the rate of respiration (R.Q.) of various plant parts or substrates with the help of Ganong's respirometer.
15. Bioassay of plant growth hormone (Auxin, Gibberellins and Cytokinin).

- **Genetics**

1. Genetic problems on monohybrid, dihybrid cross, test cross and back cross.
2. Genetic problems on allelic and non-allelic gene interactions, multiple alleles, blood group etc
3. Karyotype preparation.
4. Identification of chromosomes on the basis of their size and centomere position.
5. Pedigree analysis for dormant and recessive autosomal and sex linked traits



Inorganic ChemistryPAPER CODE
22-3004

Scheme of examination:

MM: 23

1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

UNIT – I

Chemistry of Elements of First Transition Series: Characteristic properties of d-block elements.

Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.

Unit-II

Chemistry of Elements of Second and Third Transition Series

General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry.

Unit-III

Coordination Compounds

Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds.

Unit-IV

Oxidation and Reduction

Use of redox potential data-analysis of redox cycle, redox stability in water-Frost, Latimer and Pourbaix diagrams.

Unit-V

Non-aqueous Solvents

Physical properties of a solvent, types of solvents and their general

characteristics, reactions in non-aqueous solvents with reference to liquid
 NH_3 and liquid SO_2 .

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Organic Chemistry

PAPER CODE
22-3005

Scheme of examination:

MM: 23

- 1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

UNIT – I

Electromagnetic Spectrum : An introduction

Absorption Spectra-I : Ultraviolet (UV) absorption spectroscopy - absorption laws (Beer Lamber law) molar absorptivity, presentation and analysis o UV spectra, types of electronic transitions, effect of solvent on transitions, effect of conjugation, concept of chromophore and auxochrome Bathochromic, hypsochromic and hyperchromic and hypochromic shifts, UV spectra and conjugated enes and enones.

UNIT – II

Absorption spectra – II:

Infrared IR absorption spectroscopy - molecular vibrations, Hook's law, 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.

UNIT – III

Alcohols: Classification and nomenclature.

Monhydric Alcohols : Methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters, Hydrogen bonding Acidic nature, Reactions of alcohols.

Dihydric Alcohols : Methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$\text{Pb}(\text{OAc})_4$ and HIO_4] and pinacol pinacolone rearrangement.

Trihydric alcohols : Methods of formation, chemical reactions of glycerol.

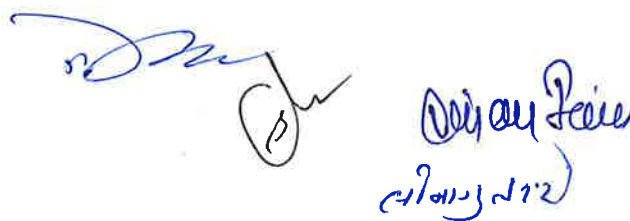
Unit-IV

Phenols: Nomenclature, structure and bonding, Preparation of Phenols, Physical properties and acidic character. Comparative acidic strength of alcohols and phenols, resonance stabilization of phenoxide ion reactions of phenols electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement. Gatterman synthesis, Hauben-Hoesch reaction, Leader manasse reaction and Reimer Tiemann reaction.

UNIT - V

Ethers and Epoxides: Nomenclature of ethers and methods of their formation, physical properties, Chemical reactions, cleavage and autoxidation, Ziesels' method.

Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides.



Physical Chemistry

PAPER CODE 22-306

Scheme of examination:

MM: 24

1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

UNIT – I

Thermodynamics-I: Definition of thermodynamic terms : System, surroundings etc. Types of systems intensive and extensive properties. State and path functions and their differentials. Thermodynamics process, concept of heat and work.

First Law of Thermodynamics : Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's law- Joule - Thomson coefficient and inversion temperature, calculation of w , q , dU & dH for the expansion of ideal gases under isothermal and adiabatic condition for reversible process.

UNIT - II

Thermochemistry: Standard state, standard enthalpy of formation Hess's law of heat summation and its application. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy. Kirchhoff's equation.

Unit-III

Chemical Equilibrium: Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. Le Chatelier's principle. Reaction isotherm and reaction isochore-Clapeyron equation and Clausius. Clapeyron equation, applications.



Phase Equilibrium –I: Statement and meaning of the terms - phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system- water, CO₂ and S systems phase equilibria of two component system - solid - liquid equilibria, simple eutectic Bi - Cd, Pb-Ag systems, desilverisation of lead.

UNIT – IV

Electrochemistry-I:Electrical transport - conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution. Migration of ions and Kohlrausch law,

Electrochemistry-II: Applications of conductivity measurements : Determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

UNIT V

Electrochemistry-III: Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes. Ostwald's dilution law its uses and limitations, Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method.

Dr. Manoj Kumar
2021

Inorganic Chemistry

Scheme of examination:

MM: 23

1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

UNIT – I

VBT of transition metal complexes, formation of octahedral complexes based on VBT, outer orbital and inner orbital complexes, formation of tetrahedral a square planar complexes based VBT, Limitations of VBT.

UNIT II

Acid and Bases: Arrhenius, Bronsted-Lowry, the Lux-Flood, solvent system and Lewis concepts of acids and bases.

UNIT III

Lanthanide: Electronic structure, oxidation state and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

UNIT IV

General features and chemistry of actinides, similarities between the later actinides and the later lanthanides super heavy elements.

UNIT V

Principles involved in extraction of elements, chemistry of separation of Np, Pu and Am from U.



Organic Chemistry

Scheme of examination:

MM: 23

1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

UNIT – I

Aldehydes and Ketones: Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties.

Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Keoevengel condensations, Condensations with ammonia and its derivatives. Wittig reaction, Mannich reaction.

Use of acetals as protecting group. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction, MPV, Clemmensen, Wolf-Kishner, LiAlH_4 and NaBH_4 reductions, Halogenation of enolizable ketones.

UNIT II

Carboxylic Acid – I: Nomenclature, structure and bonding, Physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids, Reactions of Carboxylic acids Hell-Volhard-Zelinsky reaction. Synthesis of acid chlorides, esters and amides, reduction of carboxylic acids, Mechanism of decarboxylation. Methods of formation and chemical reactions of halo acids. Hydroxy acid; malic, tartaric and citric acids.

Methods of formation and chemical reactions of α , β – unsaturated monocarboxylic acid.

Carboxylic acid-II: Dicarboxylic acid: Methods of formation and effect of heat and dehydration agents (Succinic, Glutaric and Adipic acids.).

UNIT III

Carboxylic Acid Derivatives: Structure and nomenclature of acid chlorides, esters, amides (urea) and acid anhydrides, Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.

Preparation of carboxylic acid derivatives, chemical reactions, Mechanisms of esterification and hydrolysis (acidic and basic).

UNIT IV

Organic Compounds of Nitrogen: Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkenes, Mechanisms of nucleophilic substitution in nitro arenes and their reductions in acidic, neutral and alkaline media, Picric acid.

UNIT V

Halonitroarenes: Reactivity, structure and nomenclature of amines, physical properties, stereochemistry of amines. Separation of mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase-transfer catalysts. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitrides), reductive amination of aldehydic and ketonic compounds. Gabriel - phthalimide reaction, Hofmann bromide reaction.

Reaction of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Diazotisation mechanism.

Synthetic transformation of aryl diazonium salts, azo coupling.



Physical Chemistry

PAPER CODE 22-4006

Scheme of examination:

MM: 24

1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

UNIT – I

Thermodynamics-II: Second Law of Thermodynamics: Need for the law, different statement of the law, Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature.

Concept of Entropy: Entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, Clausius inequality, entropy as a criteria of spontaneity and equilibrium, Entropy change in ideal gases and mixing of gases.

UNIT II

Thermodynamics-III: Third law of thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions: Gibbs function (G) and Helmholtz function (A) Thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change, Variation of G and A with P, v and T.

UNIT III

Phase Equilibrium – II: Solid solutions - compound formation with congruent melting point (Mg-Zn) and incongruent melting point (NaCl-H₂O), (FeCl₃ - H₂O) and CuSO₄-H₂O system, Freezing mixtures, acetone-dry ice.

Liquid-liquid mixtures - Ideal liquid mixtures, Raoult's and Henry's law, Non-ideal system-azeotropes - HCl-H₂O and ethanol water systems.



Partially miscible liquids: Phenol- water, trimethylamine -water nicotine water systems, Lower and upper consolute temperature, Effect of impurity on consolute temperature.

Immiscible liquids, steam distillation.

Nernst distribution law-thermodynamic derivation, applications.

UNIT IV

Electrochemistry-IV: Types of reversible electrodes - gas - metal ion, metal -metal ion, metal-insoluble salt-anion and redox electrodes, Electrode reactions, Nernst equation, derivation of cell EMF and single electrode potential, standard hydrogen electrode, reference electrodes, standard electrode potential, sign conventions, electrochemical series and its significance.

Electrolytic and Galvanic cells - reversible and irreversible cells, conventional representation of electrochemical cells.

EMF of a cell and its measurements, computation of cell EMF.

Calculation of thermodynamic quantities of cell reactions (ΔG , ΔH and K), polarization, cover potential and hydrogen overvoltage.

UNIT V

Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.

Definition of pH and pK_a , determination of pH using hydrogen quinhydrone and glass electrodes, by potentiometric methods.



CHEMISTRY PRACTICAL B.Sc. PT-II

5 hrs. Duration

4 hrs./ week

Max. Marks: 100

PAPER CODE ...P-22-4004 Min. Marks: 36

Inorganic chemistry

- (a) Estimation of hardness of water by EDTA.
- (b) Estimation of ferrous and ferric by dichromate method.
- (c) Estimation of copper using thiosulphate.

Gravimetric analysisAnalysis of Ba as ~~base~~ *base*, *Pb as PbCrO₄, Ni as Ni DMG*Qualitative Analysis

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

Calibration of fractional weights pipettes and burettes, preparation of standard solutions. Dilution-0.1 M to 0.001 M solutions.

Quantitative analysisVolumetric analysis

- (d) Determination of acetic acid commercial vinegar using NaOH
- (e) Determination of alkali content of tablet using HCl.
- (f) Estimation of calcium in chalk as calcium oxalate by permanganometer

Organic ChemistryLaboratory TechniquesA. Thin layer chromatography

Determination of R_f values and identification of organic compounds.

- (a) separation of green leaf pigments (spinach leaves may be used).
- (b) Preparation and separation of 2,4-dinitrophenylhydrazones of acetone, 2-butanone, hexan-2-one and 3-one using toluene and light petroleum (40-60).
- (c) Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5 : 1.5).

B. paper chromatography: ascending and circular

Determination of R_f values and identification of organic compounds.

- (a) separation of mixture of phenylalanine and glycine. Alanine and aspartic acid; leucine and glutamic acid. Spray reagent-ninhydrin.
- (b) separation of a mixture of DL-alanine, and L-leucine using n-butanol: acetic acid: water (4:1:5), spray reagent-ninhydrin.
- (c) separation of monosaccharides-a mixture of D-galactose and D-fructose using n-butanol: water (4:5:1) spray reagent-aniline hydrogen phthalate.

Physical chemistry

1. Determination of the transition temperature of the given substance by thermometric/ dilatometric method (e.g. $MnCl_2 \cdot 4H_2O / SrBr_2 \cdot H_2O$).

Phase Equilibrium

1. To study the effect of a solute (e.g. NaCl, succinic acid) on the critical solution temperature of two partially miscible liquids (e.g. phenol-water system) and to determine the concentration of the solute in the given phenol-water system.
2. To construct the phase diagram of two components (e.g. diphenylamine-benzophenone) system by cooling curve method.

Dr. Dipen Kumar Saha

Thermochemistry

1. To determine the solubility of benzoic acid at different temperatures and to determine ΔH of the dissolution process.
2. To determine the enthalpy of neutralization of a weak acid/weak base versus strong base/strong acid determine the enthalpy of ionization of the weak acid/weak base.
3. To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber cycle.



Adnan Peris
4/10/1

MAMMALIAN PHYSIOLOGY

MM: 35

Scheme of examination:

1. In Semester End Examination there will be 10 questions in all, 2 from each unit.
Candidate has to answer any 5 questions, taking one from each unit.

UNIT - I**Nutrition & Digestion**

- Nature of Food stuff,
- Digestive enzymes & their action in alimentary canal,
- Hormonal control of digestion, Absorption

UNIT - II**Circulation**

- Composition & Function of Blood and lymph,
- Blood clotting mechanism,
- Cardiac cycle, Heartbeat, blood pressure,
- Angina pectoris, Myocardial infarction, E.C.G

UNIT - III**Respiration**

- Mechanism & control of Breathing,
- Gaseous exchange in tissues,
- Transportation of oxygen and carbon di oxide in blood,
- Mechanism & regulation of respiration

Excretion

- Structure & Function of Kidney,
- Mechanism of urine formation,
- Hormonal regulation of water & electrolyte balance

UNIT - IV**Nervous system**

- Structure of neurons,
- Origin and propagation of nerve impulse,
- Synaptic transmission, Reflex action & reflex arc

Muscular system

- Structure & types of muscle,
- Mechanism of skeletal muscle contraction

UNIT - V**Endocrine System**

- Endocrine glands and their Hormones, Mechanism of Hormone action,
- Role of hypothalamus,
- Role of hormones in Reproduction, Pregnancy & Lactation

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BIOTECHNOLOGY AND IMMUNOLOGY

22-3014

Scheme of examination:

MM: 35

- In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

UNIT - I

- Definition, History, scope and application of biotechnology, Major areas of biotechnology.
- Vectors for gene transfer (plasmids and phages).
- Recombinant DNA technology & its applications.

UNIT - II

- Applications of genetic engineering, GMO & their importance, hazards and regulations. Transgenic animals, their uses in biotechnology
- Brief account of cloning, its advantages and disadvantages.
- Biotechnology in Medicine (outline idea only): P.C.R., Antibiotics. Vaccines.

UNIT - III

- Hybridoma technology, Monoclonal antibodies and their applications
- Food, drink and dairy Biotechnology (outline idea only),
- Fermented food production: dairy products, alcoholic beverages, food preservation.
- Scope of biotechnology based industries.

UNIT - IV

- Immunity:** Innate & acquired immunity,
- Antigen, Antigenicity of molecules, haptens.
- Immunoglobulins: Structure and functions,
- Antigen-antibody reactions: Precipitation reaction, agglutination reaction, neutralizing reaction, complement and lytic reactions and phagocytosis.

UNIT - V

- Type of immune regulating cells
- Cytokines
- Mechanism of humoral & cell mediated immune response.
- Complement and its action,
- AIDS

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BIOCHEMISTRY

22-4013

MM: 35

Scheme of examination:

1. In Semester End Examination there will be 10 questions in all, 2 from each unit.
Candidate has to answer any 5 questions, taking one from each unit.

UNIT - I**Carbohydrates**

- Classification & Structure,
- Metabolism- Oxidation of glucose through glycolysis, Krebs's cycle & oxidative phosphorylation,
- Interconversion of glycogen and glucose in liver

UNIT II**Lipids**

- Classification & structure.
- Metabolism- Beta-oxidative pathway of fatty acids
- Biosynthesis of Triglycerides.

UNIT III**Proteins**

- Classification & structural properties,
- Amino acids & peptides- Properties & structure,
- Metabolism- Transformation of amino acids, Deamination, Transamination, Decarboxylation,
- Synthesis of Urea (Ornithine cycle)

UNIT IV

- pH and Buffers,
- Nature of chemical bonding,
- **Enzymes:** Classification & Characteristics of enzymes.
- Michaelis-Menten Equation.

UNIT V

- **Biochemical techniques** (Brief account): Chromatography, Colorimetry & pH Meter,
- Vitamins- Fat soluble and water soluble vitamins.

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MICROBIOLOGY*Scheme of examination:***MM: 35**

1. In Semester End Examination there will be 10 questions in all, 2 from each unit.
Candidate has to answer any 5 questions, taking one from each unit.

UNIT – I

- Brief introduction to the history of Microbiology: Work of Anton Van Leeuwenhoek, Work of Louis Pasteur, John Tyndall, Robert Koch & Jenner
- Prokaryota(Bacteria): Size, shape & pattern of Arrangement
- Structural Organization—Slime layer (Capsule), Cell envelope, Cytoplasmic membrane (Inner membrane), Cell wall (Outer membrane) of gram-ve & gram +ve bacteria, Mesosomes; Cytoplasmic organization, Cell projections- Flagella & pili

UNIT II

- Virus- classifications, Life cycles (Lytic & Lysogenic cycles)
- COVID-19, Swine flu, SARS, AIDS.
- Genetic material of bacteria: Chromosomes, Plasmids,
- Replication of bacterial DNA

UNIT III

- Reproduction in Bacteria: Asexual reproduction: Binary fission, budding, Endospore formation & cyst formation,
- Sexual reproduction: Conjugation, Transduction & Bacterial recombination.
- Microbial nutrition culture of Bacteria
- Microbial growth
- Environmental factors: Temperature, pH

UNIT IV

- Bacterial of medical importance:
Gram +ve:
 - Cocci : Staphylococci, Streptococci
 - Bacilli: Diphtheria, Tetanus
- Gram -ve:
 - Cocci: Gonorrhoea, Meningitis
 - Bacilli: Diarrhea

UNIT V

- Mycobacteria: Tuberculosis
- Hepatitis (with emphasis on B type)The causative agents, Transmission, Pathogenicity, Laboratory, Diagnosis, Treatment & Prevention

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