



SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry
(Syllabus and Scheme of Studies w. e. f. 2015-18 onwards)
B. Sc. II Year (III Semester)

Lectures : 2 Hrs

Examination Time : 3 Hrs

Subject : Inorganic Chemistry

Maximum Marks: 50(20+30)

Paper Code : CH-201

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-I

Chemistry of Elements of I transition series: Definition of transition elements, position in the periodic table, General characteristics & properties of I transition elements, Structures & properties of some compounds of transition elements-TiO₂, VOCl₂, FeCl₃, CuCl₂ and Ni (CO)₄

UNIT-II

Chemistry of Elements of IInd & IIIrd transition series: General characteristics and properties of the IInd and IIIrd transition elements Comparison of properties of 3d elements with 4d & 5d elements with reference only to ionic radii, oxidation state, magnetic and Spectral properties and stereochemistry

UNIT-III

Coordination Compounds: Werner's coordination theory, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes

UNIT-IV

Non-aqueous Solvents: Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH₃ and liquid SO₂



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B. Sc. II Year (III Semester)

Lectures	: 2 Hrs		
Examination Time	: 3 Hrs	Maximum Marks: 50(20+30)	
Subject	: Organic Chemistry	Paper Code	: CH-203

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-I

Alcohols: Monohydric alcohols nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols. Dihydric alcohols — nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$\text{Pb}(\text{OAc})_4$ and HIO_4] and pinacol-pinacolone rearrangement.

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

UNIT-II

Phenols: Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols — electrophilic aromatic substitution, Mechanisms of Fries rearrangement, Claisen rearrangement, Reimer-Tiemann reaction, Kolbe's reaction and Schotten and Baumann reactions.

UNIT-III

Ultraviolet (UV) absorption spectroscopy: Absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones, Woodward-Fieser rules, calculation of λ_{max} of simple conjugated dienes and -unsaturated ketones. Applications of UV Spectroscopy in structure elucidation of simple organic compounds.

UNIT-IV

Carboxylic Acids & Acid Derivatives: Nomenclature of Carboxylic acids, 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. Reduction of carboxylic acids. Mechanism of

decarboxylation. Structure, nomenclature and preparation of acid chlorides, esters, amides and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and hydrolysis (acidic and basic)

OR

Lectures	: 2		
Examination Time	: 3 Hrs	Maximum Marks: 50(20+30)	
Subject	: Polymer Chemistry (Elective)	Paper Code	: CH-203

UNIT-I

Introduction and history of polymeric materials: Different schemes of classification of polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers, Texture of Polymers.

Functionality and its importance: Criteria for synthetic polymer formation, classification of polymerization processes, Relationships between functionality, extent of reaction and degree of polymerization. Bifunctional systems, Poly-functional systems.

UNIT-II

Kinetics of Polymerization: Mechanism and kinetics of step growth, radical chain growth, ionic chain (both cationic and anionic) and coordination polymerizations, Mechanism and kinetics of copolymerization, polymerization techniques. **Crystallization and crystallinity:** Determination of crystalline melting point and degree of crystallinity, Morphology of crystalline polymers, Factors affecting crystalline melting point.

Nature and structure of polymers-Structure, Property relationships.

UNIT-III

Determination of molecular weight of polymers (M_n , M_w , etc) by end group analysis, viscometry, light scattering and osmotic pressure methods. Molecular weight distribution and its significance. Polydispersity index.

Glass transition temperature (T_g) and determination of T_g , Free volume theory, WLF equation, Factors affecting glass transition temperature (T_g).

UNIT-IV

Polymer Solution – Criteria for polymer solubility, Solubility parameter, Thermodynamics of polymer solutions, entropy, enthalpy, and free energy change of mixing of polymers solutions, Flory- Huggins theory, Lower and Upper critical solution temperatures.

Properties of Polymers (Physical, thermal, Flow & Mechanical Properties). Brief introduction to preparation, structure, properties and application of the following polymers: polyolefins, polystyrene and styrene copolymers, poly(vinyl chloride) and related polymers, poly(vinyl acetate) and related polymers, acrylic polymers, fluoro polymers, polyamides and related polymers. Phenol formaldehyde resins (Bakelite, Novalac), polyurethanes, silicone polymers,

polydienes, Polycarbonates, Conducting Polymers, [polyacetylene, polyaniline, poly(p-phenylene sulphide polypyrrole, polythiophene)].

Reference Books:

1. Seymour's Polymer Chemistry, Marcel Dekker, Inc.
2. G. Odian: Principles of Polymerization, John Wiley.
3. F.W. Billmeyer: Text Book of Polymer Science, John Wiley.
4. P. Ghosh: Polymer Science & Technology, Tata Mcgraw-Hill.
5. R.W. Lenz: Organic Chemistry of Synthetic High Polymers.



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Department of Chemistry
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B. Sc. II Year (III Semester)

Lectures : 2 Hrs

Examination Time : 3 Hrs

Subject : Physical Chemistry

Maximum Marks: 50(20+30)

Paper Code : CH-205

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each

UNIT-I

Thermodynamics-I: Definition of thermodynamic terms: system, surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work. Zeroth Law of thermodynamics, First law of thermodynamics: statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship.

UNIT-II

Thermodynamics-II: Joule's law, Joule Thomson coefficient for ideal gas and real gas: and inversion temperature. Calculation of w q dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process, Temperature dependence of enthalpy, Kirchoffs equation. Bond energies and applications of bond energies.

UNIT-III

Chemical Equilibrium: Equilibrium constant and free energy, concept of chemical potential, Thermodynamic derivation of law of chemical equilibrium. Temperature dependence of equilibrium constant; Van't Hoff reaction isochore, Van't Hoff reaction isotherm. Le-Chatetier's principle and its applications Clapeyron equation and Clausius-Clapeyron equation its applications.

UNIT-IV

Distribution Law: Nernst distribution law – its thermodynamic derivation, Modification of distribution law when solute undergoes dissociation, association and chemical combination. Applications of distribution law: (i) Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride. (ii) Determination of equilibrium constant of potassium triiodide complex and process of extraction.



SCHOOL OF BASIC AND APPLIED SCIENCES
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(Syllabus and Scheme of Studies w. e. f. 2015-18 onwards)
B. Sc. II Year (III Semester)

Schedule per week Practical : 6

Examination Time : 4 Hrs

Maximum Marks: 50 (20+30)

Subject : Chemistry Lab-III

Paper Code : CH-207

UNIT-I (Inorganic)

1. Gravimetric Analysis

Quantitative estimations of, Cu^{2+} as copper thiocyanate and Ni^{2+} as Ni – dimethylglyoxime.

2. Colorimetry:

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

given $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ solution.

UNIT-II (Physical)

1. To determine the CST of phenol – water system.

2. To determine the solubility of benzoic acid at various temperatures and to determine the H

of the dissolution process.

UNIT-III (Organic)

Laboratory Techniques

(a) Steam distillation (non evaluative) Naphthalene from its suspension in water

Separation of *o*- and *p*-nitrophenols

(b) Column chromatography (non evaluative) Separation of fluorescein and methylene blue

Separation of leaf pigments from spinach leaves



SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Botany
(Syllabus and Scheme of Studies w. e. f. 2015-18 onwards)
B. Sc. II Year (III Semester)

Schedule per week Lectures: 3

Examination Time: 3 Hrs

Maximum Marks: 50(20+30)

Subject: Biology and diversity of seed plants –I

Paper Code : BOT-201

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-I

General characters, origin and evolution of Gymnosperms: Geological Time Table; Evolution of Seed Habit. Pilger and Melchior's (1954) system of classification of Gymnosperms.

UNIT-II

Palaeobotany: Fossils and Fossilization (Process involved, types of fossils and importance of fossils); Reconstruction of the following fossil plants: *Lyginopteris*, *Williamsonia* and *Cycadeoidea* (= *Bennettites*)

UNIT-III

Morphology and anatomy of root, stem, leaf/leaflet and reproductive parts including mode of reproduction, life-cycle and economic importance of following plants:
Cycas, *Pinus*

UNIT-IV

Morphology and anatomy of root, stem, leaf/leaflet and reproductive parts including mode of reproduction, life-cycle and economic importance of *Ephedra*. Economic importance of Gymnosperms General characters, origin and evolution of Angiosperms.

SUGGESTED READINGS:

1. Gilford. L.M. and Foster. A.S. 1998. Morphology and evolution of vascular plants. W.H. Preeman and Compony. New York.
2. Sporne. K. R. 2002. The Morphology of Gymnosperms. B.I. pub. Pvt. Ltd., Mumbai, Kolkata.
3. Biswas & Johri, 1997. The Gymnosperms. Springer-Verlag, India.
4. Whilson, N.S. and rothewall. G.W. 1993 Paleobotany and evolution of plants. (II Ed.). Cambridge university press. U.K.
5. Singh, V.P. Pandey, P.C. & Jain, D.K. 2013. A text book of botany (IV Ed). Rastogi & Co., Meerut.



SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Botany

(Syllabus and Scheme of Studies w. e. f. 2015-18 onwards)

B. Sc. II Year (III Semester)

Schedule per week Lectures: 3

Examination Time: 3 Hrs

Maximum Marks : 50(20+30)

Subject : Plant anatomy

Paper Code : BOT-203

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-I

Tissues: meristematic and permanent (simple, complex and secretory) Tissue systems (Epidermal, ground and vascular)

The Shoot system: shoot apical meristem and its histological organizations.

Root system: Root apical meristem; histological organization

UNIT-II

Leaf: Types of leaves (simple and compound); phyllotaxy. Epidermis-uniseriate and ultiseriate, epidermal appendages and their morphological types.

Anatomy of typical Monocot and Dicot leaf and cell inclusions in leaves, leaf abscission, Stomatal apparatus and their morphological types

UNIT-III

Primary structure of Monocot and Dicot Stem; Cambium: structure and functions. Secondary growth in dicot stem; characteristics of growth rings; sap wood and heart wood, periderm; Anomalous secondary growth (*Dracaena*, *Boerhaavia* and *Achyranthes*)

UNIT-IV

Primary structure of Monocot and Dicot Root; Secondary growth in dicot root; Structural modifications in roots: Storage (*Beta*), Respiratory (*Rhizophora*), Epiphytic (*Vanda*)

SUGGESTED READINGS:

1. Gilford. L.M. and Foster. A.S. 1998. Morphology and evaluation of vascular plants. W.H. Preeman and Compony. New York.
1. Bhatnagar, S. and Moitra, A. 1996. Gymnosperms. New Age International Limited, New Delhi.
2. Davis, P.H. and Heywood, V.H. 1963. Principles of Angiosperms Taxonomy, Oliver and Boyd. London.
3. Gifford, E.M. and Foster, A.S. 1988. Morphology and Evolution of Vascular Plants, W.H. Freeman & Company, New York.
4. Heywood, V.H. and Moore, D.M. (eds) 1984. Current concepts in Plant Taxonomy. Academic Press, London.
5. Jeffrey, C. 1982. An introduction to Plant Taxonomy. Cambridge University Press, Cambridge, London.
6. Jones, S.B. , Jr. Luchsinger, A.E. 1986. Plants Systematics 2nd edition). McGraw Hill Book Co. New York.
7. Maheshwari, J.K. 1963. Flora of Delhi, CSIR, New Delhi.
8. Radford, A.E. 1986. Fundamentals of Plant Systamtics. Harper and Row, New York.
9. Singh, G. 1999. Plant Systematics: Theory and Practical. Oxford and IBH Pvt. Ltd., New Delhi.
10. Sporn, K.R. 1965. The Morphology of Gymnsperms. Hutchinson & Co. Ltd., London.
11. Stace, C.A. 1989. Plant Taxonomy and Biosystematics (2nd edition). Edward Arnold, London.
12. Steward, W.M. Paleobotany and the Evolution of Plants. Cambridge University Press, Cambridge.



SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Botany

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B. Sc. II Year (III Semester)

Schedule per week Lectures: 3

Examination Tim: 3 Hrs

Maximum Marks: 50(20+30)

Subject: Botany Lab-III

Paper Code: BOT-205

1. Cut the section of given material from Gymnosperms and prepare a double-stained permanent mount. Identify giving reasons and show it to examiner.
(4)
 2. Cut the section of given material from Angiosperms and prepare a double-stained permanent mount. Identify giving reasons and show it to examiner.
(4)
 3. Identify, classify and write morphological notes on the given material/specimens A & B from Gymnosperms.
(3)
 4. Describe/compare the given flowers C and D in semi-technical language giving V.S. of flowers, T.S. of ovaries, floral diagrams and Floral Formulae. Identify and assign them to their respective families giving reasons.
(3)
 5. Identify giving the important characters of identification of the spots 1,2 and 3 from embryology.
(3)
 6. Any experiment designed by the examiner as per syllabus.
(2)
 7. Practical Record
(3)
 8. Viva-voce
(5)
- IA. Lab exercise, Practical records, Field collection, Seminars, Assignments and projects

List of experiments

Identification and characterization of following slides: T.S. of stem *Cycus*, T.S. of Leaf *Cycus*, T.S. of Root *Cycus*, T.S. of stem *Pinus*, Leaf *Pinus*, Root *Pinus*

SUGGESTED READINGS

1. Bhojwani, S.S. and Bhatnagar, S.P. 2000. The Embryology of Angiosperms. 4th revised and enlarge edition. Vikas Publishing House, Delhi.
2. Cutter, E.G. 1969. Plant Anatomy Part-I, Cells and Tissues, Edward Arnold, London.
3. Cutter, E.G. 1971. Plant Anatomy: Experiment and Interpretation. Part-II Organs, Edward Arnold London.
4. Esau, K. 1977. Anatomy of Seed Plants, 2nd edition. John Wiley & Sons, New York.
5. Fageri, K and Van der Pijl 1979. The Principles of Pollination Ecology. Pergamon Press, Oxford.
6. Fahn, A. 1974. Plant Anatomy, 2nd Edition. Pergamon Press, Oxford.
7. Hartmann, H.T. and Kestler, D.E. 1976. Plant Propagation; Principles and Practices. 3rd edition. Prentice Hall of India Pvt. Ltd. New Delhi
8. King. J. 1997. Reaching for the Sun: How Plants Works. Cambridge University Press, Cambridge, U.K.
9. Mauseth, J.D. 1988. Plant Anatomy. The Benjamin/Cummings Publishing Company Inc. Menlo Park, California, USA.
10. Proctor, M and Yeo, P. 1973. The Pollination of Flowers. William Collins Sons, London.
11. Raven, P.H. Evert, R.F. and Eichhorn, S.E. 1999. Biology of Plants. 5th edition. W.R. Freeman and Co., Worth Publishers, New York.
12. Thomas, P. 2000. Trees: Their Natural History. Cambridge University Press, Cambridge.



SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Zoology
(Syllabus and Scheme of Studies w. e. f. 2015-18 onwards)
B. Sc. II Year (III Semester)

Schedule per week Lectures: 3

Examination Time: 3 Hrs

Maximum Marks: 50(20+30)

Subject: Life and Diversity of Chordates-I

Paper Code: ZOO-201

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark each (Answer to each question should not exceed 20 words). Answer to each part should not exceed 20 words. Further examiner will set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-1

Chordates: General characteristics and classification, affinities and origin, Protochordates, Retrogressive metamorphosis, Agnatha: General features of living Agnatha and classification upto classes. Type study of Pteromyzon: Structure and life history

UNIT-2

Pisces: General features & Classification, Osmoregulation, migration and Parental care, Type study: Scoliodon

Amphibia: General features & Classification upto orders, Origin and evolution of terrestrial ectotherms/tetrapods, Parental care & pedomorphosis. Type study: Rana.

UNIT-3

Reptiles: General features & Classification upto orders, Origin of reptiles skull types, Poisonous and non- poisonous snakes in India, Biting mechanism in snakes

Aves: General features & Classification upto orders. Origin of birds, Flight adaptations, Migration.

UNIT-4

Mammals: General features & Classification upto orders. Origin of mammals, dentition, Type study: Rat.



**RAFFLES
UNIVERSITY**

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Zoology

(Syllabus and Scheme of Studies w. e. f. 2015-18 onwards)

B. Sc. II Year (III Semester)

Schedule per week Lectures: 3

Examination Time: 3 Hrs

Maximum Marks: 50(20+30)

Subject: Mammalian Physiology-I

Paper Code : ZOO-203

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark each (Answer to each question should not exceed 20 words). Answer to each part should not exceed 20 words. Further examiner will set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT 1

Digestion - Brief introduction to digestive system, Buccal digestion; salivary secretion and digestion, Gastric digestion; gastric secretion and digestion, Intestinal digestion; pancreatic secretion, bile juices and digestion and small intestine and digestion and absorption in large intestine

UNIT 2

Osmoregulation and excretion - Osmoregulation , Mammalian excretory system; excretory organs and major associated blood vessels, kidney structure, nephron structure, Urine formation; ultra filtration, selective re-absorption and tubular secretion, Counter current multiplier system

UNIT 3

Respiration - Respiratory organs, Breathing mechanism, Respiratory pigments; properties and functions, External and internal respiration, Transport of gases.
Circulation - Working of mammalian heart, Blood composition and function, Mechanism of blood clotting

UNIT 4

Immunology - Innate and Acquired immunity, Humoral and cell-mediated immunity, Active and passive immunization, Blood groups and transfusions, tissue and organ transplants, Allergies, autoimmune diseases, immunodeficiency diseases



SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Zoology

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B. Sc. II Year (III Semester)

Schedule per week Lectures: 3

Examination Time: 3 Hrs

Maximum Marks: 50(20+30)

Subject : Zoology Lab-III

Paper Code : ZOO-205

1. Classification upto orders, habit, habitats, external characters and economic importance (if any) of the following animals:-

Protochordata; Molqula, Hetryllus, Pyrosoma, Doliolum, Olikopleura, andAmphioxus.

Cyclostomata; Myxine, Petromyzon and Ammocoetus larva.

Chondrichthyes;Zygaena, Pristis, Narcine (electric ray), Trygon, Rhinobatus, Raja andChimaera.

Osteichthyes; Acipenser, Lepidosteus, Muraena, Mystus, Catla, Hippocampus,Syngnathus, Exocoetus, Anabas, Diodon, Ostraczion, Tetradon, Echinus,Lophius, Solea and Polypterus. Any of the Lung Fish

2. Preparation of models of the different systems of the following animals:
Herdmania: General anatomy

Labeo (locally available fish): Digestive and reproductive systems: cranial nerves

3. Study of the skeleton of : Scoliodon, Labeo

4. Study of the prepared slides: Tornaria larva, T.S.Amphioxus(through differentregions). Oikopleura, different types of scales

5. Make permanent stained preparations of the following:Salpa,Spicules, and Cycloid scales

6. Physiology practical; Estimation of abnormal constituents of urine (Albumin, sugar, ketone bodies), Use of respirometer, Haematein crystal preparation, Estimation of Hb, DLC of Man, RBC count, WBC count.

7. Project Report: Migration in fishes, faunal survey

8. Disaster Management Project Work: (Field Work, Case Studies.for details see theUGC Website

Open Elective paper

Lectures : 2 Hrs

Examination Time : 3 Hrs

Maximum Marks: 50(20+30)

Paper Title : Object Oriented Programming

Paper Code : OOP-201

Unit-I

Object Oriented Programming using C++ Differences between C and C++.A look at procedure Oriented programming, object oriented programming paradigm, basic concepts of OOP, Benefits of OOP, OO languages, A sample program, structure of C++ program. Introduction to OOPS :The origins of C++, What is Object Oriented Programming?, Some C++ fundamentals, Headers & Name Spaces, Introducing C++ Classes, Function overloading, Operator overloading, Inheritance, Constructors & Destructors, Function & Operator Overloading:

Unit-II

Overloading constructor functions, Localizing variables, Function overloading & Ambiguity, Finding the address of an overloaded function, this Pointer, Operator overloading, References, Using reference to overload a unary operator, Overloading, overriding, Applying operator overloading.

Unit-III

Inheritance, Virtual Functions and polymorphism Inheritance and the access specifier, Constructors and Destructors in derived classes, Multiple Inheritance, Passing parameters to a basic class, Pointers and references to derived types, Virtual Functions, Why virtual functions?, Pure virtual functions and abstract types, Early Vs Late binding.

Unit-IV

Templates Class templates, class templates with multiple parameters, function templates, function templates with multiple parameters,

Text Books:

1. Object Oriented Programming in C++ -Robert Lafore, edition, Galgotia publications
2. The Complete Reference C++, Herbert Schildt, 4th Edition, TMH

Reference Book:

1. Let's C++ by Y. Kanetkar, BPB publications
2. Object oriented programming with C++, E Balagurusamy, 4th edition, TMH
3. Object-Oriented Programming with C++, Sourav Sahay, Oxford University Press, 2006.



SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry
(Syllabus and Scheme of Studies w. e. f. 2015-18 onwards)
B. Sc. II Year (IV Semester)

Lectures	: 2 Hrs	
Examination Time	: 3 Hrs	Maximum Marks: 50(20+30)
Subject	: Inorganic Chemistry	Paper Code : CH-202

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-I

Chemistry of f -block elements:

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

UNIT-II

Chemistry of f -block elements

Actinides: General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, Comparison of properties of Lanthanides and Actinides and with transition elements.

UNIT-III

Theory of Qualitative and Quantitative Inorganic Analysis-I:

Chemistry of analysis of various acidic radicals, Chemistry of identification of acid radicals in typical combinations, Chemistry of interference of acid radicals including their removal in the analysis of basic radicals.

UNIT-IV

Theory of Qualitative and Quantitative Inorganic Analysis-II:

Chemistry of analysis of various groups of basic radicals, Theory of precipitation, co-precipitation, Post- precipitation, purification of precipitates.

OR

Lectures	: 2 Hrs	
Examination Time	: 3 Hrs	Maximum Marks: 50(20+30)
Subject	: Coordination Chemistry (Elective)	Paper Code : CH-202

UNIT-I

Werner's theory, valence bond theory (inner and outer orbital complexes), electroneutrality principle and back bonding. Crystal field theory, measurement of $10 Dq$ (Δ_o), CFSE in weak and strong fields, pairing energies, factors affecting the magnitude of $10 Dq$ (Δ_o , Δ_t). Octahedral vs. tetrahedral coordination, tetragonal distortions from octahedral geometry Jahn-Teller theorem, square planar geometry. Qualitative aspect of Ligand field and MO Theory.

IUPAC nomenclature of coordination compounds, isomerism in coordination compounds. Stereochemistry of complexes with 4 and 6 coordination numbers. Chelate effect, polynuclear complexes, Labile and inert complexes.

UNIT-II

Transition Elements: General group trends with special reference to electronic configuration, colour, variable valency, magnetic and catalytic properties, ability to form complexes. Stability of various oxidation states and e.m.f. (Latimer diagrams) Different between the first, second and third transition series. Chemistry of Cr, Mn, Fe and Co in various oxidation states with special reference to the following compounds: peroxo compounds of chromium, potassium dichromate, potassium permanganate, potassium ferrocyanide, potassium ferricyanide, sodium nitroprusside and sodium cobaltinitrite.

UNIT-III

Lanthanoids and Actinoids: Electronic configuration, oxidation states, colour, spectral and magnetic properties, lanthanide contraction, separation of lanthanides (ion-exchange method only).

UNIT-IV

Inorganic Reaction Mechanism :Introduction to inorganic reaction mechanisms. Substitution reactions in square planar complexes, Trans- effect, theories of trans effect. Thermodynamic and Kinetic stability.

Reference Books:

1. Purcell, K.F. & Kotz, J.C., Inorganic Chemistry W.B. Saunders Co, 1977.
2. Huheey, J.E., Inorganic Chemistry, Prentice Hall, 1993.
3. Cotton, F.A. & Wilkinson, G., Advanced Inorganic Chemistry Wiley-VCH, 1999
4. Basolo, F, and Pearson, R.C., Mechanisms of Inorganic Chemistry, John Wiley & Sons, NY, 1967.
5. Greenwood, N.N. & Earnshaw A., Chemistry of the Elements, ButterworthHeinemann,1997.
6. Miessler, G. L. & Tarr, Donald A. Inorganic Chemistry 3 rd Ed.(adapted), Pearson, 2009

OR

Schedule per week Lectures: 2

Examination Time : 3 Hrs

Maximum Marks: 50(20+30)

Subject : Novel Inorganic Solids (Elective)

Paper Code : CH-202

UNIT-I

Synthesis and modification of inorganic solids: Conventional heat and beat methods, Co-precipitation method, Sol-gel methods, Hydrothermal method, Ion-exchange and Intercalation methods.

Inorganic solids of technological importance: Solid electrolytes – Cationic, anionic, mixed Inorganic pigments – coloured solids, white and black pigments.

One-dimensional metals, molecular magnets, inorganic liquid crystals.

UNIT-II

Nanomaterials: Overview of nanostructures and nanomaterials: classification.

Preparation of gold and silver metallic nanoparticles, self-assembled nanostructures-control of nanoarchitecture onedimensional control. Carbon nanotubes and inorganic nanowires. Bioinorganic nanomaterials, DNA and nanomaterials, natural and antisical nanomaterials, bionano composites. Introduction to engineering materials for mechanical construction:

Composition, mechanical and fabricating characteristics and applications of various types of cast irons, plain carbon and alloy steels, copper, aluminum and their alloys like duralumin, brasses and bronzes cutting tool materials, super alloys thermoplastics, thermosets and composite materials.

UNIT-III

Composite materials:

Introduction, limitations of conventional engineering materials, role of matrix in composites, classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix composites, fibre-reinforced composites, environmental effects on composites, applications of composites.

UNIT-IV

Speciality polymers: Conducting polymers - Introduction, conduction mechanism, polyacetylene, polyparaphenylene and polypyrrole, applications of conducting polymers, Ion-exchange resins and their applications. Ceramic & Refractory: Introduction, classification, properties, raw materials, manufacturing and applications.

Reference Books:

1. Atkins, Peter, Overton, Tina, Rourke, Jonathan, Weller, Mark and Armstrong, Fraser • Shriver & Atkins' Inorganic Chemistry, 5 th Edition, Oxford University Press 2011- 2012
2. Adam, D.M. Inorganic Solids: An introduction to concepts in solid-state structural • chemistry, John Wiley and Sons, London, New York, Sydney, Toronto, 1974
3. Poole Jr., Charles P., Owens, Frank J., Introduction to Nanotechnology John Wiley and • Sons, 2003.



RAFFLES
UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry
(Syllabus and Scheme of Studies w. e. f. 2015-18 onwards)
B. Sc. II Year (IV Semester)

Lectures : 2 Hrs

Examination Time : 3 Hrs

Subject : Organic Chemistry

Maximum Marks: 50(20+30)

Paper Code : CH-204

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-I

Infrared (IR) absorption spectroscopy: Molecular vibrations, Hooke'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. Applications of IR spectroscopy in structure elucidation of simple organic compounds.

UNIT-II

Amines: Structure and nomenclature of amines, physical properties. Separation of a mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles, reductive amination of aldehydic and ketonic compounds. Gabrielphthalimide reaction, Hofmann bromamide reaction. electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid.

UNIT-III

Diazonium Salts: Mechanism of diazotisation, structure of benzene diazonium chloride, Replacement of diazo group by H, OH, F, Cl, Br, I, NO₂ and CN groups, reduction of diazonium salts to hyrazines, coupling reaction and its synthetic application.

Nitro Compounds: Preparation of nitro alkanes and nitro arenes and their chemical reactions. Mechanism of electrophilic substitution reactions in nitro arenes and their reductions in acidic, neutral and alkaline medium.

UNIT-IV

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, advantage of oxidation of alcohols with chromium trioxide (Sarett reagent) pyridinium chlorochromate (PCC) and pyridinium dichromate. Physical properties. Comparison of reactivities of aldehydes and ketones. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction. Oxidation of aldehydes, Baeyer–Villiger oxidation of ketones, Cannizaro reaction. MPV, Clemmensen, Wolff-Kishner, LiAlH₄ and NaBH₄ reductions.



**RAFFLES
UNIVERSITY**

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Chemistry

(Syllabus and Scheme of Studies w. e. f. 2015-18 onwards)

B. Sc. II Year (IV Semester)

Lectures : 2 Hrs

Examination Time : 3 Hrs

Subject : Physical Chemistry

Maximum Marks: 50(20+30)

Paper Code : CH-206

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each

UNIT-I

Thermodynamics-III: Second law of thermodynamics, need for the law, different statements of the law, Carnot's cycles and its efficiency, Carnot's theorem, Thermodynamics 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, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

UNIT-II

Thermodynamics-IV: Third law of thermodynamics: Nernst heat theorem, statement of concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function(G) and Helmholtz function (A) as 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

Electrochemistry-III: Electrolytic and Galvanic cells, reversible & Irreversible cells, conventional representation of electrochemical cells, EMF of cell and its measurement, Weston standard cell, activity and activity coefficients, Calculation of thermodynamic quantities of cell reaction (G, H & K). Types of reversible electrodes metal-metal ion gas electrode, metal-insoluble salt anion and redox electrodes. Electrode reactions, Nernst equations, derivation of cell EMF and single electrode potential. Standard Hydrogen electrode, reference electrodes, standard electrodes potential, sign conventions, electrochemical series and its applications.

UNIT-IV

Electrochemistry-IV: Concentration cells with and without transference, liquid junction potential, application of EMF measurement i.e. valency of ions, solubility product activity coefficient, potentiometric titration (acid- base and redox). Determination of pH using Hydrogen electrode, Quinhydrone electrode and glass electrode by potentiometric methods.



SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry
(Syllabus and Scheme of Studies w.e.f. 2015-18 onwards)
B. Sc. II Year (IV Semester)

Schedule per week Practical: 6

Examination Time : 4 Hrs

Maximum Marks: 50(20+30)

Subject : Chemistry Lab-IV

Paper Code : CH-208

UNIT-I (Inorganic)

Preparations: Preparation of Cuprous chloride, prussion blue from iron fillings, tetraammine cupric sulphate, chrome alum, potassium trioxalatochromate (III).

UNIT-II (Physical)

1. To determine the enthalpy of neutralisation of a weak acid/weak base vs. strong base/strong acid and determine the enthalpy of ionisation of the weak acid/weak base.
2. To determine the enthalpy of solution of solid calcium chloride
3. To study the distribution of iodine between water and CCl₄.

UNIT-III (Organic)

Systematic identification (detection of extra elements, functional groups, determination of melting point or boiling point and preparation of at least one pure solid derivative) of the following simple mono and bifunctional organic compounds: Naphthalene, anthracene, acenaphthene, benzyl chloride, *p*-dichlorobenzene, *m*-dinitrobenzene, *p*-nitrotoluene, resorcinol, hydroquinone, α -naphthol, β -naphthol, benzophenone, ethyl methyl ketone, benzaldehyde, vanillin, oxalic acid, succinic acid, benzoic acid, salicylic acid, aspirin, phthalic acid, cinnamic acid, benzamide, urea, acetanilide, benzanilide, aniline hydrochloride, *p*-toluidine, phenyl salicylate (salol), glucose, fructose, sucrose, *o*-, *m*-, *p* nitroanilines, thiourea.



**RAFFLES
UNIVERSITY**

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Botany

(Syllabus and Scheme of Studies w. e. f. 2015-18 onwards)

B. Sc. II Year (IV Semester)

Schedule per week Lectures: 3

Examination Time: 3 Hrs

Maximum Marks: 50(20+30)

Subject: Biology and diversity of seed plants-II

Paper Code: BOT-202

***Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Taxonomy and Systematics: fundamental components of taxonomy (identification, classification, description, nomenclature and phylogeny), Role of chemotaxonomy, cytotaxonomy and taxometrics in relation to taxonomy, Botanical Nomenclature, principles and rules, principle of priority, Keys to identification of plants.

UNIT-II

Type concept, taxonomic ranks, Salient features of the systems of classification of angiosperms proposed by Bentham & Hooker and Engler & Prantl, Floral Terms and Types of Inflorescence

UNIT-III

Diversity of Flowering Plants: Diagnostic features and economic importance of the following families: Ranunculaceae, Brassicaceae, Malvaceae, Euphorbiaceae, Rutaceae, Fabaceae, Cucurbitaceae

UNIT-IV

Diversity of Flowering Plants: Diagnostic features and economic importance of the families: Apiaceae, Asclepiadaceae, Lamiaceae, Solanaceae, Asteraceae, Liliaceae and Poaceae

SUGGESTED READINGS:

1. Taxonomy of the angeosperms, v.N. Nair (1995) TMH Publishing Compony New Delhi.
2. Introduction to the principles of plants Taxonomy V.V. Sivrajan (1984) Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
3. Plant Taxonomy, Sushell (2003) Dominant Publisher and Distributers. New Delhi.
4. Plant systemetics. Gurcharan Singh. (2001) Oxford and IBH Publishing Co. Pvt.



SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Botany

(Syllabus and Scheme of Studies w. e. f. 2015-18 onwards)

B. Sc. II Year (IV Semester)

Schedule per week Lectures: 3

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**

Subject : Plant Embryology **Paper Code : BOT-204**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-I

Plant Embryology: History and Scope; Flower-a modified shoot; Anther: Structure and ontogeny; Tapetum: Structure and Function; Microsporogenesis, Callose deposition and its significance; Microsporangium, its wall and dehiscence mechanism

UNIT -II

Pollen Biology: Microgametogenesis, Pollen wall development, MGU (Male Germ Unit); NPC System; Pollen wall Proteins; Pollen viability, storage and germination; Pollen tube structure; Pollen-pistil interaction; self incompatibility, **Pollination:** types and agencies

UNIT-III

Ovule: Structure, ontogeny, types; special structures – endothelium, operculum, obturator, aril, arillode, caruncle, hypostase, epistase. Female gametophyte (mono, bi and tetrasporic), Megasporogenesis; Megagametogenesis; organization and ultrastructure of mature embryo sac. Double fertilization, Endosperm types and its biological importance.

UNIT-IV

Embryogenesis in Dicot and Monocot; Polyembryony and Apomixis; Structure of Dicot and Monocot seed, Fruit types; Dispersal mechanisms in fruits and seeds.

SUGGESTED READINGS:

1. Sporne. K. R. 2002. The Morphology of Gymnosperms. B.I. pub. Pvt. Ltd., Mumbai, Kolkata.
2. Whilson, N.S. and rothewall. G.W. 1993 Paleobotany and evaluation of plants. (II Ed.). Cambridge university press. U.K.
3. Singh, V.P. Pandey, P.C. & Jain, D.K. 2013. A text book of botany (IV Ed). Rastogi & Co., Meerut.
4. Galston, A.W. 1989: Life Processes in Plants, Scientific American Library, Springer-Verlag, New York, USA.
5. N. Sharma and J. N. Sharma (2003) Structure and development and Reproduction in Flowering Plants Ramesh Book Depot. Jaipur.

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Botany
(Syllabus and Scheme of Studies w. e. f. 2015-18 onwards)

B. Sc. II Year (IV Semester)

Schedule per week Lectures: 3

Examination Time	: 3 Hrs	Maximum Marks: 50(20+30)
Subject	: Botany Lab-IV	Paper Code : BOT-206

List of experiments

1. Section cutting of the following: T. S. Of Flowers Parts, T.S. of Ovary, T. S. of embryo of *Pisum*, *Brasica*, *Hibiscus*, *Rosa*
2. Anther: wall and its ontogeny; tapetum; microsporogenesis, stages; psuedomonads, massulae (slides and fresh material).
3. Pollen grains: fresh and acetolysed, ornamentation and aperture; pollen viability: tetrazolium test.
4. Ovule: types; unitegmic, bitegmic; tenuinucellate and crassinucellate; special structures endothelium, operculum, obturator, hypostase and epistase; caruncle and aril (permanent slides/ specimens/photographs)
5. Endosperm: dissections of developing seeds for free-nuclear endosperm with haustoria; types (permanent slides).
6. Embryogenesis: study of development of dicot embryo through permanent slides; dissection of developing seeds for embryos at various developmental stages.

SUGGESTED READINGS

1. Bhojwani, S.S. and Bhatnagar, S.P. 2000. The Embryology of Angiosperms. 4th revised and enlarge edition. Vikas Publishing House, Delhi.
2. Cutter, E.G. 1969. Plant Anatomy Part-I, Cells and Tissues, Edward Arnold, London.
3. Cutter, E.G. 1971. Plant Anatomy: Experiment and Interpretation. Part-II Organs, Edward Arnold London.
4. Esau, K. 1977. Anatomy of Seed Plants, 2nd edition. John Wiley & Sons, New York.
5. Fageri, K and Van der Pijl 1979. The Principles of Pollination Ecology. Pergamon Press, Oxford.
6. Fahn, A. 1974. Plant Anatomy, 2nd Edition. Pergamon Press, Oxford.
7. Hartmann, H.T. and Kestler, D.E. 1976. Plant Propagation; Principles and Practices. 3rd edition. Prentice Hall of India Pvt. Ltd. New Delhi
8. King. J. 1997. Reaching for the Sun: How Plants Works. Cambridge University

Press, Cambridge, U.K.

9. Mauseth, J.D. 1988. Plant Anatomy. The Benjamin/Cummings Publishing Company Inc. Menlo Park, California, USA.
10. Proctor, M and Yeo, P. 1973. The Pollination of Flowers. William Collins Sons, London.
11. Raven, P.H. Evert, R.F. and Eichhorn, S.E. 1999. Biology of Plants. 5th edition. W.R. Freeman and Co.



**RAFFLES
UNIVERSITY**

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Zoology

(Syllabus and Scheme of Studies w. e. f. 2015-18 onwards)

B. Sc. II Year (IV Semester)

Schedule per week Lectures: 3

Examination Time: 3 Hrs

Maximum Marks: 50(20+30)

Subject: Life and Diversity of Chordates-II

Paper Code: ZOO-202

***Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark each (Answer to each question should not exceed 20 words). Answer to each part should not exceed 20 words. Further examiner will set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

Unit 1

Comparative Anatomy of Chordates:

Integument; Structure and derivatives of integument

Bone; Structure and types, Ossification, bone growth.

Unit 2

Digestive System; Alimentary canal and associated glands

Respiratory system; Skin, Gills, Lungs, Air sacs and voice apparatus, Air bladder and accessory breathing organs in fishes.

Unit 3

Circulatory System; Evolution of heart and aortic arches, Venous system and lymphatic system

Skeleton System: Axial and appendicular skeleton, Jaw suspensorium and Visceral arches.

Unit 4

Nervous System; Central & Autonomic Nervous System, Cranial nerves

Sense Organs; Classification of receptors, structure and working of Mammalian eye and ear

Urinogenital System; Succession of kidney, Evolution of Urinogenital ducts



SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Zoology
(Syllabus and Scheme of Studies w. e. f. 2015-18 onwards)
B. Sc. II Year (IV Semester)

Schedule per week Lectures: 3

Examination Time: 3 Hrs

Subject: Mammalian Physiology-II

Maximum Marks: 50(20+30)

Paper Code: ZOO-204

***Note:** Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark each (Answer to each question should not exceed 20 words). Answer to each part should not exceed 20 words. Further examiner will set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT 1- Muscle physiology

1. Ultra structure of smooth, striated and cardiac muscles
2. Muscle contraction
3. Simple twitch and fatigue

UNIT 2- Nerve physiology

1. Structure of neuron
2. Conduction of nerve impulse through axon
3. Neurotransmitters
4. Synapses; ultrastructure and function

UNIT 3 - Endocrinology

1. Endocrine system; definition of endocrine, paracrine and autocrine system, significance of endocrine and neuro-endocrine system
2. Pituitary gland; structure, hormones and their functions
3. Thyroid gland; structure, hormones and their functions
4. Adrenal gland; structure, hormones and their functions
5. Pancreas; islets of langerhans, structure, hormones and their functions

UNIT 4 -Physiology of reproduction

1. Hormonal control of male and female reproduction
2. Implantation
3. Parturition and lactation in mammals
4. Reproductive cycle; oestrous and menstrual cycles
5. Menopause in human



SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Zoology
(Syllabus and Scheme of Studies w. e. f. 2015-18 onwards)
B. Sc. II Year (IV Semester)

Schedule per week Lectures: 3

Examination Time: 4 Hrs

Subject: Zoology Lab-IV

Maximum Marks: 50(20+30)

Paper Code: ZOO-206

1. Classification up to orders, habit, habitats, external characters and economic importance (if any) of the following animals:-
Amphibia: *Necturus*, *Proteus*, *Amphiuma*, *Salamandra*, *Amblystoma*, *Axolotle larva*, *Alytes*, *Bufo*, *Rana*
Reptilia: *Hemidactylus*, *Calotes*, *Draco*, *Varanus*, *Phrynosoma*, *Chamaeleon*, *Typhlops*, *Python*, *Eryx*, *Ptyas*, *Bungarus*, *Naja*, *Hydrus*, *Viper*, *Crocodilus*, *Gavialis*, *Chelone* (Turtle) and *Testudo* (Tortoise)
Aves: *Casuaris*, *Arden*, *Anas*, *Milvus*, *Pavo*, *Eudynamis*, *Tyto* and *Alcedo*, *Halcyon*
Mammalia: *Ornithorhynchus*, *Echidna*, *Didelphis*, *Macropus*, *Loris*, *Macaque*, *Hystrix*, *Funambulus*, *Telax*, *Panthera*, *Canis*, *Herpestes*, *Capra*, *Pteropus*
2. Preparation of models of the different systems of the following animals:
Hemidactylus; Digestive, arterial, venous and urinogenital systems
Rat : Digestive, arterial, venous and urinogenital systems
3. Study of the skeleton of *Rana* (Frog), *Varanus*, Pigeon or *Gallus* and *Orcyctolagus*/rat
4. Study of the following prepared slides: Histology of rat (compound tissues)
5. Study and collection of different types of feathers; Quill, Contour, Filoplume and Down feathers
6. Physiology practical; study of estrus cycle, ultrasound image of foetus, study of histological structure of major endocrine glands of mammals
7. Project Report: Survey of diversity, Parental care , Dentition in mammals, Migration in birds

Suggested readings

1. Bell JN and Davidson GH, Textbook of physiology and Biochemistry, ELBS.
2. Sastry, KV. Animal physiology & biochemistry. Rastogi publications, Meerut.
3. Taylor, DJ, Green, NPO, and Stout, GW. Biological Science. Cambridge low price edition. Cambridge University Press.
4. Schmidt-Nielsen. Animal physiology. Cambridge University Press.
1. David S. Goodsell The Machinery of Life, 2009. [Springer-Verlag New York Inc.](http://www.springer-verlag.com)
2. Young JZ. The life of vertebrates, Oxford University Press, London
5. Peter Holland. The Animal Kingdom. Oxford University Press, New Delhi.

Open Elective paper

Lectures : 2 Hrs

Examination Time : 3 Hrs

Paper Title : Principle of Management

Maximum Marks: 50(20+30)

Paper Code : PM-202

Unit I: Introduction to Management

- Nature of Management- Meaning, Definition, it's nature purpose, importance & Functions.
- Evolution of Management Thoughts- Contribution of F.W.Taylor, Henri Fayol ,Elton Mayo , Chester Barnard & Peter Drucker to the management thought. Various approaches to management (i.e. Schools of management thought)Indian Management Thought.

Unit II: Planning and Decision Making

- Planning - Meaning - Need & Importance, types levels - advantages & limitations.
- Forecasting - Need & Techniques
- Decision making - Types - Process of rational decision making & techniques of decision making.

Unit III: Organizing and Directing

- Organizing - Elements of organizing & processes: Types of organizations, Delegation of authority - Need, difficulties in delegation – Decentralization.
- Directing- Introduction, Principles and Elements of Direction; Supervision, Traditional vs. Development Supervision.

Unit IV: Controlling and Coordination

- Controlling- Concept, Importance, Process & Types of Controlling, Contemporary Issues in Control, Entrepreneurs and Control. Operations Management- Importance, Service and Manufacturing Firms, Project Management Tools & Techniques.
- Coordination- Coordination- Definition, Characteristics, Objectives, Techniques.

Unit V: Contemporary Management Issues

- Management in the International Area.
- Change and Organizational Development.
- Ethics, Corporate Governance and Social Responsibilities.

Recommended book

- V.S.P. RAO: Principles of Management text and cases

Reference books

- L. M. Prasad: Principles of Management
- Robbins, De Cenzo, Bhattacharya and Agarwal, (2009): Fundamentals of Management- Essential Concepts & Applications 6e, India, Pearson
- Hellriegel, Jackson and Sloceum, (2008): Management- A Competency Based Approach 10e, India, South- Western Cengage Learning.
- Stoner, Freeman, Gilbert, Jr., (2006), Management 6e, India, Prentice- Hall

OR

Lectures : 2 Hrs

Examination Time : 3 Hrs

Paper Title : Origination Behavior

Maximum Marks: 50(20+30)

Paper Code : OB-202

Unit I: Foundations of Individual Behavior

- Introduction and Conceptual framework of OB- Nature & Scope of Organizational Behavior. The organization and the individual.
- Personality: Determinants and Attributes, Big Five Model
- Major Personality Attributes: Locus of Control, Machiavellianism, Self Esteem, Self Monitoring, Type A & B personality, Risk taking ability.
- Learning and Learning Theories: Concept, Law of Effect, Classical Conditioning, Operant Conditioning, Social Learning Theory. Reinforcement Theory and OB Modification Process and its Advantages.
- Attitudes: Concept, its components and various job related attitudes, Job satisfaction and its impact on OB.
- Values: Concept, types of values, Robbin's Dominant Work Values today, Hofstede's Values Across Cultures, Javidan & House's The G.L.O.B.E. Findings.
- Perception: Definition, factors affecting individual perception, Perceptual Selectivity.

Unit II: Motivation and Leadership

- Motivation: Definition and concept, different types of motives.
- Theories of motivation: Maslow's Hierarchy of Needs, Herzberg's Two Factor theory, ERG theory, Vroom's Expectancy theory, Equity theory, Reinforcement theory and Behavior Modification.
- Leadership: Nature and Significance of leadership, Trait theory of leadership.
- Behavioral theories of leadership- Ohio State Studies, Michigan Studies, and Managerial Grid.
- Contingency theories - Fiedler's model, Hersey and Blanchard's situational theory, leader-member exchange theory, path goal theory, Charismatic leadership.

Unit III: Foundations of Group Behavior

- Group: Definition, Classification of Groups, stages of group development, Group Structure, Group Processes, Strength and weakness of group over individuals.

- Team: Concept of team, Group v/s Team, Team Effectiveness, Different types of teams, how to convert an individual into team player.
- Conflict and Collaboration: Transitions in Conflict Thought, Functional versus Dysfunctional Conflict, Conflict Process.
- Conflict Management: Techniques, Negotiation process, Bargaining strategies, Global implications.

Unit IV: Structural & Cultural Dimensions of OB

- Organization Structure: Definition, Elements of Organization Structure, Common Organization Designs: simple Structure, Bureaucratic Structure, Matrix Structure.
- New Designs Option: Team Structure, Virtual Structure, Boundaryless Organization Structure; Factors affecting choice of different organization designs.
- Organization Culture: Meaning of Organizational Culture, Creating and Sustaining Culture, Countries and Culture, Employee Acculturation Process.
- Organizational Climate: Concept and How to build a more positive and employee centered climate.

Recommended Book

- Robbins, Judge & Sanghi, (2009): Organizational Behavior 13e, India, Pearson, Prentice Hall

Reference Book

- L. M. Prasad, (2011): Organizational Behavior, India, Sultan Chand & Sons
- Hersey, Blanchard & Johnson, (2009), India, Pearson/ Prentice Hall
- Keith Davis: Organizational Behavior
- Fred Luthans: Organizational Behavior