**B.Sc., BIOCHEMISTRY**

**I YEAR – I SEMESTER**

**COURSE CODE: 7BBCA1**

**ALLIED COURSE - I – GENERAL CHEMISTRY – BIOCHEMISTRY**

**Unit I ATOMIC STRUCTURE**

Electronic structure of atoms – quantum numbers – shape of s & p orbitals – hybridization of Atomic orbitals – sp3, sp2 & sp hybridisation. Oxidation & reduction – oxidizing and reducing agents – oxidizing number – balancing oxidation – reduction equation

Constituents of atom – atomic number – mass number – isotopes – isobars – separation of isotopes. By diffusion method – application of isotopes in medicine, industry, biology and agriculture

**Unit II CHEMICAL BONDING**

Ionic bond – covalent bond – coordinate Bond – polar covalent Bonds – Electronegativity – Electron affinity - localized and Delocalised Bonding – resonance effect – Inter Molecular forces - Intramolecular forces Vanderwaals and dipole forces.

**ENERGETICS**

Exothermic and Endothermic reactions – Internal Energy – enthalpy of Reaction – Hess’ Laws of constant summation – measurement of thermal changes – Enthalpy of combustion and Enthalph of Formation - Entropy.

**Unit III SOLUTIONS**

Types of solutions – Raouetes law – ideal and non-ideal solutions – Methods for Expressing concentration of solutions – Weight Percentage – Molarity – Molarity - mole fraction – Normality – ppm and ppb – Osmotic Pressure and its Applications.

**Unit IV COLLOIDAL STATE**

Classification of colloids – Preparation of colloids – Properties of colloids - Dialysis – Electroosmosis – Electrophoresis stability of colloids – gold number – Application of colloids.

**Unit V SPECTROSCOPY AND ITS APPLICATIONS**

Basic principle of UV, IR and 1H NMR spectroscopy – application of UV, IR and 1H NMR techniques in the identification of simple organic molecules (ethanol and dimethyl ether, acetaldehyde and Acetone, Ethylene and acetylene, cis-2-butene and trans – 2-butane; methylamine, dimethylamine and trimethylamine only).

**Books for Reference:**

1. Harpers Illustrated Biochemistry (2006) by R.K. Murray, D.K. Granner and V.M Rodwell,The McGraw-Hill companies, Inc.
2. Textbook of Biochemistry with Clinical Correlations (2006) byThomas M. Devlin, John

wiley & Sons Inc., Publications

1. Lehninger Principles of Biochemistry (2006) by D.L. Nelson and M.M. Cox, Macmillan worth Publishers.
2. Biochemistry (2004) by Donald Voet and Judith G. Voet, John Wiley and Sons, USA
3. Biochemistry (2007) by Jeremy M.Berg, John L. Tymoczke and Lubert Stryer, W.H. Freeman and Company, USA.
4. Enzymes- Biochemistry, Biotechnology and Clinical Chemistry (2004) by Trevor Palmer. Affiliated Fast- West Press Pvt Ltd, India.
5. Modern experimental biochemistry, 3rd edition (2004). Rodney Boyer, Benjamin and

Cummings, New York.

1. Fundamental of Enzymology 3rd ed. (2003). Nicholas C. Price, Lewis Stevens, Oxford

university Press, Oxford.

1. Enzymes: A practical introduction to structure, mechanism and data analysis 2nd edition

(2000). Robert A. Copeland, John Wiley and Sons, New York.

1. Essential of Physical Chemistry, Arun Bahl, B S Bahl & G D Tuli, S. Chand Publishing

Company, 2012.

1. Advanced Organic Chemistry, Arun Bahl & B S Bahl, S. Chand Publishing Company, 2000.
2. Principles of Physical Chemistry, B.R. Puri, L.R. Sharma and M.S. Pathania; Vishal

Publishing Company, 2008.

1. Textbook of Physical Chemistry, P.L. Sony, O.P.Dharmarha and U.N. Dash; Sultan Chand and Sons; (2006).
2. Elementary Organic Spectroscopy, Y R Sharma, S. Chand Publishing, 1980.

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**1 YEAR – I/II SEMESTER**

**COURSE CODE: 7BBCAP1**

**ALLIED PRACTICAL - I – QUALITATIVE AND VOLUMETRIC ANALYSIS**

**QUALITATIVE ANALYSIS OF ORGANIC COMPOUNDS**

1. Tests for aliphatic and aromatic compound.
2. Tests for saturation and unsaturation in organic compounds
3. Tests for the detection of elements: Halogen, nitrogen and sulphur.
4. Analysis of functional group: Acids, phenols, aromatic amines, aldehydes, ketones, esters, amides, urea and carbohydrates.
5. Preparation of derivatives/colour reactions for the functional group.

**SUBMISSION OF PRACTICAL RECORD NOTE IS COMPULSARY (10 Marks)**

**1. VOLUMETRIC ANALYSIS**

 A double titration involving making up of the solutions to be estimated or a single titration involving making up of solution to be estimated and the preparation of a primary standard.

**2. ACIDIMETRY AND ALKALIMETRY:**

A) Titration between a strong acid and sodium hydroxide/sodium carbonate.

B)Titration between weak acid, oxalic acid and sodium hydroxide/potassium hydroxide.

**3.** **PERMANGANOMETRY:**

Permanganometry titration between potassium permanganate and oxalic acid / ferrous sulphate / ferrous ammonium sulphate.

**4. DICHROMETRY:**

Titration between potassium dichromate and ferrous sulphate / ferrous ammonium sulphate.

**5.** **IODOMETRY AND IODIMETRY**:

Titration between sodium thio sulphate and iodine / potassium permanganate / potassium dichromate / copper sulphate.

**Books for Reference:**

1. Vogel's Textbook of Practical Organic Chemistry, Arthur Israel Vogel, B. S. Furniss,

Longman, 1989.

1. B.S.Furniss, A.J.Hannaford, P.W.G.Smith and A.R.Tatchell, Vogel’s Practical Organic

Chemistry, 5th edn. ELBS, 1989.

1. Raj K. Bansal, Laboratory Manual of Organic Chemistry, III Edn., New Age International (P) Ltd. 1996.
2. A.I.Vogel, Elementary practical organic chemistry: Quantitative organic analysis Part-III,

Pearson Education Asia, 2011

1. A.I.Vogel, Elementary practical organic chemistry: Qualitative organic analysis Part-II,

Pearson Education Asia, 2011

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**I YEAR – II SEMESTER**

**COURSE CODE: 7BBCA2**

**ALLIED COURSE - II – ORGANIC CHEMISTRY**

**Unit I INTRODUCTION:**

Characterisation of Organic compounds purification by the method of Crystallisation, Fractional crystallization, Sublimation, Distillation, Fractional distillation, Distillation under reduced pressure steam distillation and Chromatographic methods (Column, Thin layer and Paper only). Detection of carbon, hydrogen, nitrogen, halogens and sulphur in organic compounds. Emprical and molecular formula isomerism – structural, functional, positional and metamerism – Keto-enol tautomerism.

**Unit II NOMENCLATURE:**

Classification of organic compounds – homologous series – Nomenclature of organic compounds (aliphatic and aromatic) – trivial names and IUPAC system.

**Unit III STEREOISOMERISM:**

Optical isomerism – Chiral center – optical activity of compounds containing one or two chiral centers – R/S – notation - Enantiomers – Diasteromers – recemisation – resolution.

Geomertical isomerism of maleic and fumaric acids – E/Z notation of geometrical isomers.

**Unit IV ELECTRON DISPLACEMENT IN MOLECULES:**

Polarisation of bond – Inductive and field effects – mesomeric effect – hyper conjugation – Steric effect – Hydrogen bonding (inter and intra molecules).

**Unit V DYES AND POLYMERS:**

Classification of dyes on the basis of structure and application – theory of colour and constitution – Colour fastress.

Classification of polymers – Types of polymerization (mechanism not required) – Thermoplast and thermoset plastics – resins – Natural and synthetic rubber (bunas – Neoprene, Thiokol only)

**Books for Reference:**

1. A text book of Oranic Chemistry – Arun Bhal and B.S.Bhal, S.Chand and Company.
2. Organic Chemistry vol.1 (.l.Finar, ELBS Longman, V. Edn. (1975) Reprint (1982)
3. Organic Chemistry, vol.2, I.L. Finar ELBS/ Longaman,V. Edn. (1975) Reprint (1982)
4. Stereochemistry, Conformation & Mechanism,P.S.Kalsi,Whiley 383 Eastern Ltd., (1993)
5. Chemistry of Organic Natural Products vol.1- O.P.Agarwal,Goel Publishing House, Meerut (1978).
6. Elementary Organic Spectroscopy– Y.R.Sharma S.Chand and company, – Fourth edition.
7. Morrison R.T, Boyd R.N.,Organic Chemistry ,7th edition,Prentice Hall,New Delhi, 2008.
8. Soni. P.L, Chawala H.M., Text book of Organic Chemistry, 26th edition, Sultan Chand, Delhi 1994.
9. Raj.K.Bansal, Organic Reaction Mechanisms , 3rd edition, Tata MCGraw-Hill.

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**II YEAR – III SEMESTER**

**COURSE CODE: 7BBCA3**

 **ALLIED COURSE III – GENERAL BIOLOGY**

**Unit I**

Basis of classification – units of classification species, genus, family – nomenclature – Binomial system. Systems of classification – artificial, natural and phylogenetic; Bentham and Hooker’s system of classification plants (order level only).

**Unit II**

Morphology, structure and reproduction of plants:

**Algae:** General characters upto class level with Sargassum as an example – Economic importance of seaweeds.

**Fungi:** Classification upto class level – Yeast as an example

**Bryophytes:** Classification upto class level – Funaria as an example – alternation of generations

**Pteridophytes:** Selaginella, Heterospory and seed habit

**Gymnosperms**: Pinus – Economic uses of Gymnosperms

**Angiosperms:** Monocot flower – *Allum cepa*; Dicot flower – *Tribulus terrestris.*

**Unit III**

General classification of animals upto class level with examples as mentioned in practical syllabus –descriptions for examples not required

**Unit IV**

Organisation, movements and secretions of gastro intestinal tract Respiration – Respiratory organ in mammal – morphology – Respiratory pigments Blood and circulation – composition of blood– General organization of circulatory system Excretion – Excretory organs

**Unit V**

Muscular system – ultra structure of voluntary muscle – construction of muscles – Nervous system – Central nervous system – Autonomic nervous system – Over view of Endocrine glands – Human reproduction – Male and Female reproductive systems – Reproductive hormones – Menstrual cycle.

**Books for Reference:**

1. Introduction to Plant Biotechnology (2001), Third Edition, H.S.Chawla, Oxford & IBH Publishing Co. Pvt. Ltd.
2. Plant Biotechnology-New Products & Applications (2000). J. Hammond, P.McGarvey

&V.Yusibov (Eds), Springer-Verlog.

1. Plant Biotechnology: The Genetic Manipulation of Plants (2008) Adrian Slater, Nigel

W.Scott and Mark R.Fowler, Oxford University Press.

1. Plants, Genes and Agriculture (2000). Maarten J.Chrispeels and David E.Sadava, Jones and Barlett Publishers.
2. Plant Biochemistry & Molecular Biology (1999), Second Edition, Peter J.Lea, Richard

C.Leegood, John Wiley &Sons.

1. Recent advances in Plant Biotechnology (2009) First Edition, A. Kirakosyan and P B

Kaufman, Springer

1. Introduction to Computers (2005) by Peter Norton, Sixth Edition, Tata Mcgraw Hill.
2. A.C. Dutta, Botany for degree students, Oxford University Press

G.M. Smith, Cryptogamic Botany Volume I & II, Tata Mc Graw Hill

1. W.T. Taylor and R.J. Wehe-General Biology, East West Press Pvt. Ltd
2. Narayanasamy *et al* Outlines of Botany, Viswanathan

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**I YEAR – III/IV SEMESTER**

**COURSE CODE: 7BBCAP2**

 **ALLIED PRACTICAL - II – GENERAL BIOLOGY**

1. Blood cells of Human, Different types of Muscles
2. Vegetative structure and reproductive structure in Sargassum yeast, Funaria, Seleginella and Pinus (section cutting of Sargassum and Selaginella, Pinus stem and needles)
3. Structure of Monocot flower – *Allium Cepa*
4. Structure of Dicot flower – *Tribulus terrestris*
5. Morphology of one representative for each phylum – spotters only – Amoeba, Euglena, Paramecium, Hydra, Planaria, Liver fluke, Taneia, Ascaris, Earthworm, Prawn, Pila, Star-fish, Shark, Mugil, Bufo, Calotes, Pigeon and Rat
6. Study of cell inclusions
7. Study of Mitosis by smear technique of *Allium cepa* root
8. Survey of Mendelian traits
9. Law of probability
10. Use of methods of illustrate Mendel’s law
11. Determination of blood groups
12. Determination of Rh factor
13. Determination of Haemoglobin
14. Blood cell count

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 **II YEAR – IV SEMESTER**

**COURSE CODE: 7BBCA4**

 **aLLIED COURSE - IV – Cell Biology and Genetics**

**Unit I**

Cell Structure: Prokaryotes and Eukaryotic cells (plant and animal) – structural features – A brief comparative account – Plasma membrane – chemistry and ultra structure – fluid mosaic model functions to be dealt with briefly – protoplasm – chemistry and organization – microtubules and micro filaments

**Unit II**

Organelles in Eukaryotes – Nucleus, Plastids, Mitochondria, Lysosomes and Ribosomes. Cell cycle– Mitosis and Meiosis – Interphase and Division phase – cell growth – normal and cancerous – Viruses – kinds, structure, chemistry and life cycle

**Unit III**

Microscopy – Light and Electron Microscope – a brief account – Centrifugation – Hitochemical staining – Starch (Potassium iodide reaction), Proteins (Mercuric Bromophenol Blue method) and Lipids and Lipoproteins (Sudan Black B)

**Unit IV**

Mendel’s works – Mendel’s methods, experiments, observations and results. Rediscovery of Mendel – Mendel’s laws – Terminology – Rack – Test cross – problems. Mendel’s law are not universal – Modifications – complete and incomplete dominance. Co-dominance – Lether factor – Non allelic gene interactions – complementary genes – supplementary genes – inhibitory genes – Epitasis – Biochemical spects – duplicating genes – pleotrophism – problems.

**Unit V**

Genes and chromosomes – linkage and crossing over – theories of crossing over – cytological basis– mapping of chromosomes – single cross over and double cross over maps – problems. Mutation – gene mutation – molecular basis of gene mutation – base substitution – tautomerism – mutagens – chromosomal mutation – deletion – duplication – translocation – invarsion – ploidy Population genetics – gene pool concept Hardy Weiberg law – gene frequencies – calculations – factors affecting Hardy Weiberg equilibrium.

**Books for Reference:**

1. Molecular Biology of the Cell (2008), Fourth Edition, B. Alberts, A. Johnson, J. Lewis, M. Raff, K. Roberts and P Walter, Garland Publishing (Taylor & Francis Group), New York &London
2. Genes IX (2007), 9th Edition, Benjamin Lewin, Jones and Barlett Publishers.
3. Molecular Cell Biology (2004), Harvey Lodish, Fifth Edition, W.H.Freeman and Company,New York.
4. The Cell: A Molecular Approach (2009) Fifth Edition, Geoffrey M.Cooper and Robert

E.Hausman, ASM Press, Washington D.C. & Sinauer Associates, Inc, Sunderland,

Massachusetts.

1. Cell and Molecular Biology – Concepts and Experiments (2008), Gerald Karp, Harris, D(ed), John Wiley & Sons Inc, New York.
2. Cell and Molecular Biology (Eight Edition) (1995), De Roberties, E.D.P. and De Roberties, E.M.F. B.I.Waverly Pvt.Ltd., New Delhi.
3. Albert, B. Bray, D. Lewis, J. Raff, M. Roberts K& Watson J.D. Molecular Biology of the cell,New York, Garland 1983
4. De Robertis, E.D.P. and De Robertis, Jr.E.M.E. Essentials of cell and molecular biology
5. Fawcett, D.W. The cell its organells and inclusions Philadelphia W.B. Saunders 1966
6. K.V. Krishnamoorthy – Methods in plant Histochemistry-Viswanathan, Printers and

 Publishers 1966

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