

PUNJABI UNIVERSITY,
PATIALA, PUNJAB, INDIA
(Established under Punjab Act No. 35 of 1961)



Syllabi
for
B.Sc.(HONS.) BIOTECHNOLOGY

COURSE CODE: BTHB3PUP

(Choice Based Credit System)

for
Sessions: 2021-22, 2022-23, 2023-24

Faculty of Life Sciences,
Punjabi University, Patiala

B.Sc. (Hons.) Biotechnology Part I

COURSE CODE: BTHB3PUP

CHOICE BASED CREDIT SYSTEM
(Academic Session 2021-22, 2022-23 & 2023-24)

1st Semester

Paper Code	Paper	Credit/Week	Internal Marks	External Marks	Total Marks
BTHB1101T	Biochemistry & Metabolism	4	26	74	100
BTHB1102T	Cell Biology	4	26	74	100
BTHB1103T	English-I	2	25	75	100
BTHB1104T	Biostatistics*	4	26	74	100
BTHB1105T	Developmental Biology*				
BTHB1106T	Chemistry-1*				
BTHB1107T	Punjabi-I** Elementary Punjabi***	2 Lectures/week (Non-credit)	25	75	100**** (Qualifying paper)
BTHB1101L	Practical pertaining to Theory Paper BTHB1101T	2	-NIL-	50	50
BTHB1102L	Practical pertaining to Theory Paper BTHB1102T	2	-NIL-	50	50
BTHB1103L	Practical pertaining to Theory Paper BTHB1104T/ BTHB1105T/ BTHB1106T	2	-NIL-	50	50
	Total	30	103	447	550

Note: Weightage of different components in internal assessment is as: Attendance -20%; Written assignment/project works/seminar/industrial visit-40%; Two-mid semester Tests/internal examination-40%

* Candidate have to select one option from papers BTHB1104T, BTHB1105T & BTHB1106T

**Candidates who have passed Punjabi at matriculation level

*** Candidates from Foreign countries & other states

****Marks of the qualifying paper would not be included in total marks of the semester

B.Sc. (Hons.) Biotechnology Part I

COURSE CODE: BTHB3PUP

CHOICE BASED CREDIT SYSTEM
(Academic Session 2021-22, 2022-23 & 2023-24)

2nd Semester

Paper Code	Paper	Credit/Week	Internal Marks	External Marks	Total Marks
BTHB1201T	Mammalian Physiology	4	26	74	100
BTHB1202T	Plant Anatomy & Physiology	4	26	74	100
BTHB1203T	English-II	2	25	75	100
BTHB1204T	Biotechnology & Human Welfare*	4	26	74	100
BTHB1205T	Microbial Physiology*				
BTHB1206T	Chemistry-2*				
BTHB1207T	Punjabi-II** Elementary Punjabi-II***	2 Lectures/Week (Non-credit)	25	75	100**** (Qualifying Paper)
BTHB1208T	Drug Abuse: Problem, Management and Prevention	4 Lectures/Week (Non-credit)	30	70	100**** (Qualifying Paper)
BTHB1201L	Practical pertaining to Theory Paper BTHB1201T	2	-NIL-	50	50
BTHB1202L	Practical pertaining to Theory Paper BTHB1202T	2	-NIL-	50	50
BTHB1203L	Practical pertaining to Theory Paper BTHB1204T/ BTHB1205T/ BTHB1206T	2	-NIL-	50	50
	Total	20	103	447	550

Note: Weightage of different components in internal assessment is as: Attendance -20%; Written assignment/project works/seminar/industrial visit- 40%; Two-mid semester Tests/internal examination-40%

* Candidate have to select one option from papers BTHB1204T, BTHB1205T & BTHB1206T

**Candidates who have passed Punjabi at matriculation level

*** Candidates from Foreign countries & other states

**** Marks of the qualifying papers would not be included in total marks of the semester

B.Sc.(HONS.) BIOTECHNOLOGY

COURSE CODE: BTHB3PUP

PART I (1st SEMESTER)

BIOCHEMISTRY & METABOLISM: BTHB1101T

Time Allowed: 3hrs; MM: 74; Pass Percentage: 40 %

OBJECTIVES:

- The major objective of this subject is the complete understanding at the molecular level of all of the chemical processes associated with living cells.
- The molecular architecture of cells and organelles, including membrane structure and dynamics will be discussed.
- It will also focus on the principles of bioenergetics and enzyme catalysis.
- The chemical nature of biological macromolecules, their three dimensional construction and the principles of molecular recognition is also included.
- It helps student's understanding in the principles and basic mechanisms of metabolic control and molecular signaling.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and carry 11 marks each. Section C will consist of 15 short answer type questions which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR THE CANDIDATES

1. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire section C.

Section-A

UNIT I

(10 Periods)

Amino acids & Proteins: Structure & Function. Structure and properties of Amino acids, Types of proteins and their classification, Forces stabilizing protein structure and shape. Different Level of structural organization of proteins. Fibrous and globular proteins.

Carbohydrates: Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo & Hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall polysaccharides, Glycoprotein's and their biological functions

UNIT II

(10 Periods)

Lipids: Structure and functions-Classification, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids, sphingolipids, glycolipids, lipoproteins. Nucleic acids:

Structure and functions: Physical & chemical properties of Nucleic acids, Nucleosides & Nucleotides, purines & pyrimidines. Biologically important nucleotides, Double helical model of DNA structure and forces responsible for A, B & Z - DNA, denaturation and renaturation of DNA.

Section-B

UNIT III

(20 Periods)

Enzymes: Nomenclature and classification of Enzymes, Holoenzyme, apoenzyme, Cofactors, coenzyme, prosthetic groups, metalloenzymes, monomeric & oligomeric enzymes, activation energy and transition state, enzyme activity, specific activity, common features of active sites, enzyme specificity: types & theories.

UNIT IV

(20 Periods)

Carbohydrates Metabolism: Reactions, energetics and regulation. Glycolysis: Fate of pyruvate under aerobic and anaerobic conditions. Pentose phosphate pathway and its significance Gluconeogenesis, Glycogenolysis and glycogen synthesis. TCA cycle, Electron Transport Chain.

SUGGESTED READINGS

1. Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H Freeman and Co.
2. Buchanan, B., Gruissem, W. and Jones, R. (2000) Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists.
3. Nelson, D.L., Cox, M.M. (2004) Lehninger Principles of Biochemistry, 4th Edition, WH Freeman and Company, New York, USA.
4. Hopkins, W.G. and Huner, P.A. (2008) Introduction to Plant Physiology. John Wiley and Sons.
5. Salisbury, F.B. and Ross, C.W. (1991) Plant Physiology, Wadsworth Publishing Co. Ltd.

CELL BIOLOGY: BTHB1102T

Time Allowed: 3hrs; MM: 74; Pass Percentage: 40 %

OBJECTIVES:

- This subject aims to give Students an overview of basic cell biology and its applications in and around the work place.
- In particular, this subject focuses on identifying key components that constitute living cells.
- The function and structure of each cell components (organelles and tissues) will also be discussed in this subject.
- The cellular and sub cellular specializations, and characteristics of higher tissue assemblies, will be studied to understand how cells contribute to the overall functioning of the organisms.
- As cell biology is primarily an experimental science, the working of cells will frequently be discussed in an experimental context to familiarize students with many of the common tools used by cell biologists.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and carry 11 marks each. Section C will consist of 15 short answer type questions which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR THE CANDIDATES

1. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire section C.

Section-A

UNIT I

(10 Periods)

Cell: Introduction and classification of organisms by cell structure, cytosol, compartmentalization of eukaryotic cells, cell fractionation.

Cell Membrane and Permeability: Chemical components of biological membranes, organization and Fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport.

UNIT II

(15 Periods)

Membrane Vacuolar system, cytoskeleton and cell motility: Structure and function of microtubules, Microfilaments, Intermediate filaments.

Endoplasmic reticulum: Structure, function including role in protein segregation.

Golgi complex: Structure, biogenesis and functions including role in protein secretion.

Section-B

UNIT III

(20 Periods)

Lysosomes: Vacuoles and micro bodies: Structure and functions

Ribosomes: Structures and function including role in protein synthesis.

Mitochondria: Structure and function, Genomes.

Chloroplasts: Structure and function, genomes. Nucleus: Structure and function, chromosomes and their structure.

UNIT IV

(15Periods)

Extracellular Matrix: Composition, molecules that mediate cell adhesion, membrane receptors for extra cellular matrix, macromolecules, regulation of receptor expression and function. Signal transduction.

Cancer: Carcinogenesis, agents promoting carcinogenesis, characteristics and molecular basis of cancer.

SUGGESTED READINGS

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
3. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

ENGLISH-I: BTHB1103T

OBJECTIVES:

- The objective of this subject is to increase Students's English communication skills by improving fluency through regular practice and speaking instructions.
- It will help students in developing a core understanding of basic grammar structure like nouns, verbs and adjectives through class reading and speaking tasks.
- It will also improve the ability of Students to communicate effectively in English.
- This subject also focuses to expand vocabulary through assignments and class work.

**SYLLABUS AS PER
UNDER GRADUATE (BOARD OF STUDIES) IN ENGLISH
OF PUNJABI UNIVERSITY PATIALA
FOR B.Sc. (Hons.) COURSES**

BIOSTATISTICS: BTHB1104T

Time Allowed: 3hrs; MM: 74; Pass Percentage: 40 %

OBJECTIVES:

- Students will be able to understand the common statistical techniques and terminology used in studies.
- This subject provides knowledge regarding common probability distributions that are used in statistical techniques.
- Students will be able to participate in on line discussions about any subject or topic using skills developed in this course.
- Students will understand the principle numeric and graphical techniques to display and summarize medical and health related data.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and carry 11 marks each. Section C will consist of 15 short answer type questions which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR THE CANDIDATES

1. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire section C.
2. The use of scientific calculators is allowed.

Section-A

UNIT I

(12 Periods)

Types of Data, Collection of data; Primary & Secondary data, Classification and Graphical representation of Statistical data. Measures of central tendency and Dispersion. Measures of Skewness and Kurtosis.

UNIT II

(18 Periods)

Probability classical & axiomatic definition of probability, Theorems on total and compound probability), Elementary ideas of Binomial, Poisson and Normal distributions.

Section-B

UNIT III

(18 Periods)

Methods of sampling, confidence level, critical region, testing of hypothesis and standard error, large sample test and small sample test. Problems on test of significance, t-test, chi-square test for goodness of fit and analysis of variance (ANOVA)

UNIT IV

(12 Periods)

Correlation and Regression. Emphasis on examples from Biological Sciences.

SUGGESTED READINGS

1. Le CT (2003) Introductory biostatistics. 1st edition, John Wiley, USA
2. Glaser AN (2001) High YieldTM Biostatistics. Lippincott Williams and Wilkins, USA
3. Edmondson A and Druce D (1996) Advanced Biology Statistics, Oxford University Press.
4. Danial W (2004) Biostatistics: A foundation for Analysis in Health Sciences, John Wiley and Sons Inc.

DEVELOPMENTAL BIOLOGY: BTHB1105T

Time Allowed: 3hrs; MM: 74; Pass Percentage: 40 %

OBJECTIVES:

- This subject provides knowledge regarding broad phylogenetic and evolutionary relationship.
- Students will be able to understand four rounds of cell division.
- This subject explains the clinical implications of development and mechanisms that intervene in developmental alterations.
- Students will be able to identify the homologies, similarities and differences between structures and processes in the developmental models studied.
- Students will also be able to identify embryonic structures and principle cellular mechanisms of development.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and carry 11 marks each. Section C will consist of 15 short answer type questions which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR THE CANDIDATES

1. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire section C.

Section-A

UNIT I: Gametogenesis and Fertilization

(10 Periods)

Definition, scope & historical perspective of development Biology, Gametogenesis - Spermatogenesis, Oogenesis Fertilization - Definition, mechanism, types of fertilization. Different types of eggs on the basis of yolk.

UNIT II: Early embryonic development

(20 Periods)

Cleavage: Definition, types, patterns & mechanism Blastulation: Process, types & mechanism Gastrulation: Morphogenetic movements- epiboly, emboly, extension, invagination, convergence, de-lamination. Formation & differentiation of primary germ layers, Fate Maps in early embryos.

Section-B

UNIT III: Embryonic Differentiation

(20 Periods)

Differentiation: Cell commitment and determination- the epigenetic landscape: a model of determination and differentiation, control of differentiation at the level of genome, transcription and post-translation level Concept of embryonic induction: Primary, secondary & tertiary embryonic induction, Neural induction and induction of vertebrate lens.

UNIT IV: Organogenesis

(10 Periods)

Neurulation, notogenesis, development of vertebrate eye. Fate of different primary germ layers
Development of behaviour: constancy & plasticity, Extra embryonic membranes, placenta in Mammals.

SUGGESTED READINGS

1. Gilbert, S. F. (2006). Developmental Biology, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
2. Balinsky, B.I. (2008). An introduction to Embryology, International Thomson Computer Press.
3. Kalthoff, (2000). Analysis of Biological Development, II Edition, McGraw-Hill Professional.

CHEMISTRY -1: BTHB1106T

Time Allowed: 3hrs; MM: 74; Pass Percentage: 40 %

OBJECTIVES:

- Students will understand the different principles of inorganic chemistry.
- Students will get knowledge of optical activity.
- Students will be able to perform analysis of ions from Group I & II.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and carry 11 marks each. Section C will consist of 15 short answer type questions which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR THE CANDIDATES

1. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire section C.

Section-A

UNIT I

(12 Periods)

Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, quantum numbers, shapes of s, p, d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements and ions. Position of element in the periodic table. Atomic and ionic radii, ionization energy, electronic affinity and electronegativity. Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, Van der Waals interactions, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.

UNIT II

(18 Periods)

Intermolecular forces, structure of liquids Structural differences between solids, liquids and gases. Liquid crystals: Difference between liquid crystal, solid and liquid, Postulates of kinetic theory of gases, deviation from ideal behaviour, van der Waals equation of states. Molecular velocities: Root mean square, average and most probable velocities. Liquifaction of gases (based on Joule-Thomson effect).

Section-B

UNIT III

(18 Periods)

Nomenclature and isomerism in alkanes, methods of formation, physical properties and Chemical

reactions. Nomenclature of alkenes-methods of formation, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes. Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes.

UNIT IV

(12 Periods)

Optical activity, polarization, orientation of dipoles in an electric field, dipole moment. Induced dipole moment, measurement of dipole moment temperature method and refractivity method. Dipole moment and structure of molecules, magnetic properties-paramagnetism, diamagnetism and ferromagnetism.

SUGGESTED READINGS

1. Basic Inorganic Chemistry. F.A. Cotten. G. Wilkinson and P.L. Gaus. Wiley.
2. Concise Inorganic Chemistry. I.D. Lee. ELBS.
3. Concepts of Models of Inorganic Chemistry. B. Doaglas. D. McDaniel and I. Alexander, John Wiley.
4. Inorganic Chemistry. D.E. Shriver, P. W. Aikins and C.H. Langford. <Oxford.
5. Inorganic Chemistry. W. W. Porterfield Addison. Wesley.
6. Inorganic Chemistry. A.G. Sharpe, ELBS.
7. Inorganic Chemistry. G.L. Miessler and O.A. Tarr, Prentice Hall.
8. Organic Chemistry. Morrison and Boyd, Prentice Hall.
9. Organic Chemistry. L.G. Wade Jr. Prentice Hall.
10. Fundamentals of Organic Chemistry. Solomons, John Wiley.
11. Organic Chemistry. Vol. I, II & III. S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd. (New Age International)
12. Organic Chemistry. F.A. Aarey, McGraw Hill India.
13. Introduction to Organic Chemistry. Stretwieser, Heathcock and Kosover, Machmilan.
14. Physical Chemistry. G.M. Barrow, International Student Edition. McGraw Hill.
15. Basic Programming with Application. V.K. Jain, I'ata McGraw Hill.
16. Computers and Common. Sense. B. Ryal and Shely, Prentice Hall.
17. University General Chemistry. C.N.B. Rao. Macmillan.
18. Physical Chemistry. R.A. Alberty, Wiley Eastern Ltd.
19. The Elements of Physical Chemistry, P.w. Aikins, Oxford.
20. Physical Chemistry Through Problems. S.K. Dogra and S. Dogra. Wiley Eastern Ltd

PUNJABI-I: BTHB1107T

SYLLABUS & COURSES OF READING FOR PUNJABI QUALIFYING /ELEMENTARY PUNJABI WILL BE AS PER UG (BOARD OF STUDIES) IN PUNJABI FOR DEGREE LEVEL PROFESSIONAL COURSES, PUNJABI UNIVERSITY, PATIALA

**PRACTICAL BTHB1101L
PERTAINING TO THEORY BTHB1101T**

1. To study activity of any enzyme under optimum conditions.
2. To study the effect of pH, temperature on the activity of salivary amylase enzyme.
3. Estimation of blood glucose by glucose oxidase method.
4. Principles of Colorimetry: (i) Verification of Beer's law, estimation of protein. (ii) To study relation between absorbance and % transmission.
5. Preparation of buffers.
6. Separation of Amino acids by paper chromatography.
7. Qualitative tests for Carbohydrates, lipids and proteins.

**PRACTICAL BTHB1102L
PERTAINING TO THEORY BTHB1102T**

1. Study the effect of temperature and organic solvents on semi permeable membrane.
2. Demonstration of dialysis.
3. Study of plasmolysis and deplasmolysis.
4. Cell fractionation and determination of enzyme activity in organelles using sprouted seed or any other suitable source.
5. Study of structure of any Prokaryotic and Eukaryotic cell.
6. Microtomy: Fixation, block making, section cutting, double staining of animal tissues like liver, oesophagus, stomach, pancreas, intestine, kidney, ovary, testes.
7. Cell division in onion root tip/ insect gonads.
8. Preparation of Nuclear, Mitochondrial & cytoplasmic fractions.

**BTHB1103L
PERTAINING TO THEORY BTHB1104T**

1. Based on graphical Representation
2. Based on measures of Central Tendency & Dispersion
3. Based on Distributions Binomial Poisson Normal
4. Based on t, f, z and Chi-square

PERTAINING TO THEORY BTHB1105T

1. Identification of developmental stages of chick and frog embryo using permanent mounts
2. Preparation of a temporary stained mount of chick embryo
3. Study of developmental stages of *Anopheles*.
4. Study of the developmental stages of *Drosophila* from stock culture/ photographs..
5. Study of different types of placenta.

PERTAINING TO THEORY BTHB1106T

1. Cation analysis.
2. Separation and identification of ions from Groups I, II group.
3. Anion analysis (2 cation and 2 anion with no interference).
4. Practical's related to concept of isomerism

B.Sc.(HONS.) BIOTECHNOLOGY
COURSE CODE: BTHB3PUP

PART I (2ND SEMESTER)

MAMMALIAN PHYSIOLOGY: BTHB1201T

Time Allowed: 3hrs; MM: 74; Pass Percentage: 40 %

OBJECTIVES:

- Students will understand why cells need to communicate and to give examples of some of the processes involved in animals.
- Students will be informed about definition and distinguish the roles of membrane bound, secreted and diffusible signaling molecules and relate this to their functions.
- The subject will describe students the major components of the extracellular matrix and how cells adhere to it.
- The subject will describe students other forms of cell-cell contact such as cadherin junctions and gap junctions and to appreciate the functions which these serve.
- Students will understand the principles of immune recognition.
- The subject will describe students the process of fertilization and reproduction.
- Students will understand the principals of the mechanisms of action of drugs on tissues and some ways in which their effects might be tested in vitro and in vivo.
- The subject will define the terms agonist and antagonist, competitive and non-competitive and partial agonist and antagonist.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and carry 11 marks each. Section C will consist of 15 short answer type questions which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR THE CANDIDATES

1. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire section C.

Section-A

UNIT I Digestion and Respiration

(15 Periods)

Digestion: Mechanism of digestion & absorption of carbohydrates, Proteins, Lipids and nucleic acids. Composition of bile, Saliva, Pancreatic, gastric and intestinal juice

Respiration: Exchange of gases, Transport of O₂ and CO₂, Oxygen dissociation curve, Chloride shift.

UNIT II Circulation

(15 Periods)

Composition of blood, Plasma proteins & their role, blood cells, Haemopoiesis, Mechanism of coagulation of blood.

Mechanism of working of heart: Cardiac output, cardiac cycle, Origin & conduction of heart beat.

Section-B

UNIT III Muscle physiology and osmoregulation

(15 Periods)

Structure of cardiac, smooth & skeletal muscle, threshold stimulus, All or None rule, single muscle twitch, muscle tone, isotonic and isometric contraction, Physical, chemical & electrical events of mechanism of muscle contraction.

Excretion: modes of excretion, Ornithine cycle, Mechanism of urine formation.

UNIT IV Nervous and endocrine coordination

(15 Periods)

Mechanism of generation & propagation of nerve impulse, structure of synapse, synaptic conduction, saltatory conduction, Neurotransmitters. Mechanism of action of hormones (insulin and steroids) Different endocrine glands- Hypothalamus, pituitary, pineal, thymus, thyroid, parathyroid and adrenals, hypo & hyper-secretions.

SUGGESTED READINGS

1. Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Herculat Asia PTE Ltd. /W.B. Saunders Company.
2. Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition. John wiley & sons, Inc.

PLANT ANATOMY AND PHYSIOLOGY: BTHB1202T

Time Allowed: 3hrs; MM: 74; Pass Percentage: 40 %

OJECTIVES:

- Students will have an understanding of basic plant chemistry and physiology.
- Students will have an overview of photosynthesis, cellular respiration, and fermentation.
- Students will understand the basic parts of a plant cell and the distinction between different tissue types in plants.
- Students will be familiar with the anatomical features of leaves, stems, and roots as well as flowers and fruits.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and carry 11 marks each. Section C will consist of 15 short answer type questions which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR THE CANDIDATES

1. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire section C.

Section-A

UNIT I: Anatomy

(10 Periods)

The shoot and root apical meristem and its histological organization, simple & complex permanent tissues, primary structure of shoot & root, secondary growth, growth rings, leaf anatomy (dorsi-ventral and isobilateral leaf)

UNIT II: Plant water relations and micro & macro nutrients

(12 Periods)

Plant water relations: Importance of water to plant life, diffusion, osmosis, plasmolysis, imbibition, guttation, transpiration, stomata & their mechanism of opening & closing. Micro & macro nutrients: criteria for identification of essentiality of nutrients, roles and deficiency systems of nutrients, mechanism of uptake of nutrients, mechanism of food transport

Section-B

UNIT III: Carbon and nitrogen metabolism

(20 Periods)

Photosynthesis- Photosynthesis pigments, concept of two photo systems, photophosphorylation, calvin cycle, CAM plants, photorespiration, compensation point
Nitrogen metabolism- inorganic & molecular nitrogen fixation, nitrate reduction and ammonium assimilation in plants.

UNIT IV: Growth and development

(18 Periods)

Growth and development: Definitions, phases of growth, growth curve, growth hormones (auxins, gibberlins, cytokinins, abscisic acid, ethylene) Physiological role and mode of action, seed dormancy and seed germination, concept of photoperiodism and vernalization

SUGGESTED READINGS

1. Dickinson, W.C. 2000 Integrative Plant Anatomy. Harcourt Academic Press, USA.
2. Esau, K. 1977 Anatomy of Seed Plants. Wiley Publishers.
3. Fahn, A. 1974 Plant Anatomy. Pergmon Press, USA and UK.
4. Hopkins, W.G. and Huner, P.A. 2008 Introduction to Plant Physiology. John Wiley and Sons.
5. Mauseth, J.D. 1988 Plant Anatomy. The Benjammin/Cummings Publisher, USA.
6. Nelson, D.L., Cox, M.M. 2004 Lehninger Principles of Biochemistry, 4th edition, W.H. Freeman and Company, New York, USA.
7. Salisbury, F.B. and Ross, C.W. 1991 Plant Physiology, Wadsworth Publishing Co. Ltd.
8. Taiz, L. and Zeiger, E. 2006 Plant Physiology, 4th edition, Sinauer Associates Inc .MA, USA.

ENGLISH-II: BTHB1203T

OBJECTIVES:

- The objective of this subject is to increase students's English communication skills by improving fluency through regular practice and speaking instructions.
- It will help students in developing a core understanding of basic grammar structure like nouns, verbs and adjectives through class reading and speaking tasks.
- It will also improve the ability of students to communicate effectively in English.
- This subject also focuses to expand vocabulary through assignments and class work.

**SYLLABUS AS PER
UNDER GRADUATE (BOARD OF STUDIES) IN ENGLISH OF
PUNJABI UNIVERSITY PATIALA
FOR B.Sc. (Hons.) COURSES**

BIOTECHNOLOGY AND HUMAN WELFARE: BTHB1204T

Time Allowed: 3hrs; MM: 74; Pass Percentage: 40 %

OBJECTIVES:

- Students will learn new approaches from relevant areas of bio science and technology.
- Students will understand applications of biotechnology in four major fields such as industry, health care (medical), crop production and agriculture and forensic science.
- Students will learn the use of products and raw materials from biological means and processes them by using technology from different spheres like chemical engineering, bio-process engineering, information technology.
- Students will understand how to increase crop yield, reduce vulnerability of crops to environmental stresses, increased nutritional qualities, improve taste, texture or appearance of food, reduce dependence on fertilizers, pesticides and other agrochemicals and production of novel substances in crop plants.
- Students will learn designing of organisms to produce antibiotics, and the engineering of genetic cures through genomic manipulation.
- Students will learn various industrial processes such as designing of an organism to produce a useful chemical and use of enzymes as industrial catalysts to either produce valuable chemicals or destroy hazardous/polluting chemicals.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and carry 11 marks each. Section C will consist of 15 short answer type questions which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR THE CANDIDATES

1. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire section C.

Section-A

UNIT I

(10 Periods)

Industry: protein engineering; enzyme and polysaccharide synthesis, activity and secretion, alcohol and antibiotic formation.

UNIT II

(10 Periods)

Agriculture: N₂ fixation: transfer of pest resistance genes to plants; interaction between plants and microbes; qualitative improvement of livestock.

Section-B

UNIT III

(15 Periods)

Environments: e.g. chlorinated and non-chlorinated organ pollutant degradation; degradation of hydrocarbons and agricultural wastes, stress management, development of biodegradable polymers such as PHB..

UNIT IV

(12 Periods)

Forensic science: e.g. solving violent crimes such as murder and rape; solving claims of paternity and theft etc. using various methods of DNA finger printing.

UNIT V

(13 Periods)

Health: e.g. development of non-toxic therapeutic agents, recombinant live vaccines, gene therapy, diagnostics, monoclonal in *E.coli*, human genome project.

SUGGESTED READINGS

1. Sateesh MK (2010) Bioethics and Biosafety, I. K. International Pvt Ltd.
2. Sree Krishna V (2007) Bioethics and Biosafety in Biotechnology, New age international publishers.

MICROBIAL PHYSIOLOGY: BTHB1205T

Time Allowed: 3hrs; MM: 74; Pass Percentage: 40 %

OBJECTIVES:

- This subject highlights diversity in microorganism based on their physical and chemical requirements for growth.
- It will help student to understand how a cell function in the environment, how it can reproduce from very simple substrates available in the environment.
- It will introduce the inter-relatedness of microbiology, biochemistry and genetics in the context of a functioning bacterial cell.
- It will help students to understand the cell structure, growth factors, metabolism and genetic composition of microorganism.
- It will help students to understand single-celled organisms as a paradigm.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and carry 11 marks each. Section C will consist of 15 short answer type questions which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions each from sections A and B of the question paper and the entire section C.

Section-A

UNIT I

(12 Periods)

Nutritional classification of microorganisms based on carbon, energy and electron sources, Metabolite Transport, Diffusion: Passive and facilitated, Primary active and secondary active transport, Group translocation (phosphotransferase system), symport, antiport and uniport, electrogenic and electro neutral transport, transport of Iron.

UNIT II

(13 Periods)

Microbial Growth. Definition of growth, balanced and unbalanced growth, growth curve, the mathematics of growth-generation time, specific growth rate, batch and continuous culture, synchronous growth, diauxic growth curve. Measurement of microbial growth. Measurement of cell numbers, cell mass and metabolic activity

Section-B

UNIT III

(15 Periods)

Effect of the environment on microbial growth

Temperature- temperature ranges for microbial growth, classification based on temperature ranges and adaptations, pH-classification based on pH ranges and adaptations, solutes and water

activity, oxygen concentration, radiation and pressure. Chemolithotrophic metabolism, Physiological groups of aerobic and anaerobic chemolithotrophs. Hydrogenoxidizing bacteria and methanogens.

UNIT IV

(20 Periods)

Phototrophic metabolism. Historical account of photosynthesis, diversity of phototrophic bacteria, anoxygenic and oxygenic photosynthesis, photosynthetic pigments: action and absorption spectrum, type, structure and location, physiology of bacterial photosynthesis: light reactions, cyclic and non-cyclic photophosphorylation. Carbon dioxide fixation, Calvin cycle and reductive TCA cycle.

SUGGESTED READINGS

1. Gottschalk G. (1986). Bacterial Metabolism. 2nd edition. Springer Verlag
2. Madigan MT, Martinko JM and Parker J. (2003). Brock Biology of Microorganisms. 10th edition. Pearson/ Benjamin Cummings.
3. Moat AG and Foster JW. (2002). Microbial Physiology. 4th edition. John Wiley & Sons.
4. Reddy SR and Reddy SM. (2005). Microbial Physiology. Scientific Publishers India.
5. Stanier RY, Ingrahm JI, Wheelis ML and Painter PR. (1987). General Microbiology. 5th edition, McMillan Press.
6. Willey JM, Sherwood LM, and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. 7th edition. McGraw Hill Higher Education.

CHEMISTRY 2: BTHB1206T

Time Allowed: 3hrs; MM: 74; Pass Percentage: 40 %

OBJECTIVES:

- The students will develop curiosity and interest in chemistry.
- The student will acquire an ability to think rationally and critically.
- The student will learn ionic solids, solutions and chemical kinetics.
- The students will learn about Colligative properties.
- The subject will provide details about benzene and its derivatives.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective sections of the syllabus and carry 11 marks each. Section C will consist of 15 short answer type questions which will cover the entire syllabus uniformly and will carry 30 marks in all.

INSTRUCTIONS FOR THE CANDIDATES

1. Candidates are required to attempt two questions each from sections A and B of the question paper and the entire section C.

Section-A

UNIT I

(12 Periods)

Ionic Solids- Concept of close packing, Ionic structures, semiconductors, lattice energy, solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule. Metallic bond-free electron, valence bond and bond theories.

Solutions, Dilute Solutions and Colligative Properties- Ideal and non-ideal solutions, methods of expressing concentration of solutions, activity and activity coefficients. Dilute solution, colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, elevation of boiling point and depression of freezing point.

UNIT II

(15 Periods)

Chemical Kinetics and catalysis- Rate of a reaction, factors influencing the rate of a reaction-concentration, temperature, pressure, solvent, light, catalyst. Characteristics of simple chemical reactions-zero order, first order, second order, pseudo order, half life and mean life. Theories of chemical kinetics, effect of temperature on rate of reaction. Arrhenius equation, concept of activation energy. Catalysis and general characteristics of catalytic reactions. Homogeneous catalysis, acid base catalysis and enzyme catalysis including their mechanisms, Michaelis Menten equation for enzyme catalysis and its mechanism.

Section-B

UNIT III

(12 Periods)

Isomerism- Concept of isomerism. Types of isomerism: Optical isomerism-elements of symmetry, molecular chirality, enantiomers, optical activity, properties of enantiomers, diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization. D & L and R & S systems of nomenclature. Geometric isomerism, E & Z system of nomenclature. Conformational isomerism. Newman projection and Sawhorse formulae, Fischer and flying wedge formulae. Definition of colloids, classification of colloids.

UNIT IV

(15 Periods)

Benzene and its derivatives- Nomenclature of benzene derivatives. The aryl group. Aromatic nucleus and side chain. Structure of benzene: molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, Huckel rule. Aromatic electrophilic substitution, role of σ and π complexes. Activating and deactivating substituents, orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Methods of formation and chemical reaction of alkylbenzenes.

SUGGESTED READINGS

1. Basic Inorganic Chemistry. F.A. Cotton. G. Wilkinson and P.L. Gaus. Wiley.
2. Concise Inorganic Chemistry. I.D. Lee. ELBS.
3. Concepts of Models of Inorganic Chemistry. B. Douglas. D. McDaniel and I. Alexander, John Wiley.
4. Inorganic Chemistry. D.E. Shriver, P. W. Atkins and C.H. Langford. <Oxford.
5. Inorganic Chemistry. W. W. Porterfield Addison. Wesley.
6. Inorganic Chemistry. A.G. Sharpe, ELBS.
7. Inorganic Chemistry. G.L. Miessler and O.A. Tarr, Prentice Hall.
8. Organic Chemistry. Morrison and Boyd, Prentice Hall.
9. Organic Chemistry. L.G. Wade Jr. Prentice Hall.
10. Fundamentals of Organic Chemistry. Solomons, John Wiley.
11. Organic Chemistry. Vol. I, II & III. S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd. (New Age International)
12. Organic Chemistry. F.A. Aarey, McGraw Hill India.
13. Introduction to Organic Chemistry. Stretwieser, Heathcock and Kosover, Macmillan.
14. Basic Programming with Application. V.K. Jain, I'ata McGraw Hill.
15. Computers and Common. Sense. B. Ryal and Shely, Prentice Hall.
16. University General Chemistry. C.N.B. Rao. Macmillan.
17. Physical Chemistry. R.A. Alberty, Wiley Eastern Ltd.
18. The Elements of Physical Chemistry, P.w. Atkins, Oxford.
19. Physical Chemistry Through Problems. S.K. Dogra and S. Dogra. Wiley Eastern Ltd.

PUNJABI-II: BTHB1207T

SYLLABUS & COURSES OF READING FOR PUNJABI QUALIFYING /ELEMENTARY PUNJABI WILL BE AS PER UG (BOARD OF STUDIES) IN PUNJABI FOR DEGREE LEVEL PROFESSIONAL COURSES, PUNJABI UNIVERSITY, PATIALA

DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION: BTHB1208T

**COMMON FOR ALL UNDERGRADUATE DEGREE COURSES
PART-I(SEMESTER-II)QUALIFYING SUBJECT-DRUG
ABUSE:PROBLEM,MANAGEMENT AND PREVENTION**

**PRACTICAL BTHB1201L
PERTAINING TO THEORY BTHB1201T**

1. Finding the coagulation time of blood
2. Determination of blood groups
3. Counting of mammalian RBCs
4. Determination of TLC and DLC
5. Demonstration of action of an enzyme
6. Determination of Haemoglobin

**PRACTICAL BTHB1202L
PERTAINING TO THEORY BTHB1202T**

1. Preparation of stained mounts of anatomy of monocot and dicot's root, stem & leaf.
2. Demonstration of plasmolysis by *Tradescantia* leaf peel.
3. Demonstration of opening & closing of stomata
4. Demonstration of guttation on leaf tips of grass and garden nasturtium.
5. Separation of photosynthetic pigments by paper chromatography.
6. Demonstration of aerobic respiration.
7. Preparation of root nodules from a leguminous plant.

**PRACTICAL BTHB1203L
PERTAINING TO THEORY BTHB1204T**

1. Perform of ethanolic fermentation using Baker's yeast
2. Study of a plant part infected with a microbe
3. To perform quantitative estimation of residual chlorine in water samples
4. Isolation and analysis of DNA from minimal available biological samples
5. Case studies on Bioethics (any two)

PERTAINING TO THEORY BTHB1205T

1. To study and plot the growth curve of *E. coli* using turbidometric method and to calculate specific growth rate and generation time.
2. To study and plot the growth curve of *Aspergillus niger* by radial growth measurements.
3. To study the effect of pH on the growth of *E. coli*
4. To study the effect of temperature of *Aspergillus niger* by dry weight method.
5. Demonstration of the thermal death time and decimal reduction time of *E. coli*.

PERTAINING TO THEORY BTHB1206T

1. Determination of melting points: Naphthalene, 80-82⁰, Benzoic acid, 121.5-122⁰, Urea, 132.5-133⁰, Succinic acid, 184.5-185⁰, Cinnamic acid, 132.5-133⁰, Salicylic acid, 157.5-158⁰, Acetanilide, 113.5-114⁰, m-Dinitrobenzene, 90⁰, p-Dichlorobenzene, 52⁰, Aspirin, 135⁰.
2. Determination of boiling points: Ethanol:78⁰, Cyclohexane:81.4⁰, Toluene:110.6⁰, Benzene:80⁰.
3. Crystallization: Concept of induction of crystallization, Phthalic acid from hot water (using fluted filter paper and seamless funnel), Acetanilide from boiling water, Naphthalene from ethanol, Benzoic acid from water.
4. Practical pertaining to Viscosity & Surface Tension of pure liquids.
5. To determine the viscosity and surface tension of C₂H₅OH and glycerin solution in water.
6. Molecular weight determined by Rast method.