B.Sc(Biotechnology) - I Semester
BTT101- English

Unit-I

Amalkanti : Nirendranath Chakrabarti

Sita : Toru Dutt

Tryst with Destiny : Jawaharlal Nehru

Delhi in 1807 : Mirza Ghalib

Preface to the Mahabharata : C. Rajagopalachari

Where the Mind is Without Fear : Rabindranath Tagore

A Song of Kabir : Translated by Tagore

Satyagraha : M.K. Gandhi

Toasted English : R. K. Narayan

The Portrait of a Lady : Khushwant Singh

Discovering Babasaheb : Ashok Mahadevan

Unit-II

Comprehension

Unit-III

Composition and Paragraph Writing (Based on expansion of an idea).

Unit-IV

Basic Language Skills : Vocabulary – Synonyms, Antonyms, Word Formation, Prefixes and Suffixes, Words likely to be confused and Misused, Words similar in Meaning or Form, Distinction between Similar Expressions, Speech Skills

Unit-V

Basic Language Skills: Grammar and usage – The Tense Forms, Propositions, Determiners and Countable/Uncountable Nouns, Verb, Articles, Adverbs.

Prescribed Books:

English Langugae and Indian Culture, Publihsed by M.P. Hindi Grant Academy. Note :- Eight questions to be set from unit-1 and four to be attempted.

B.Sc(Biotechnology) I Semester
BTT102- Development of Entrepreneurship

Unit I

Entrepreneurship- Definition, Characteristics and importance, Types and functions of an entrepreneur, merits of a good entrepreneur motivational factors of entrepreneurship.

Unit II

Motivation to achieve targets and establishment of ideas. Setting targets and facing challenges. Resolving problems and creativity. Sequenced planning and guiding capacity, Development of self confidence. Communication skills, Capacity to influence, leadership

Unit III

Project Report - Evaluation of selected process. Detailed project report – Preparation of main part of project report pointing out necessary and viability. Selecting the form of Organization – Meaning and characteristics of sole Proprietorship, Partnership and cooperative committees, elements affecting selection of a form of an organization. Economic management – Role of banks and financial institutions banking, financial plans, working capital-evaluation and management, keeping of accounts.

Unit IV

Production management. Methods of purchase. Management of movable assets/goods. Quality management. Employee management. Packaging. Marketing management. Sales and the art of selling. Understanding the market and market policy. Consumer management. Time management.

Unit V

Role of regulatory institutions – district industry centre, pollution control board, food and drug administration, special study of electricity development and municipal corporation. Role of development organizations, khadi & village Commission/ Board, MP Finance Corporation, scheduled banks, MP Women's Economics Development Corporation. Self-employment-oriented schemes, Prime Minister's Employment schemes, Golden Jubilee Urban environment scheme, Rani Durgavati Self-Employment scheme, Pt. Deendayal Self-employment scheme. Various grant schemes – Cost-of-Capital grant,interest grant, exemption from entry tax, project report, reimbursement grant, etc. Special incentives for women entrepreneurs, prospects & possibilities. Schemes of M.P. Tribal Finance Development Corporation, schemes of M.P. Antyavasai Corporation, schemes of M.P. Backward Class and Minorities Finance Development Corporation.

B.Sc(Biotechnology) I Semester
BTT105- Chemistry

UNIT I

Mathematical Concepts: Logarithmic relations, curves sketching, linear graphs and calculation of slopes, Differentiation of functions like Kx, ex, xn, sin x, log x; maxima and minima, partial differentiation and reciprocity relations. Integration of some useful/relevant functions, permutations and combinations. Factorials, Probability.

Gaseous States: Deviation from ideal behaviour, van der Waals equation of state. Critical phenomenon : PV isotherms of ideal gases, continuity of states, the isotherms of van der Waals equations, relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of states.

Molecular Velocities: Root mean square, average and most probablevelocities.Qualitative discussion of the Maxwell's distribution of molecular velocities, collision numbers, mean free path and collision diameter. Liquefaction of gases (based on Joule- Thomson effect).

UNIT II

Liquid State : Intermolecular forces, structure of liquids (a qualitative description) Liquid rystals: Difference between liquid crystal, solid and liquid. Classification,structure of nematic and cholestric hases. Thermography and seven segment cell. Colloidal State : Defmition of colloids, classification of colloids. Solids in liquids (sols): properties- kinetic, optical and electrical; stability of colloids, protective action, Hardy-Schulze law, gold number. Liquids in liquids (emulsions): types of emulsions, preparation. Emulsifier. Liquids in solids (gels): classification, preparation and properties, inhibition, general applications of colloids. Solid State: Definition of space lattice, Unit cell, Laws of crystallography- (i) aw of constancy of interfacial angles (ii) Law of rationality of indices (iii) Laws of symmetry, Symmetry elements in crystals.Diffraction: X-ray diffraction by crystals, Derivation of Bragg's equation. Determination of crystal structure of NaCI, KC1 and CsCI (Laue's method and powder method).

UNIT III

Chemical KinetiCs: Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction- concentration, temperature, pressure, solvent, light and catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions- zero order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction- differential method, method of integration, method of half life period and isolation method. Experimental methods of chemical kinetics- conductometric, potentiometic, optical methods- polarimetry and spectrophotometery. Theories of chemical kinetics: effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis) Expression for the rate constant based on equilibrium constant and thermodynamic aspects.

UNIT IV

Structure and Bonding : Hybridizations,Bond lengths and bond angles, bond energy : Localized and delocalized chemical bond, van-der Waals interactions, inclusion compounds, clatherates, charge transfer complexes, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding. Mechanism of Organic reactions Curved arrow notations, drawing electron movements with arrows, half-headed and double headed arrows, homolytic and heterolytic bond breaking. Types of Reagents: Electrophiles and nucleophiles. Types of organic reactions. Energy consideration. Reactive intermediates- carbocations, carbanions, free radicals and carbenes. Methods of determination of reaction mechanism.

UNIT V

Structure and Bonding : Hybridizations, Bond lengths an bond angles, bond energy : Localized and delocalized chemical bond, van-der Waals interactions, inclusion compounds, clatherates, charge transfer complexes, esonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding. Mechanism of Organic reactions: Curved arrow notations, drawing electron movements with arrows, half-headed and double headed arrows, homolytic and heterolytic bond breaking. Types of Reagents: Electrophiles and nucleophiles. Types of organic reactions. Energy consideration. Reactive intermediates- carbocations, carbanions,free radicals and carbenes. Methods of determination of reaction mechanism.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

B.Sc.(Biotechnology) II Semester
BTT201- HINDI

इकाई – 1

(क) भारत वंदना (काव्य) : सूर्यकांतत्रिपाठी 'निराला'
(ख) जाग तुझको दूर जाना : सुश्री महादेवी वर्मा
(ग) स्वतंत्रता पुकारती (काव्य) : जयशंकर 'प्रसाद'
(घ) हम अनिकेतन (काव्य) : बालकृष्ण शर्मा 'नवीन'
(ड) भाषा की महत्व और उसके विविध रूप भाषा – कौशल

इकाई – 2

(क) करूणा (निंबध) : आचार्य रामचन्द्र शुक्ल
(ख) समन्वय की प्रकिया (निंबध) : रामधारी सिंह 'दिनकर'
(ग) बिच्छी बुआ (कहानी) : डॉ लक्ष्मण विष्ट 'बटरोही'
(घ) अनुवाद : परिभाषा,प्रकार, महत्व,विशेषतॉए
(ड) हिन्दी की शब्द– संपदा परिभाषिक शब्दावली

इकाई – 3

(क) विलायत पहुँच ही गया (आत्मकथा) : महात्मा गॉधी
(ख) अफसर (व्यंग्य) : शरद जोशी
(ग) तीर्थयात्रा (कहानी) : डॉ. मिथलेश कुमार मिश्रा
(घ) मकड़ी का जाला (व्यंग्य) : डॉ रामप्रकाश सक्सेना
(ड) वाक्य– संरचना : तत्सम तदभव

इकाई – 4

(क) अप दीपो भव (व्यक्तत्व कला) : स्वामी श्रद्धानन्द
(ख) भारत का समाजिक व्यक्तिव्व (प्रस्तावना) : जवाहर लाल नेहरू
(ग) पत्र मैसूर के महाराजा को (पत्र–लेखन) : स्वामी विवेकानन्द
(घ) बनी रहेगी किताबे (आलेख) : डॉ सुनीता रानी घोष
(ड) पत्र– लेखन : महत्व और उसके विविध रूप
सड़क पर दौड़ते मृग (निबंध) डॉ. श्यामसुन्दर दुबे

इकाई – 5
(क) योग की शक्ति (डायरी) : डॉ हरिवंशराय बच्चन ।
(ख) कोश के अखाडे में कोई पहलवान नही उतरता : भाषाविद् डॉ हरदेव बिहारी से प्रो. त्रिभुवननाथ शुक्ल ।
(ग)(साक्षात्कर) नीग्रे सैनिक से भेंट (यात्रा स्मरण) : डॉ देवेन्द सत्यार्थी ।
(घ)यदि न होते तो गॉधी को यह ऊँचाई न मिलती (साक्षात्कर) 5 कथाकार गिारिराज किशोर से सत्येन्द्र शर्मा ।
(ड) सर– लेखन. भाव–पल्लवन साक्षात्कर प्रयोजन और कौशल निर्धारित ।

पाठ्य पुस्तक : हिन्दी भाषा संरचना मध्यप्रदेश हिन्दी ग्रन्थ अकादमी द्वारा प्रकाशित ।

B.Sc(Biotechnology) II Semester

BTT202- Environment

Unit-I

Study of Environmental and ecology:

(a) Definition and Importance.
(b) Environmental Pollution and problems.
(c) Public participation and Public awareness.

Unit-II

Environmental Pollution :

(a) Air, water, noise, heat and nuclear pollution.
(b) Causes, effect and prevention of pollution.
(c) Disaster management – Flood, Earthquake, cyclones and landslides.

Unit-III

Environment and social problems :

(a) Development – non-sustainable to Sustainable.
(b) Energy problems of cities.
(c) Water preservation – rain-water collection.

Unit-IV

Role of mankind in conserving natural resources :

(a) Food resources – World food problem.
(b) Energy resources – increasing demand for energy.
(c) Land resources – Land as resources.

Unit-V

Environment conservation laws :

(a) Conservation laws for air and water pollution.
(b) Wildlife conservation laws.
(c) Role of information technology in protecting environment & health.

Sarvepalli Radhakrishnan University Bhopal

B. Sc. (Biotechnology) – Sem-1

BTT 103 - Fundamentals of Biotechnology

Unit– I

Introduction to Biotechnology: Modern Biotechnology, Branches of Biotechnology and its scope

Unit –II

Biological systems in Biotechnology: Prokaryotic systems (E. coli, Bacillus), eukaryotic systems (Saccharomyces), mammalian and non-mammalian cells in culture, organismal systems.

Unit –III

- Centrifugation (Principle, types and applications)
- Electrophoresis (Principle, support media, protein and N.S. Electrophoresis)
- Chromatography (Principle, types and applications)
- Lyophilization (Principle, mechanism and applications)

Unit –IV

- Basic Microscopy (Principle, various types of microscopes and introduction to electron microscopy)
- Radioisotopy (various types of radioisotopes and instrumentation)
- Spectroscopy

Unit –V

Microbiology and its scope, Microbial culture- its characteristics and types, Methods of isolating pure culture, Maintenance and preservation of cultures, Media (used for cultivation of microbes) and its types Cultivation of micro organisms: Bacteria, Algae and Fungi.

Books Recommended

1. McGregor, C.W.; Membrane separation in Biotechnology; Marcel Dekker, Inc, New York.
2. Frieferder, S.; Physical Biochemistry; Freeman and Co., New York.
3. Biotol Series (I - IV); Techniques used in Bioproduct Analysis; Buterworth Heineman,U.K.
4. Work, T.S.; Lab. Techniques in Biochemistry and Molecular Biology, Elsevier, New York.
5. Microbiology: Michael J. Pelczar Jr., E. C. S Chan, Noel R. Krieg

LIST OF PRACTICALS

1. Introduction to instrumentation: - Centrifuges, Autoclaves, Spectrophotometers, Microscopes, Laminar hoods, incubators.
2. Centrifugation including ultra-centrifugation.
3. Polyacrylamide gel electrophoresis for proteins.

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B. Sc. (Biotechnology) – Sem-1

BTT 104 - Cell Biology & Genetics

Unit I

Cell as a basic unit of living systems: The cell theory. Broad and detailed classification of cell types within an organism. Different levels of organization of cells.

Unit II

Cell division and Cell cycle:Cell interaction. Cell locomotion. Muscle and Nerve cells. Cell senescence and death, Cell differentiation.

Fixation and Staning; Freeze drying and freeze substitution, Microtome and Embedding, Chemical basis of staining, Cytophotometric Methods.

Unit III

Structure and function of cell organelles: Ultrastructure of cell membrane, cytosol, golgi bodies, endoplasmic reticulum (rough and smooth), ribosomes.

Cytoskeletal structures (actin, microtubules etc.) Mitochondria, chloroplasts, lysosomes, peroxisomes. Nucleus(nuclear membrane, nucleoplasm, nucleolus, chromatin)

Unit IV

Introduction: Introduction to gene and protein, splice variants, secondary structure, triplet coding.

Sex determination. Dosage compensation, sex chromatin, chromosomal inheritance, Mitochondrial and chloroplast genetic system.

Gene expression: Gene organization and expression in prokaryotes and Eukaryotes.

Gene regulation. Prokaryotic and Eukaryotic gene regulation. Genetic control and Development. Genetics of immunity. Transcription and translation in Eukaryotes.

Protein structure and function. Chromosomal variation. Genetics of Cancer. Population Genetics; Hardy-Weinberg equilibrium, evolutionary genetics

Unit –V

Analysis of mutation in biochemical pathway. One gene-one enzyme hypothesis. Isolation of auxotrophs, replica- plating technique.

Genomics. Introduction, genome sequencing projects, comparative genomic, gene prediction and counting. Genome evolution.

Recommended Books

1. Current Perspectives in Genetics: Insights and Applications in Molecular, Classical, and Human Genetics, 2000 Edition by Shelly Cummings, Paperback: 170pages, Publisher: Books Cole.
2. Genes VIII by Benjamin Lewin. Publisher: Prentice Hall.
3. Cell and molecular Biology: De Roberties
4. Cell Biology: Bruce Albert's
5. Cell Biology: Dowben

List of Practicals

1. Sub Cellular Fractionation and marker enzymes
2. Mitosis and Meiosis
3. Vital staining for visualizing cell organelles
4. Histochemical Techniques.
5. Instrumental methods for Cell Biology- Centrifugation, Chromatogarphy.
6. Microscopy: Bright field, phase contrast and fluorescence microscopy.

7. Probability – Coin tossing and color blindness
8. Spotters related to theory: To show gene interaction, Rh factor – Erythroblastosis foetalis, Freemartin, Human abnoramilities, Holandric genes (Hypertrochosis), DNA model – window cutting of mutation and replication, structure of bacteriophage.
9. Model Preparation related to theory

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B. Sc. (Biotechnology) – Sem-2

BTT 203 - Biostatistics

Unit –I

Logarithms And Antilogarithms (Basic Concepts), Definition- Biostatistics and its importance- Collection and Classification of data- Sample Methods of sampling- Classification of data, Representation Of Data **:** Frequency distribution- Histogram- Frequency Polygon- Frequency Curve- Normal Frequency Curve Relative Frequency Curve- Comulative Frequency Curve or Ogive

Unit –II

Measures Of Central Tendency : Objectives- Arithmetic Mean- Geometric Mean- Harmonic Mean- Mode- Median, Quartiles, Deciles, Percentiles, Measures Of Despersion : Range- Quartile Deviation- Mean Deviation- Standard Deviation- Coefficient of Variation

Unit –III

Probability : Measure of Probability- Terminology- Permutations and Combinations- Laws of Probability and Set Theory- Bayes' Theorem. Theoretical Distribution Introduction- Binomial Distribution- Poisson Distribution- Normal Distribution- Standard Normal Distribution

Unit –IV

Test Of Hypothesis :Test of Significance- Sampling Distribution and Standard Error- Hypothesis Testing- Degrees of Freedom, F-Test Abd Analysis Of Variance : Test of Hypothesis on equality of variances- Analysis of Variance (ANOVA) - One way classification- Two way classification- Least Significance Difference (LSD) test,

Unit –V

Chi-Square Test : Chi-square test vs other tests- Application of chi-square test- Goodness of Fit-Test of independence, Application of Computers In Biostatistics

Recommended Books

1. Biostatistics: A foundation for Analysis in Health Sciences (2004) by *Wayne W. Daniel* Publisher: Wiley, Edition:I

2. Statistical Methods by S.P.Gupta, Publisher S.Chand & Co, New Delhi Statistics by R.S.N. Pillai & V. Bagavathi, Publisher S.Chand & Co, New Delhi

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B. Sc. (Biotechnology) – Sem-2

BTT 204 - General Microbiology

Unit I

History of Microbiology: A. Leeuwenhoek, L.Pasteur, R.Koch, J.Lister, J.Tyndall, etc. Biogenesis vs Abiogenesis, Koch Postulates, Discovery of antibiotics.

Principle of Microscopy: Bright field, Dark field, Phase contrast, Fluorescent, Electron Microscopy.

Unit II

Microbial classification : Bacteria, Fungi and Algae. Morphology of bacteria, viruses and fungi with major emphasis on bacterial structure specially cell wall. Gram positive and Gram negative bacteria. Microbial spores, Sporulation and germination process.

Unit III

Microbial growth, nutritional biodiversity, phases of growth, generation time, growth rates, monoauxic, diauxic and synchronous growth, chemostat Microbes in extreme environment like high temperature and high/ low pH Physical and chemical agents to kill microbes, sterilization and pasteurization processes

Unit IV

Normal micro flora in humans/animals. Types of microbial pathogens and diseases caused by them. Microbial interactions like symbiosis and antibiosis etc. Host defense mechanism against pathogens.

Unit –V

Nitrogen fixing microbes in agriculture.

Microbial metabolism, unique pathways, photosynthesis, fermentation and its products, production of heterologous proteins in microbes.

Recommended books

1. Davis, B.D Dulbecco, R., Eiser, H.N. and Ginsberg, H.S. (1990). Microbiology, 4th edition, Harper and Row, Publishers, Singapore.
2. Tortora, G.J., Funke, B.R., and Case, C.L. (1994). Microbiology: an introduction, 5th edition, the Benjamin/Cummings Publishing Company, Inc.
3. Stanier, R.Y. (1995). General Microbiology, MacMillian Press London.
4. Pelczar, M.T. (1995). Microbiology, Tata McGraw Hill Publication, New Delhi.
5. Schegel, H.G., (1995). General microbiology 7th ed. Cambridge University Press.
6. Prescot and Dunn (1999). Industrial Microbiology, 4th ed. By S.K Jain for CBS Publishers and Distributors.
7. Purohit, S.S. (2000). Microbiology: Fundamentals and Applications (6th edition), Agrobios (India)
8. Postgate, J. (2000). Microbes and Man : 4th ed, Cambridge University Press.

LIST OF PRACTICALS

1. Aseptic techniques
2. Cleaning of glass wares, Preparation of media, Cotton plugging and sterilization
3. Personal hygiene Microbes from hands, Tooth-Scum and other body parts.
4. Isolation of microorganisms from air, water and soil samples
5. Dilution and pour plating techniques.
6. Enumeratiuon of microorganisms-total vs viable counts.

7. Identification of isolated bacteria
8. Gram staining, other staining methods, metabolic characterization (*e.g.,* IMVic) tests
9. Growth curve of microorganisms.
10. Antibiotics sensitivity of microbes. Using antibiotic discs.
11. Testing of water quality
12. Test for antibodies against given bacteria
13. One step growth of bacteriophage.
14. Culture from body fluids (Stool, Urine, Blood).
15. Alcoholic and mixed acid fermentation.

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B. Sc. (Biotechnology) – Sem-2

BTT 205 - Biochemistry

Unit-I

Enzymes: General properties factors affecting enzyme activity regulation of enzyme activity, steady state kinetics, first order and second order kinetics, covalent modifications, classification, nomenclature types of inhibitors, inhibitors, immobilized enzymes, Ribozymes.

Unit-II

Metabolism: Metabolic pathways, biochemical reaction mechanism, energy rich metabolites, inter organ metabolic pathways.

Carbohydrate metabolism: Biosynthesis and degradation of carbohydrates; feed pathways for glycolysis; Pentose pathway Kreb's Cycle: Enzymes of Kreb's cycle, amphibolic nature of the Kreb's cycle; regulation of Kreb's cycle, Regulation of carbohydrate metabolism

Unit-III

Electron transport and Oxidative phosphorylation

Mitochondrial electron transport chain, oxidative phosphorylation; regulation of ATP synthesis.

Unit-IV

Lipid Metabolism: Digestion and absorption Biosynthesis and degradation of fatty acids; metabolism of triacyl glycerols; cholesterol metabolism, ketonobodies.

Unit –V

Nitrogen Metabolism: Reduction and assimilation of atmospheric nitrogen, Biosynthesis and degradation of amino acids; amino acids as precursors of heme; biogenic amines; biosynthesis of degradation of nucleic acids.

Porphyrins : Translation, Transcription, Replication

Recommended Books

1. Lehninger, A.L. Nleson, D.L. and Cox, M.M. (1993), Principles of Biochemistry, 2nd Ed., Worth Publishers, New York.
2. Rawn, J.D. (1989), Biochemistry, Niel Patterson Publications, North Carolnia.
3. Berg, Tymoezko and Stryer, L (2002), Biochemistry, 5th ed. W.H. Freman & Co. San
4. Francisco
5. Voet D. and Voet, J.G. (2004), Biochemistry 3rd ed. John Wiley and Sons Inc. New York.
6. Voet, D., Voet, J.G. and Pratt, C.W. (1999), Fundamentals of Biocemistry, John Wilay and Sons, New York.
7. Plumer D.T. (1998), An Introduction of Practical Biochemistry, 3rd Ed. Tata McGraw Hill Publishers Co. Ltd., New Delhi.
8. Bansal, D.D., Khardori, R & Gupta, M.M. (1985), Practical Biochemistry, Standard Publication Chandigarh.

LIST OF PRACTICALS

1. Estimation of □-amylase activity from saliva
2. Assay of acid phosphatase activity
3. Effect of temperature on enzyme activity
4. Effect of pH on enzyme activity
5. Determination of Km for acid phosphatase
6. Purification of protein using salt precipitation
7. Chromatographic methods for separation of macromolecules

- Paper chromatography, Thin layer chromatography, Gel permeation chromatography