

Shiksha Mandal's
Bajaj College of Science, Wardha
(Autonomous)
B. Sc. Semester Pattern Syllabus
B. Sc. Part I
BIOTECHNOLOGY
(With effect from academic session 2023-24)
Minor

B.Sc. Part I- Semester II

Sr. No.	Units	Total Theories Required
1	Unit I	10
2	Unit II	12
3	Unit III	10
4	Unit IV	12
5	Unit V	12
6	Unit VI	12

BIOTECHNOLOGY
B. Sc. Semester Pattern Syllabus
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B. Sc. Part I – Semester II

The examination shall comprise of one theory paper, one in each semester and one practical in each Semester. Each theory paper will be of 3Hrs. duration and carry 100 marks. The internal assessment will carry 20 marks. The practical examination will be of at least 4 hours duration in one day and shall carry 30 marks. The following syllabi is prescribed on the basis of six lectures per week and 6 practical periods per batch per week. Each theory paper has been divided into 6 units. There shall be one question on every unit with internal choice for each of 14 marks & one compulsory question covering all the syllabus of Semester-II (16 marks)

B. Sc. Part I – Semester II
MICROBIOLOGY, CELL BIOLOGY AND ENZYMOLOGY

Course Objectives:

1. To get the knowledge on various technique for growth and control of microorganisms.
2. To built a foundation knowledge of cell biology,
3. To get knowledge of the biomolecules, enzymes and mechanism of enzyme.
4. This course will aid students to acquire skills and competency in microbiological, enzymology and cell biology.

Course Outcomes:

1. Students apply the knowledge of microbial growth and microbial control methods while performing microbiological experiments.
2. Students apply the knowledge of antiseptic, disinfectant and their mode of action in their daily life and principle, working and applications of instruments viz, laminar air flow, autoclave and hot air oven in laboratories.
3. Students can develop an understanding of the cytoskeleton, cell membrane, microtubules, microfilaments and can differentiate the organisms by its cell structure
4. Students will be able to perform assay of various enzymes according to their properties and can analyze their kinetics.

B.Sc. –I Semester -II	MICROBIOLOGY, CELL BIOLOGY AND ENZYMOLOGY	UBT121T
Unit Number	Topic	Total Theories Required
I	<p>Microbial Growth</p> <p>A) Growth: Definition- growth rate, generation time and generation period. Details of growth curve and its various phases. Concept of synchronous cultures, continuous and batch cultures (Chemostat and Turbidostat). Physical conditions required for growth: Temperature, p^H and Oxygen and outline of other miscellaneous factor. Classification of microorganisms on the basis of temperature, P^H and Oxygen requirement</p> <p>B) Techniques for measurement of bacterial growth. pure cultures techniques and techniques used for obtaining axenic culture. Methods used for maintenance of pure culture</p>	10
II	<p>Microbial Control</p> <p>A) Terminologies - Sterilization, disinfection, antiseptic, sanitization, germicide, microbistasis, preservative and antimicrobial agents.</p> <p>B) Mechanism of cell injury: Damage to cell wall, cell membrane, denaturation of proteins, inhibition of protein synthesis, replication.</p> <p>C) Physical control: Temperature (moist heat, dry heat, and incinerators), dessication, surface tension, osmotic pressure, radiation, UV light, electricity, ultrasonic sound waves, filtration.</p> <p>D) Chemical control: Antiseptics and disinfectants (halogens, alcohol, gaseous sterilization. Antibiotics and chemotherapeutics agents. Concept of biological control.</p>	12
III	<p>Eukaryotic cell</p> <p>A) Eukaryotic Cell –difference between plant and animal cell Structure and function of the following: nucleus, mitochondria, ribosomes, Golgi complex, endoplasmic reticulum, plastids, lysosomes, peroxisomes, glyoxisomes and vacuoles.</p> <p>B) Plant cell wall. Cytoskeleton (microtubules, intermediate filaments (IF) and microfilaments) and cell locomotion. Mitosis and meiosis. Brief idea of cell cycle. Muscle and nerve cell structure, synaptic transmission and neuromuscular junctions</p>	10
IV	<p>Carbohydrates and Lipids</p> <p>A) Definition, classification, nomenclature of carbohydrates, structures of monosaccharides (glucose and fructose), disaccharides (sucrose, lactose, and maltose), trisaccharide (raffinose) and polysaccharides (structures of cellulose, starch and glycogen as examples of homopolysaccharides). Concept and examples of heteropolysaccharides.</p> <p>B) Types of lipids, structures of saturated and unsaturated fatty acids, triglycerides, simple and mixed triglyceridesphospholipids, glycolipids (ganglioside and cerebrosides) and sphingolipids. Concept of acid value, saponification value and iodine value. Terpenoids and isoprenoids-definition and representative structures, steroids. Definition, Classification and representative structures (Cholesterol).</p>	12
V	<p>Introduction to Enzymes</p> <p>A) Terminology: Active site, allosteric site, holoenzyme, apoenzyme, coenzyme, substrate, inhibitor, activator, modulator etc. Enzyme</p>	12

	nomenclature and classification (IUBM) with example. B) Concept of isoenzymes (example Lactate Dehydrogenase) and multienzymes (example pyruvate dehydrogenase), Substrate Specificity (bond specificity, group specificity, absolute specificity, stereo-specificity), lock and key and induced fit models. Concept of allosteric enzymes (brief idea of ATCase as an example) Mechanisms of catalysis: Acid-base, covalent and metal ion catalysis.	
VI	Enzymes Kinetic A) Assay of Enzymes: Concept of activity, specific activity, turnover number, units of enzyme activity (katal, international unit), spectrophotometric methods of assay of enzymes (simple and coupled assay). B) Enzyme kinetics: Michaelis-Menten equation and its modification (Lineweaver-Burke plots) Factors affecting enzyme activity: Enzyme concentration, Substrate concentration, pH, Temperature, C) Activators and Inhibitors, enzyme inhibition kinetics (reversible inhibition types – competitive, uncompetitive and non-competitive), kinetics of allosteric enzymes, industrially significant enzymes: amylase, protease, and lipase. Immobilization techniques.	12

Sr. No.	Practicals (UBT121P)	Minor/Major
1	Qualitative Analysis of sugars and proteins.	Major
2	Quantitative estimation of sugars (Dinitrosalicylic acid method).	Major
3	Estimation of glucose by Benedict's quantitative method.	Major
4	Quantitative estimation of proteins by Lowry's method.	Major
5	Determination of saponification value of Fats/Acid Fast Value	Minor
6	Preparation of starch from Potato and its hydrolysis by salivary amylase.	Minor
7	Immobilization of enzymes/ cells by entrapment in alginate gel.	Major
8	Effect of temperature / pH on enzyme activity	Major
9	Isolation of pure culture by Pour Plate method (Serial dilution)/ Streak Plate method.	Minor
10	Anaerobic cultivation of microorganisms (Candle Jar Method).	Minor
11	Cultivation of yeast and moulds.	Minor
12	Antibiotic sensitivity assay (Disc diffusion).	Minor
13	Oligodynamic action of metals	Minor
14	To study germicidal effect of UV light on bacterial growth.	Minor
15	Demonstration on various stages of mitosis and meiosis	Major

Recommended readings:

1. Textbook of Microbiology, (2006), Ananthanarayan R. and Paniker, University Press Publication.

2. General Microbiology - 5th edition, (1987), Stanier R.Y., Macmillan Publication, UK.
3. Prescott's Microbiology, 8th edition, (2010), Joanne M Willey, Joanne Willey, Linda Sherwood, McGraw-Hill Science Engineering, USA
4. General Microbiology (Vol.1), (2012), Powar C. B, and Daginawala H. F., Himalaya Publication house.
5. General Microbiology (Vol.2), (2012), Powar C. B, and Daginawala H. F., Himalaya Publication house. Mumbai
6. Cell Biology, 6th edition, (2010), Gerald Karp. John Wiley & Sons., USA
7. Cell Biology, (1989)Pawar.C. B., Himalaya Pub. House, Mumbai.
8. Cell Biology, 3rd edition (2005), Rastogi S. C., New Age International (P) Ltd.
9. Lehninger's Principles of Biochemistry, 5th edition, (2008), Nelson D. L. and Cox M. M., CBS Publications,
10. Principles of Biochemistry, 4th edition, (1997), Jeffery Zubey., McGraw-Hill College, USA.
11. Text of Biochemistry, 4th edition, (2013), Satyanarayana U., Books and Allied (P) ltd, Kolkata
12. Understanding Enzymes, 1st edition, (2018), Aray A., Kumar A. and Jha J., Drowing pin Publication.
13. Fundamental of Enzymology 1st edition, (2009), Meena M., Avishkar publication