

**SYLLABUS**

**FOR**

**B.Sc. SEMESTER PATTERN IN**

**BIOTECHNOLOGY**

**SEMESTER - III**

**GONDWANA UNIVERSITY**

**GADCHIROLI**

**INDIA**

[www.expof.com](http://www.expof.com)

**Gondwana University, Gadchiroli**  
**Teaching & Examination Scheme**  
**Bachelor of Science**  
**Three Year (SIX SEMESTER ) Degree course**

**BIOTECHNOLOGY**

1. There shall be total six Semesters. Total 3000 Marks.
2. The Division / Grade of the student shall be calculated on the basis of Science subjects as per the previous yearly pattern.
3. Each semester shall comprise of 90 teaching days.
4. Semester I and II shall be of 600 Marks
5. Semester III to IV shall be of 450 Marks
6. Semester V to VI shall be of 450 Marks
7. Biotechnology subject in each semester will comprise of
  - a. Two theory papers – 50 Marks each
  - b. One internal assessment based on two theory papers for 10 Marks each. Total 20 Marks.
  - c. One practical / Laboratory work – Total 30 marks
8. In addition to above Semester I and II will have
  - a. One compulsory English paper of 60 marks with 15 marks internal assessment.
  - b. One second language paper (Supp Eng / Hindi / Marathi / Urdu / etc) of 60 Marks with 15 marks internal assessment.
9. The Internal assessment shall be conducted by the University approved teachers in the relevant subjects.
10. The internal assessment shall be done by the respective college one month prior to the final exam of each semester. The Marks shall be sent to the university immediately after the internal assessment is over.
11. The pattern of Internal assessment and guidelines for the same shall be prepared by the respective subject Board of Studies
12. All Theory papers shall be divided into four units. Each unit shall be covered in 7.5 hours.
13. The theory question papers shall be of 3 hours duration and comprise of 5 questions with internal choice and with equal weightage to all units. (as per the previous pattern)
14. Practical exam shall be of 8 hours duration for one day.
15. Table of teaching and examination scheme attached.

**Teaching & Examination Scheme**

**Bachelor of Science**

**Three Year (SIX SEMESTER) DEGREE COURSE**

**B. Sc. Part II (Semester III and IV)**

S. No.		Subject	Teaching scheme			Examination scheme										
			Th + Tu (Periods)	Pr (Periods)	Total Periods	Theory					Practical					Total Marks / credits (Th, Pr, IA)
						Duration Hrs	Max Marks Th paper	Min Passing Marks Th	Max Marks Int Assessment	Min Passing IA	Total	Min passing Marks	Duration Hrs	Max marks practical	Min passing marks	
1	Semester-III	Biotechnology Paper I- Cell Metabolism	3+@	-	6+@	3	50	18	10	4	120	22	-	-	-	150
2		Biotechnology Paper II- Molecular Biology and Enzymology	3+@	-		3	50	18	10	4		22	-	-	-	
3		Practical	-	6	6	-	-	-	-	-	-	-	6-8*	30	11	
4	Semester-IV	Biotechnology Paper I- Biophysical Techniques	3+@	-	6+@	3	50	18	10	4	120	22	-	-	-	150
5		Biotechnology Paper II- Immunology and Biostatistics	3+@	-		3	50	18	10	4		22	-	-	-	
6		Practical	-	6	6	-	-	-	-	-	-	-	6-8*	30	11	
<b>Grand Total of Semester III &amp; IV: 450 each semester = TOTAL - 450 Marks per semester</b>																

Note: Th = Theory; Pr = Practical; Tu = Tutorial; IA = Internal Assessment; @ = Tutorials wherever applicable; \* = If required, for two days.

## **B.Sc. Biotechnology** **Semester-III**

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### **Paper -I Cell Metabolism**

#### **Unit-I Bioenergetics**

- A. Concept of free energy, entropy, enthalpy and redox potential.
- B. Concept of high energy bonds as related to the structure of phosphoenolpyruvate, creatine phosphate etc.
- C. ATP-ADP cycle
- D. Energy charge (Phosphate potential) and its relation to metabolic regulation.

#### **Unit-II Carbohydrate Metabolism**

- A. Cellular respiration, glycolysis (pathway, its regulation and inhibitors)
- B. Glyconeogenesis (bypass reaction)
- C. TCA cycle and its regulation
- D. Electron transport chain-ATP synthesis, oxidative phosphorylation
- E. Photophosphorylation, Hill reaction, CO<sub>2</sub> fixation
- F. Glycogenesis and glycogenolysis

#### **Unit-III Lipid Metabolism**

- A. Biosynthesis of fatty acids, fatty acid synthase complex
- B. Oxidation of fatty acids,  $\alpha$ ,  $\beta$  and  $\omega$
- C. Ketogenesis, ketosis and ketoacidosis
- D. Diseases of fat metabolism- Gaucher's disease, Tay-Sachs disease, Niemann Pick disease, Fabry's disease

#### **Unit-IV Metabolism of Nitrogenous Compound**

- A. Transamination (Mechanism)
- B. Urea cycle- detail account, linkage of urea cycle and TCA cycle, regulation
- C. Metabolic disorders of urea cycle
- D. Transmethylation and decarboxylation, physiological important products of decarboxylation
- E. Biosynthesis of purine and pyrimidines

## **B.Sc. Biotechnology**

### **Semester-III**

#### **Paper -II Molecular Biology and Enzymology**

##### **Unit-I Introduction to the Enzymology**

- A. Terminology- Active site, holoenzyme, apoenzyme, substrate, coenzyme, cofactor, inhibitor, activator, modulator, allosteric enzyme, isoenzyme, ribozyme
- B. Concept of activity, specific activity, turnover number, unit of enzyme activity (Katal, international unit)
- C. Nomenclature and classification of enzyme
- D. Mechanism of action- Activation energy, Lock and Key model (Fischer's template theory), Koshland model (Induce fit model)

##### **Unit-II Enzyme Catalysis**

- A. Mechanism of enzyme catalysis- Acid base catalysis, covalent catalysis, metal ion catalysis
- B. Enzyme kinetics- Michaelis-Menten equation, Lineweaver- Burke plot
- C. Enzyme inhibition- Reversible inhibition, irreversible inhibition,
- D. Factors affecting enzyme activity- concentration of enzyme, concentration of substrate, effect of temperature, effect of pH, temperature quotient
- E. Enzyme immobilization

##### **Unit –III Replication and Transcription in Prokaryotes**

- A. **Replication-** Enzymology of replication DNA polymerase I, brief treatment of pol II and III, helicases, topoisomerases, single strand binding proteins, primase.
- B. Proof for semiconservative replication, Okazaki fragments,
- C. Replication origins, initiation, elongation and termination.
- D. **Transcription-** Concept of promoter (-10 and -35 sequences and their significance)
- E. RNA polymerase
- F. Four steps of transcription (promoter binding and activation, RNA chain initiation, and promoter escape, chain elongation, termination and release).
- G. Regulation of Transcription in Prokaryotes: Basic idea of lac- and trp operons.

#### **Unit –IV Genetic Code and Translation in Prokaryotes**

- A. General characteristics of Genetic code
- B. Codon- anticodon interaction –the wobble hypothesis.
- C. Selection of initiation codon – Shine-Dalgarno sequence and the 16S r RNA.
- D. Protein synthesis: - Initiation, elongation and termination.
- E. Concept of Couple transcription-translation.

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## B.Sc. Biotechnology Semester-III

### PRACTICALS

#### Cell Metabolism, Enzymology and Molecular Biology

1. \*Isolation of RNA from bacteria.
2. \*Determination of  $V_{max}$  and  $K_m$  for  $\alpha$ -amylase.
3. Effect of different concentration of metal ions on activity of  $\alpha$ -amylase enzyme.
4. Effect of pH on enzyme activity.
5. Assay of activity of  $\beta$ -galactosidase.
6. Isolation of mitochondria and assay of marker enzyme.
7. Isolation and determination of concentration of photosynthetic pigments from spinach leaves.
8. Estimation of free fatty acids by titration method.
9. \*Effect of substrate concentration on enzyme activity.
10. Determine the heat of reaction (Enthalpy).
11. \*Immobilization of enzyme in alginate gel.
12. Production microbial enzyme (amylase) and conversion of starch to glucose and detection of formed glucose by anthrone method.
13. Demonstration of genetic code.

**Note: -**

1. Underlined practicals are considered as major practicals.
  2. Practical with asteric mark are compulsory practicals.
  3. At least 8 practical to be carried out in a semester.
  4. The theory involved with each practical must be taught before conducting the practical.
- Distribution of marks during semesterwise practical examinations of B.Sc. II(Semester III )**

1. One major experiment-	10
2. Two minor experiment- 2 X 5=	10
3. Viva voce-	5
4. Practical record-	5
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Total	30

**Duration of exam will be 8 hrs. on a day**

**TEXT BOOKS & REFERENCES FOR THEORY AND PRACTICALS FOR B.Sc.  
semester III:**

1. CELL BIOLOGY GENETICS MOLE BIOLOGY EVOLUTION AND ECOLOGY BY P. S. VERMA, S. CHAND COMPANY, 2005
2. BIOCHEMISTRY BY C.B. POWAR HIMALAYA PUBLICATION, 2006
3. BIOCHEMISTRY BY J. L. JAIN, S. CHAND COMPANY, 2005
4. PRINCIPLE OF BIOCHEMISTRY (LEHNINGER) BY D. L. NELSON, REPLIKA PRESS, 2008
5. PRINCIPLE OF BIOCHEMISTRY BY D.J. VOET & C. W. PRATT, JOHN WILEY AND SONS PUBL., 2008
6. BIOCHEMISTRY, U.SATYANARAYANA, BOOKS AND ALLIED PUBL., 2011
7. BIOCHEMICAL METHOS BY S. SADASIVAM AND A. MANICKAM, NEW AGE INT. PVT. PLB., 2010
8. LABORATORY MANUAL IN BIOCHEMISTRY BY J. JAYARAMAN, NEW AGE INT. PVT , 2011
9. STANDARD METHODS OF BIOCHEMICAL ANALYSIS BY S. R. THIMMAIAH, KALYANI PUBLICATION, 2009
10. ELEMENTARY BIOCHEMISTRY, J.L.JAIN,SANJAI JAIN, 2007, S.CHAND
11. QUALITATIVE TEST AND QUANTITATIVE PROCEDURES IN BIOCHEMISTRY, PUSHPA SUNDARARAJ,ANUPA SIDHU, 1995, S.CHAND
12. BIOCHEMISTRY- A.C. DEB, 1998, NEW CENTRAL BOOK AGENCY, CALCUTTA.
13. BIOCHEMISTRY- STRYER, 6TH EDI., FREEMAN PUBLICATION.
14. BIOCHEMISTRY- PAWAR AND CHATWAL, 2005. HIMALAYA PUBLICATION HOUSE.
15. PLANT BIOTECHNOLOGY-PRACTICAL MANUAL, C.C.GIRI,ARCHANA GIRI, I.K.INT.PUB HOUSE, 2007
16. BIOCHEMISTRY, MATHEWS VAN HOLDDE,AHERN, PEARSON EUD., 2005
17. AN INTRODUCTION TO PRACTICAL BIOCHEMISTRY, DAVID T. PLUMMER, TATA MCGRAW HILL, 2008
18. BIOCHEMISTRY AND MOLECULAR BIOLOGY OF PLANTS , BUCHANAN,CRUISSEN JONES, I.K.INT.PUB HOUSE, 2007
19. ANALYSIS OF AMINO ACID OF PROTEINS AND NUCLEIC ACID, BUTTERWORTH,HEINEMANM, OPEN UNIVERSITY PUBL, 2004
20. GENERAL ENZYMOLOGY, KULKARNI & DESHPANDE, HIMALAYA PUBLICATION
21. INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS, CHATWAL & ANAND, HIMALAYA PUBLICATION
22. ENZYMOLOGY & ENZYME TECHNOLOGY, S. M. BHATT, S. CHAND
23. BIOCHEMISTRY, TREHAN, KESHAR, NEW AGE PUBLICATION
24. ENZYMES, TREVOR PALMER, AFFILIATED EAST-WEST PRESS PVT. LTD.
25. PRINCIPALS OF CELLS ENERGETICS, BUTTERWORTH,HEINEMANM, OPEN UNIVERSITY PUBL, 2004
26. PRINCIPLES OF ENZYMOLOGY FOR TECHNOLOGICAL APPLICATION, BUTTERWORTH,HEINEMANM, OPEN UNIVERSITY PUBL, 2004
27. GENETICS BY C. B. PAWAR, HIMALAYA PUBLICATION, 2008