

**DEPARTMENT OF CHEMISTRY**  
**COURSE CURRICULUM & MARKING SCHEME**

**B.Sc. Part - III**  
**BIOCHEMISTRY**

**SESSION : 2023-24**



**ESTD : 1958**

**GOVT. V.Y.T. PG AUTONOMOUS COLLEGE,  
DURG, 491001 (C.G.)**

**(Former Name – Govt. Arts & Science College, Durg)**

**NAAC Accredited Grade A<sup>+</sup>, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)**

**Phone : 0788-2212030**

**Website - [www.govtsciencecollegedurg.ac.in](http://www.govtsciencecollegedurg.ac.in), Email – [autonomousdurg2013@gmail.com](mailto:autonomousdurg2013@gmail.com)**

**DEPARTMENT OF CHEMISTRY**  
**GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG**  
**Approved syllabus for B.Sc. BIOCHEMISTRY by the members**  
**of Board of Studies for the Session**  
**2023-24**

**The syllabus with the paper combinations is as under**

**B.Sc. III: (OLD COURSE)**

PAPER I:	MOLECULAR BIOLOGY
Paper II:	NUTRITIONAL, CLINICAL & ENVIRONMENTAL BIOCHEMISTRY
Practical:	BIOCHEMISTRY

The syllabus for B.Sc. Bio-Chemistry is hereby approved for the session 2023-24. In case any change or modification is prescribed by Central Board of Studies or Higher Education Department, Govt. of Chhattisgarh with respect to content or distribution of marks for undergraduate syllabi, it will be implemented accordingly.

**NAME AND SIGNATURE:**

		Departmental members	
Chairperson /H.O.D .....		1.....	8.....
Subject Expert .....		2.....	9.....
(University Nominee)		3.....	10.....
Subject Expert.....		4.....	11.....
Representative .....		5.....	12.....
(Industry)		6.....	13.....
Representative .....		7.....	14.....
(Alumni)			
Representative .....			
(Professor Science Faculty Other Dept.)			

## B.Sc. BIOCHEMISTRY

2023-24

### DIRECTIVES FOR STUDENTS OF B.SC. PART-I, II & III

#### EVALUATION PATTERN

- Theory Paper - I & II : 50 marks
- Practical: 50 marks

#### Question Paper Format and Distribution of Marks for Under Graduate Examination

1. The question paper will be divided into three Sections - A, B & C.
2. Section A shall contain very short answer type questions (answer in one or two sentences) or objective type questions. (**No Multiple choice questions, No 'Fill in the blank' type Questions**)
3. Section B shall contain short answer type questions with the limit of 150 words.
4. Section C shall contain long answer/descriptive type questions. The students are required to answer precisely and the answer should not exceed the limit of 350 words.
5. The scheme of marks should be as follows :

Question Type	MM 50 (Marks x No. of Questions)
A (Very short Answer)	1x10 = 10
B (Short Answer)	3 x 5 = 15
C (Long Answer)	5 x 5 = 25

6. The half yearly internal examinations will be held for Part-I & Part II. 10% out of marks obtained by the students in each paper in internal examinations will be added to 90% of marks obtained in each paper of annual examination.

## Syllabus and Marking Scheme for Third Year

2023-24

Paper No.	Title of the Paper	Marks Allotted in Theory
		Max
I	MOLECULAR BIOLOGY	50
II	NUTRITIONAL , CLINICAL & ENVIRONMENTAL BIOCHEMISTRY	50
III	Practical	50
	<b>Total</b>	<b>150</b>

Lab Course		
Duration: <b>5 Hrs</b> Total Marks: <b>50</b>	<b>TWO EXPERIMENTS</b>	30 Marks
	<b>VIVA/PROJECT</b>	10 Marks
	<b>SESSIONAL</b>	10 Marks

<b>02</b>	<b>Theory papers</b>	<b>-</b>	<b>100</b>
<b>01</b>	<b>Practical</b>	<b>-</b>	<b>50</b>
	<b>Total Marks</b>	<b>-</b>	<b>150</b>

**B.Sc. Part - III (BIOCHEMISTRY)**  
**2023-24**  
**PAPER- I**  
**MOLECULAR BIOLOGY**

<b>PSO1:</b>	Explain concept of molecular biology, nutritional, clinical, Environmental biochemistry, etc.
<b>PSO2:</b>	Discuss application of the physical and biochemical principals and techniques.
<b>PSO3:</b>	Describe and understand various biochemical aspects through theory and industrial visits.
<b>PSO4:</b>	Carry out experiments, present effectively through presentations and project work.

**Course Outcome (CO):**

*After completion of the course, the students would be able:*

<b>CO1.</b>	To understand DNA as genetic material, primary, secondary and tertiary structure of DNA and RNA.
<b>CO2.</b>	Replication, Transcription, and Translation and their mechanisms.
<b>CO3.</b>	To understand coding and non-coding regions of eukaryotic genome and their importance.
<b>CO4</b>	To understand importance of E. coli lac operon, PCR, expression vectors and their importance in Biotechnology.
<b>CO5.</b>	To acquire knowledge about recombinant DNA technology.
<b>CO6.</b>	To explain different types of mutations their causes and types.

**B.Sc. Part - III (BIOCHEMISTRY)**  
**2023-24**  
**PAPER- I**  
**MOLECULAR BIOLOGY**

**Max.Marks - 50**

**UNIT - I      Basic Concepts of Genetic Information**

- a. Nucleic acids as genetic information carriers, experimental evidence e.g. bacterial genetic transformation, Hershey-Chase Experiment, TMV reconstitution experiment.
- b. Central dogma of molecular genetics –current version, reverse transcription and retroviruses.
- c. Primary structure of nucleic acids and their properties, salient features of eukaryotic, prokaryotic and viral genomes; highly repetitive, moderately repetitive and unique DNA sequences.
- d. Basic concepts about the secondary structures of nucleic acids, 5'→3'direction antiparallel strands, base composition, base equivalence, base pairing and base stacking in DNA molecule.  $T_m$  and buoyant density and their relationship with G-C content in DNA.

**UNIT-II      Structural Levels of Nucleic Acids and Sequencing**

- a. Secondary and Tertiary structure of DNA: Watson and Crick model, A, B and Z type of DNA major and minor grooves, chirality of DNA, tertiary structure of DNA.
- b. Structures and properties of RNA: Classes of RNA secondary and tertiary structures.
- c. Nucleic acid hybridization : Cot value and satellite DNA.
- d. Sequencing: Restriction and modification system; sequencing of DNA and RNA

**UNIT-III      DNA Replication**

DNA replication in prokaryotes - conservative, semiconservative and dispersive types, experimental evidence for semi conservative replication. DNA polymerases other enzymes and protein factors involved in replication, Mechanism of replication. Inhibitors of DNA replication.

**Transcription**

Transcription in prokaryotes RNA polymerase, promoters, initiation, elongation and termination of RNA synthesis, inhibitors of transcription. Reverse transcriptase, post transcriptional processing of RNA in eukaryotes.

#### **UNIT-IV Translation and Regulation of Gene Expression**

- a. Genetic code: Basic features of genetic code, biological significance of degeneracy. Wobble hypothesis, gene within genes and overlapping genes.
- b. Mechanism of translation: Ribosome structure, A and P sites, charged tRNA, f-mat-tRNA initiator codon, Shine Dalgarno consensus sequence (AGGA), formation of 70S initiation complex, role of EF-Tu, EF-Ts, EF-G and GTP, non-sense condons and release factors RF 1 and RF 2.
- c. Regulation of gene Expression in prokaryotes: Enzyme induction and repression, operon concept, Lac operon, Trp operon.

#### **UNIT-V Mutation and Repair**

- a. Mutation: Molecular basis of mutation, type of mutation, e.g transition, transversion frame shift, insertion, deletion, suppresser sensitive, germinal and somatic, backward and forward mutations, true reversion and suppression, dominant and recessive mutations, spontaneous and induced mutations-Lederberg's replica plating experiment.
- b. Mutagenecity testing: Correlation of mutagenecity and carcinogenecity: Ames testing, Random and site - directed mutagenesis.
- c. DNA Repair: UV repair systems in E Coli, Significance of thymine in DNA.

#### **Recombinant DNA Technology**

Restriction endonucleases, brief discussion of steps in DNA cloning. Applications of recombinant DNA technology.

#### **List of Reference Books:**

1. Biochemistry J David Rawn, Neil Patterson Publisher, North Carolina.
2. Molecular biology of the gene JD Watson, NH Hopkins, JW Robert, JP Stertz, AM Weiner, Freeman, San Francisco.
3. Fundamental of biochemistry by D Voet and CW Pratt, John Wiley & Sons., NY
4. Text book of biochemistry Thomas M Devin, John Wiley & Sons, NY.

**B. Sc. Part - III (BIOCHEMISTRY)**  
**2023-24**  
**PAPER- II**  
**NUTRITIONAL, CLINICAL & ENVIRONMENTAL**  
**BIOCHEMISTRY**

**Course Outcome (CO):**

*After completion of the course, the students would be able:*

<b>CO1.</b>	To understand normal constituents of urine, blood and their significance in maintaining good health.
<b>CO2.</b>	To understand the mechanisms of causation of diseases of liver and kidney.
<b>CO3.</b>	To understand the current concepts related to mechanism of Cancer.
<b>CO4</b>	To understand the variations in the levels of triglycerides and lipoproteins and their relationship with various diseases.
<b>CO5.</b>	To get acquainted with the role of enzymes in diagnosis of various diseases.

**B. Sc. Part - III (BIOCHEMISTRY)**  
**2023-24**  
**PAPER- II**  
**NUTRITIONAL, CLINICAL & ENVIRONMENTAL**  
**BIOCHEMISTRY**

**Max. Marks – 50**

**UNIT –I**

**Nutritional Biochemistry**

**Nutrition and dietary habits**

- a. Introduction and definition of foods and nutrition. Factors determining food acceptance, physiological, energy, body building (growth and development). Regulation of body temperature. Physiology and nutrition of carbohydrates, fats, proteins and water. Vitamins A, D, E, K, Vit B-Complex and Vit C and minerals like Ca, Fe and Iodine and their biological functions. Basic food groups: energy giving foods, body building foods and protective foods.



- b. Composition of balanced diet, recommended dietary allowances (RDA) for average Indian, locally available foods, inexpensive quality foods and food stuffs rich in more than one nutrients. Balanced vegetarian diets, emphasis on nutritional adequacy.

## **UNIT II     Nutritive and Calorific Value of Foods**

- a. Basic concepts of energy expenditure, units of energy, measurement of energy expenditure by direct or indirect calorimetry, calculation of non protein RQ with respect to carbohydrates and lipids. Determination of heat production of the diet. The basal metabolism and methods of measuring basal metabolic rate (BMR); energy requirements during growth, pregnancy, lactation and various physiological activities. Calculation of energy expenditure of average man and woman.
- b. Specific dynamic action (SDA) of foods, nutritive value of various kinds of foods generally used by Indian population. Planning of dietary regimes for infants, during pregnancy and old age. Malnutrition, its implications and relationship with dietary habits and prevention of malnutrition specially protein-calories malnutrition (Kwashiorkor and Marasmus) by improvement of diets. Human milk and its virtues, breast vs formulated milk feeding. Food preservation standards, food adulterations and precautions, government regulations on preservation and quality of food.

## **UNIT - III     Clinical Biochemistry**

### **Basic concept of clinical biochemistry**

- a. Definition and scope of clinical biochemistry in diagnosis, a brief review of units and abbreviations used in expressing concentration and standard solutions. Quality control. Manual vs automation in clinical laboratory.
- b. Collection and preservation of biological fluids ( blood, serum, plasma, urine and CSF). Chemical analysis of blood, urine and CSF. Normal values for important constituents (in SI units) in blood (plasma /serum ), CSF and urine, clearance test for urea.

**UNIT – IV (i) Clinical Enzymology**

- a. Definition of functional and non functional plasma enzymes, isoenzyme and diagnostic tests. Enzyme pattern in health and diseases with special mention of plasma lipase, amylase, cholinesterase, alkaline and acid phosphat, SGOT, SGPT, LDH and CPK.
- b. Functional test of kidney, liver and gastric fluids.

**(ii) Disease Related to Metabolism**

Hypo and hyper – glycemia, glycogen storage diseases, lipid mal-absorption and steatorrhea, sphingolipidosis; role of lipoproteins. Inborn errors of amino acid metabolism – alkaptonuria, phenyl – ketonuria, albinism, gout and hyper –uricemia.

**UNIT – V Environmental Biochemistry**

- a. **Air pollution**  
Particulate matter, compounds of carbon, sulphur, nitrogen and their interactions, methods of their estimation, their effect on atmosphere.
- b. **Water pollution**  
Types of water bodies and their general characteristics, major pollutants in domestic, agricultural and industrial wastes, methods of their estimation, effects of pollutants on plants and animals, treatment of domestic and industrial wastes, solid wastes and their treatment.

**List of Reference Books:**

1. Modern nutrition in health and diseases by Whol and Goodhart.
2. Human nutrition and Dietetics by S Davidson and Passmore: ELBS Zurich.
3. Tietz fundamental of clinical Chemistry by Cart A Burtis & ER Ashwood Saunders WB Co.
4. Lecture Notes on Clinical Biochemistry – LG Whitby, AF Smith , GJ Beckett, SM Walker, Blackwell Sci Inc.

**B. Sc. Part - III  
BIOCHEMISTRY PRACTICAL**

**Max. Marks - 50**

**Min. Marks - 17**

1. Estimation of DNA by diphenylamine method .
2. Effect of temperature on the viscosity of DNA using Ostwald's viscometer.
3. Extraction of RNA and its estimation by Orcinol method.
4. Estimation of Hemoglobin by measuring total iron in blood .
5. Estimation of calcium and phosphorus in serum & urine.
6. Estimation of creatine and creatinine in urine.
7. Estimation of immunoglobulins by precipitation with saturated ammonium sulphate.
8. Denaturation of enzyme, studies on DNA.
9. (a) Separation of proteins by column chromatography.  
(b) Determination of proteins by dye binding assay.
10. Separation of proteins by SDS- polyacrylamide gel electrophoresis.

**NAME AND SIGNATURE:**

	Departmental members	
Chairperson /H.O.D ..... <i>A. Singh</i>		
Subject Expert ..... <i>M. Chhabey</i> (University Nominee)	1. <i>Deoria</i>	8. <i>Divastar</i>
Subject Expert ..... <i>S. D.</i>	2. <i>M. R.</i>	9. <i>[Signature]</i>
Representative ..... (Industry)	3. <i>[Signature]</i>	10. <i>[Signature]</i>
Representative ..... <i>Agrawal</i> (Alumni)	4. <i>Divastar</i>	11. <i>Agrawal</i>
Representative ..... <i>[Signature]</i> (Professor Science Faculty Other Dept.)	5. <i>[Signature]</i>	12. ....
	6. <i>[Signature]</i>	13. ....
	7. <i>[Signature]</i>	14. ....