

Revised Syllabus

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM & MARKING SCHEME

**B.Sc. I & II Semester
BIOCHEMISTRY**

(Based on Choice Based Credit System)

SESSION : 2022-23



ESTD : 1958

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

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

NAAC Accredited Grade A+ with CPE-Phase III (UGC), STAR COLLEGE (DBT)

Phone : 0788-2212030

Website – www.govtsciencecollegedurg.ac.in. Email-autonomousdurg2013@gmail.com

कार्यालय प्राचार्य

शासकीय विश्वनाथ यादव तामस्कर स्नातकोत्तर स्वशासी महाविद्यालय, दुर्ग (छ.ग.)

फोन नं./फैक्स नं. 0788-2359688, स्वशासी प्रकोष्ठ फोन नं.-0788-2212030

वेबसाइट : www.govtsciencecollegedurg.ac.in

(राष्ट्रीय मूल्यांकन एवं प्रत्यायन परिषद (NAAC) द्वारा A⁺ ग्रेड प्रदत्त महाविद्यालय)

क्रमांक / Ref. No. 1583/Auto

दुर्ग / Durg / दिनांक / Date : 11.02.22

आदेश

स्वशासी योजनांतर्गत विभिन्न विभागों के अध्ययन मंडल का गठन

महाविद्यालय में स्वशासी योजना के अंतर्गत रसायन विज्ञान विभाग के अध्ययन मंडल का गठन निम्नानुसार किया जाता है। अध्ययन मंडल का कार्यकाल आगामी दो वर्षों तक होगा -

रसायन विज्ञान अध्ययन-मंडल

क्रं.	श्रेणी	मनोनीत सदस्य का नाम
1	अध्यक्ष	संबंधित विभागाध्यक्ष
2	सदस्य	संबंधित विभाग के समस्त सदस्य
3	विषय विशेषज्ञ	1. डॉ. ए. एल. एम. चंदेल, शा. ई. आर. आर. विज्ञान महाविद्यालय, बिलासपुर (छ.ग.)
		2. डॉ. सुशीलचंद्र तिवारी, प्राचार्य, शासकीय, कन्या महाविद्यालय दुर्ग (छ.ग.)
		3. डॉ. हेमलता मोहबे, पूर्व प्राचार्य राजनांदगांव (छ.ग.)
		4. डॉ. अंजू झा, शासकीय, नागार्जुन स्नातकोत्तर स्वशासी विज्ञान महाविद्यालय रायपुर (छ.ग.)
4	कुलपति द्वारा मनोनीत सदस्य	डॉ. अरुण मिश्रा, प्राध्यापक एवं विभागाध्यक्ष रसायन विज्ञान, शासकीय, नागार्जुन स्नातकोत्तर स्वशासी विज्ञान महाविद्यालय रायपुर (छ.ग.)
5	उद्योग/निगमित क्षेत्र प्रतिनिधि	श्री दिलीप सिंह, म.न. 600, स्ट्रीट 33, स्मृति नगर, भिलाई
6	स्नातकोत्तर कक्षा का मेधावी पूर्व छात्र	डॉ. भावना जैन, रसायन विभाग, शा. वि.या.ता. स्नात. स्वशासी, महाविद्यालय, जिला-दुर्ग (छ.ग.)
7	विशेष पाठ्यक्रम विषय विशेषज्ञ	डॉ. मृगेन्द्र द्विवेदी, जीवरसायन विभाग, शासकीय, नागार्जुन स्नातकोत्तर स्वशासी विज्ञान महाविद्यालय रायपुर (छ.ग.)
8	समान संकाय के अन्य विभाग के प्राध्यापक	डॉ. एस.डी. देशमुख, विभागाध्यक्ष भूगर्भ विज्ञान, शा. वि.या. ता. स्नात. स्वशासी, महाविद्यालय, जिला-दुर्ग (छ.ग.)

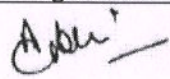

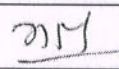
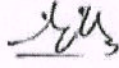
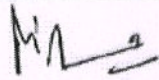
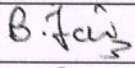

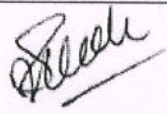
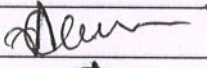


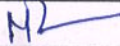
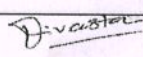

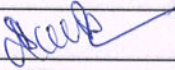
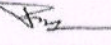
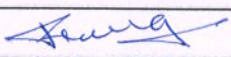

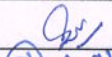
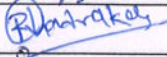
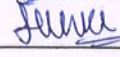
प्राचार्य

शा. वि.या.ता. स्नातकोत्तर स्वशासी महाविद्यालय

Principal
Govt.V.Y.S.P.G. Autonomous
College.Durg.(C.G.)

Syllabus approved by Board of study

Members (Board of study)

S.No.	Category	Nominee Member	Signature
01	Head Department of Chemistry	Dr. Anupama Asthana Govt. V.Y.T.PG Autonomous College, Durg (C.G.)	
02	Subject Expert	Dr. Shushil Chand Tiwari Principal, Govt. Girls College Durg (C.G.)	
03	Subject Expert	Dr. Hemlata Mohobey Former Principal Rajnandgaon	
04	Subject Expert	Dr. Anju Jha Govt. NGP Autonomous College, Raipur (C.G.)	
05	University Nominee	Dr. Arun Mishra Govt. NGP Autonomous College, Raipur (C.G.)	
06	Representative (Industries)	Mr. Dilip Singh Street - 33, Smriti Nagar	
07	Alumni	Dr. Bhavana Jain	
08	Subject Expert (Biochemistry)	Dr. Mrigendra Diwedi Govt. NGP Autonomous College, Raipur (C.G.)	
08	Professor (other Department)	Dr. S. D. Deshmukh (Head Department of Geology) Govt. V.Y.T.PG Autonomous College, Durg (C.G.)	
09	Member	Dr. Alka Tiwari	
10	Member	Dr. S. Chatterjee	
11	Member	Dr. Anil Kashyap	
12	Member	Dr. Manju Kaushal	
13	Member	Dr. Ajaya Singh	
14	Member	Dr. Nutan Rathod	
15	Member	Dr. Uama Shrivastava	
16	Member	Dr. V.S. Geete	
17	Member	Dr. Sunita B. Mathew	
18	Member	Dr. Anupama Kashyap	
19	Member	Dr. Purna Kathane	
20	Member	Dr. Sunita Sanwaria	
21	Member	Dr. Soma Sengupta	
22	Member	Mrs. Romanchi Chandrakar	
23	Member	Ku. Jyoti Verma	

DEPARTMENT OF CHEMISTRY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG

Approved Revised syllabus for
B.Sc. BIOCHEMISTRY by the members of Board of Studies for Session 2022-23
Scheme and Syllabus for B.Sc. Year 1 (Semester I & II)

Scheme for B.Sc. Program with BioChemistry - First Year
(with 3 Subjects A, B*, C*Subject A-BioChemistry)

Semester	Discipline Specific Course/ Core Course DSC (Credit-4)	Generic Elective Course GEC (Credit-4)	Skill Enhancement Course SEC (Credit-2)	Ability Enhancement Course AEC (Credit-2)	Value Added Course VAC (Credit-2)	Total Credits
1	BioChemistry-I Biomolecules (Th=3, P=1)	Choose any one course other than DSC (Th=3, P=1)	Choose 1 from pool of SEC (Th=1, P=1)	Hindi Language (Th-2)	Sports (Th=1, P=1)	22
	Subject B1 (Th=3, P=1)					
	Subject C1 (Th=3, P=1)					
2	Biochemistry-II Biophysical and biochemical techniques (Th=3, P=2)	Choose any one course other than DSC (Th=3, P=1)	Choose 1 from pool of SEC (Th=1, P=1)	English Language (Th-2)	Yoga (Th=1, P=1)	22
	Subject B2 (Th=3, P=2)					
	Subject C2 (Th=3, P=2)					

Students on exit shall be awarded undergraduate certificate (in the field of Multidisciplinary Study) after securing the requisite 44 credits in semester I and II

*Maths/Physics/Botany/Zoology/Microbiology/Zoology/Geology/Biotechnology/Biochemistry/Industrial Chemistry/Anthropology

LIST OF COURSES OFFERED BY DEPARTMENT OF CHEMISTRY

For students opting B.Sc. with BioChemistry (First Year)

Discipline Specific Courses/Core Papers DSC (Credits: 04 each; T= Theory. P = Practical)

1. BBC 101: Fundamentals of Chemistry - I (T- 3, P- 1)
2. BBC 201: Fundamentals of Chemistry - II (T- 3, P-1)

Skill Enhancing Courses SEC (Credits:02)

1. BCHS 01: Good lab practices in Chemistry (T- 1, P- 1)
2. BCHS 02: Water remediation and conservation studies (T- 1, P- 1)

For students opting UG without BioChemistry

Generic Electives Courses GEC (Credits: 04 each; T= Theory. P = Practical)

1. BBC 101: Fundamentals of Chemistry - I (T- 3, P- 1)
2. BBC 201: Fundamentals of Chemistry - II (T- 3, P-1)

DEPARTMENT OF CHEMISTRY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG
Approved Revised syllabus for
B.Sc. BIOCHEMISTRY by the members of Board of Studies for the Session
2022-23
Scheme and Syllabus for B.Sc. Year 1 (Semester I & II)
Courses and Marking Scheme for First-year B.Sc. with
BioChemistry

Year	Sem.	Course Code	Paper Title	Theory/ Practical	Credits	Marks	Sem End	IA	
Certificate in Science									
Discipline Specific Courses – DSC (Core Courses)									
1	I	BBC 101	Fundamentals of Chemistry - I	Theory	3	75	60	15	
		BBCL 101	Lab Course - 1	Practical	1	25			
	II	BBC 201	Fundamentals of Chemistry - I	Theory	3	75	60	15	
		BBCL 201	Lab Course -2	Practical	1	25			
	Skill Enhancement Courses - SEC								
	I	I	BCHS 01	Good lab practices in Chemistry	Theory	1	25	20	05
					Practical	1	25		
		II	BCHS 02	Water remediation and conservation studies	Theory	1	25	20	05
Practical					1	25			

Note: Semester End – 80% and Internal Assessment (IA) – 20%(Weightage of marks internal examinations will be included as per guidelines of Autonomous Examination Cell)

The revised syllabus for B.Sc. (BioChemistry) Semester I & II is hereby approved for the session 2022-23

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
2022-23

The syllabus with the paper combinations is as under

B.Sc. I: (BIOCHEMISTRY) SEMESTER – I

CORE COURSE	BIOCHEMISTRY - I
TITLE	BIOMOLECULES
PAPER CODE	BBC 101
PRACTICAL	LAB COURSE BIOCHEMISTRY-I
PAPER CODE	BBCL 01

The syllabus for B.Sc. Bio-Chemistry SEMESTER-I is hereby approved for the session 2022-23. 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.

B.Sc. BIOCHEMISTRY SEMESTER - I

2022-23

DIRECTIVES FOR STUDENTS OF B.Sc. BIOCHEMISTRY SEMESTER - I

EVALUATION PATTERN

- Theory Paper : 60 marks
- Internal ; 15 marks
- Practical [lab course-I] : 25 marks

Question Paper Format and Distribution of Marks for B.Sc. (Biochemistry) Semester-I

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 60 (Marks x No. of Questions)
A (Very short Answer)	1x10 = 10
B (Short Answer)	3 x 5 = 15
C (Long Answer)	7 x 5 = 35

6. The scheme of marks for Assignment should be as follows :

Question Type	MM 75 (Marks x No. of Questions)
A (Very short Answer)	1 x10 = 10
B (Short Answer)	4x5 = 20
C (Long Answer)	9x5= 45
Total	75

Syllabus and Marking Scheme for First SEMESTER (BIOCHEMISTRY)

2022-23

Paper No.	Title of the Paper	Marks Allotted
		Max
I	BIOMOLECULES	60
II	INTERNAL	15
II	LAB COURSE BIOCHEMISTRY - I	25
	TOTAL	100

Lab Course		
Duration: 5 Hrs Total Marks: 25	TWO EXPERIMENTS	15
	VIVA	03
	PROJECT/FIELD WORK	04
	SESSIONAL	03

01	Theory paper	-	60
01	Internal	-	15
01	Practical	-	25
	Total Marks	-	100

**B.Sc. Part - I (BIOCHEMISTRY) SEMESTER - I
2022-23**

Program Specific Outcome (PSO):

Upon completion of B.Sc. Degree (with Biochemistry) , the students will be able to:

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

**B.Sc. Part - I (BIOCHEMISTRY) SEMESTER - I
2022-23**

PAPER- BIOMOLECULES (BBC101)

Course Outcome (CO):

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

- CO1.** To compare and explain the structure, occurrence and function of the carbohydrates.
- CO2.** To recognize the structure of an amino acid, summarize the function of proteins and explain protein denaturation and the effect of heat on protein structure and function.
- CO3.** To identify lipids chemical elements, compare saturated, mono-unsaturated and poly-unsaturated fatty acids, explain the importance and sources of poly-unsaturated fatty acids.
- CO4.** To describe chemical elements and components of a nucleotide. function of DNA and compare DNA and RNA.
- CO5.** To classify porphyrins, explain detection methods, chemical nature and physiological significance of Bile pigments.

**B.Sc. (BIOCHEMISTRY)
(SEMESTER-I)**

2022-23

PAPER- BIOMOLECULES [BBC101]

Max. Marks – 50

- UNIT –I** **Introduction** **[04 Hrs]**
Introduction to Biochemistry, water as a biological solvent, weak acids and bases, pH, buffers, Henderson-Hasselbalch equation, physiological buffers, fitness of the aqueous environment for living organisms.
- Carbohydrates** **[08hrs]**
Structure of monosaccharides. Stereoisomerism and optical isomerism of sugars. Reactions of aldehyde and ketone groups. Ring structure and anomeric forms, mutarotation. Reactions of sugar due to hydroxyl groups. Important derivatives of monosaccharides, disaccharides and trisaccharides (structure, occurrence and functions of important ones). Structure, occurrence and biological importance of monosaccharides, oligosaccharides and polysaccharides e.g. cellulose, chitin, agar, algalic acids, pectins, proteoglycans, sialic acids, blood group polysaccharides, glycogen and starch. Bacterial cell wall polysaccharides etc. Glycoproteins.
- UNIT-II** **Lipids** **[10hrs]**
Definition and classification. Fatty acids: Introduction, classification, nomenclature, structure and properties of saturated and unsaturated fatty acids. Essential fatty acids, prostaglandins. Triacylglycerols: nomenclature, physical properties, chemical properties and characterization of fats – hydrolysis, saponification value, rancidity of fats, Reichert – Meissel number and reaction of glycerol. Biological significance of fats. Glycerophospholipids (lecithins, lysolecithins, cephalins, phosphatidyl serine, phosphatidyl inositol, plasmalogens), sphingomyelins, glycolipids – cerebrosides, gangliosides. Properties and functions of phospholipids, isoprenoids and sterols.
- UNIT-III** **Proteins** **[14Hs]**
Introduction, classification based on solubility, shape, composition and functions. Amino acids: common structural features, stereo-isomerism and RS system of designating optical isomers, classification and chemical properties, titration of amino acids, separation of amino acids. Essential amino acids.
Peptides: structure of peptide bond, chemical synthesis of polypeptides – protection and deprotection of N-terminal, C-terminal ends and functional groups in the side-chains, formation of peptide bonds, condensing agents, strategy of chemical synthesis, Merrifield solid-phase peptide synthesis. Determination of the amino acid sequence of a polypeptide chain, specific chemical and enzymatic cleavage of a polypeptide chains and separation of peptides. Protein structure: levels of structure in protein architecture, primary structure of proteins, secondary structure of proteins – helix and pleated sheets, tertiary structure of proteins, forces stabilizing the tertiary structure and quaternary structure of proteins. Denaturation and renaturation of proteins. Behaviour of proteins in solutions, salting in and salting out of proteins. Structure and biological functions of fibrous proteins (keratins, collagen and elastin), globular proteins (hemoglobin, myoglobin), lipoproteins, metalloproteins, glycoproteins and nucleoproteins.

UNIT-IV**Nucleic acids****[12Hrs]**

Nature of genetic material; evidence that DNA is the genetic material, Composition of RNA and DNA, generalized structural plan of nucleic acids, nomenclature used in writing structure of nucleic acids, features of DNA double helix. Denaturation and annealing of DNA, structure and roles of different types of RNA. Size of DNA in prokaryotic and eukaryotic cells, central dogma of molecular biology. Gene, genome, chromosome.

UNIT-V**Porphyryns****[12hrs]**

Porphyrins: Porphyrin nucleus and classification of porphyrins. Important Metalloporphyrins occurring in nature. Detection of porphyrins spectrophotometrically and by fluorescence. Bile pigments – chemical nature and their physiological significance

LIST OF REFERENCE BOOKS:

1. Lehninger's Principles of biochemistry by Nelson , David L and Cox M.M. Macmillan, NY.
2. Fundamental of biochemistry by Donald Voet, Judith G Voet and Charlotte W Pratt, John Willey & sons, NY.
3. Biochemistry III ed by Lubert Stryer, WH Freeman and Co , San Francisco.

B. Sc. Part - I (BIOCHEMISTRY) SEMESTER - I
2022-23
LAB COURSE – I

BIOCHEMISTRY PRACTICAL [BBCL01]

Course Outcome (CO):

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

- CO1. To have practical knowledge of buffers and determination of pH.
- CO2. To learn preparation of standard solution.
- CO3. To understand Beer-Lambert's law.
- CO4. To learn about Qualitative test of carbohydrate, protein, amino acid and lipids.
- CO5. To have practical knowledge of titration curve and determination of pK value..

LAB COURSE – I

BIOCHEMISTRY PRACTICAL [BBCL01]

Max.Marks – 25

Min.Marks – 10

1. Preparation of standard buffers and determination of pH of a solution.
2. Qualitative test for :
 - a. Carbohydrates
 - b. Proteins and amino acids
 - c. Lipids
3. Determination of saponification value and iodine number of fats.
4. Estimation of ascorbic acid.
5. Titration curve for amino acids and determination of pK value.
6. Verification of Beer-Lambert's law.

B.Sc. (CHEMISTRY)

2022-23

Skill Enhancement Course – 1

BCHS 01: GOOD LAB PRACTICES IN CHEMISTRY THEORY AND PRACTICAL

[Credits -02, 30 hrs.]

Course outcome:

After completing the course students will be able to:

- CO1: Understand general laboratory practices
 - CO2: Prepare solutions
 - CO3: Handle glasswares and chemicals
 - CO4: Explore various research issues and their solutions
 - CO5: Apply practical skills in chemistry
- A.** Technique and uses of handling glasswares; calibrations, knowledge about common toxic chemicals and safety measures in their handling.
- B.** Common calculations in chemistry laboratories. Understanding the details on the label of reagent bottles.
Inorganic and organic reagents (Baeyer's reagent, nessler's reagent, fehling solution A and B, shiff reagents, Tollen's reagent, Mollish's reagent, Neutral ferric chloride, Nitrating Mixture, Aqua regia, Dimethyl glyoxime, H₂S gas); chemicals such as acids, bases, indicators, etc. used in chemistry lab for qualitative analysis .
- C.** Molarity and normality of common acids and bases. Preparation of solutions – solid and liquids, Molar, molal and normal solutions, Dilutions. Percentage solutions.
- D.** **Qualitative test of CO₃²⁻, CH₃COO⁻, SO₄²⁻, Cl⁻, NO₃⁻, NH₄⁺, Cu²⁺, Fe³⁺, Ni²⁺, Ba²⁺, Mg²⁺.**
Qualitative elemental analysis for Nitrogen, Sulphur, Halogen in organic compounds.

Reference Books

1. Seiler, J.P. (2005). Good Laboratory Practices: the why and how. Springer-Verlag Berlin and Heidelberg GmbH & Co. K; 2nd ed.
2. Garner, W.Y., Barge M.S., Ussary. P.J. (1992). Good Laboratory Practice Standards: Application for field and Laboratory studies. Wiley VCH.

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
2022-23

The syllabus with the paper combinations is as under

B.Sc. I: (BIOCHEMISTRY) SEMESTER – II

CORE COURSE	BIOCHEMISTRY - II
TITLE	BIOPHYSICAL AND BIOCHEMICAL TECHNIQUES
PAPER CODE	[BBC02]
PRACTICAL	LAB COURSE BIOCHEMISTRY-II
PAPER CODE	BBCL 02

The syllabus for B.Sc. Bio-Chemistry SEMESTER-II is hereby approved for the session 2022-23. 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.

B.Sc. – BIOCHEMISTRY SEMESTER - II
2022-23

DIRECTIVES FOR STUDENTS OF B.Sc. – BIOCHEMISTRY
SEMESTER - II

EVALUATION PATTERN

- Theory Paper : 60 marks
- Internal ; 15 marks
- Practical [lab course-I] : 25 marks

Question Paper Format and Distribution of Marks for
B.Sc.- (Biochemistry) Semester-II

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 60 (Marks x No. of Questions)
A (Very short Answer)	1x10 = 10
B (Short Answer)	3 x 5 = 15
C (Long Answer)	7 x 5 = 35

6. The internal examinations will be held for core course.
7. The scheme of marks for **Assignment** should be as follows :

Question Type	MM 75 (Marks x No. of Questions)
A (Very short Answer)	1 x10 = 10
B (Short Answer)	4x5 = 20
C (Long Answer)	9x5= 45
Total	75

**Syllabus and Marking Scheme for SECOND SEMESTER
(BIOCHEMISTRY)**

2022-23

PAPER NO.	TITLE OF THE PAPER	WEIGHT AGE
I	BIOPHYSICAL AND BIOCHEMICAL TECHNIQUES	60
II	INTERNAL	15
II	LAB COURSE BIOCHEMISTRY - II	25
	TOTAL	100

Lab Course		
Duration: 5 Hrs Total Marks: 25	TWO EXPERIMENTS	15
	VIVA	03
	PROJECT/FIELD WORK	04
	SESSIONAL	03

01	Theory paper	-	60
01	Internal	-	15
01	Practical	-	25
	Total Marks	-	100

**B. Sc. (BIOCHEMISTRY)
(SEMESTER-II)
2022-23**

BIOPHYSICAL AND BIOCHEMICAL TECHNIQUES [BBC202]

Max. Marks – 60

UNIT-I Concepts of Bioenergetics

[12Hrs]

Concept of free energy, standard free energy, determination of ΔG for a reaction, relation between equilibrium constant and standard free energy change, biological standard state and standard free energy change in coupled reactions. Biological oxidation-reduction reactions – introduction, redox potentials, relation between standard reduction potentials and free energy change (derivations and numericals included). High-energy phosphate compounds-introduction, phosphate group transfer-free energy of hydrolysis of ATP and sugar phosphates along with reasons for high ΔG .

UNIT-II Radio Isotopic Techniques

[10Hrs]

Types of radioisotopes used in Biochemistry, units of radioactivity measurements, techniques used to measure radioactivity (gas ionization and liquid scintillation counting), nuclear emulsions used in biological studies (pre-mounted, liquid and stripping), isotopes commonly used in biochemical studies – ^{32}P , ^{35}S , ^{14}C and ^3H), Autoradiography. Biological hazards of radiation and safety measures in handling radioisotopes. Biological applications.

UNIT-III Chromatography

[10Hrs]

General principles and application of:

- | | |
|-----------------------------------|--------------------------------|
| 1. Paper chromatography | 2. Thin-layer chromatography |
| 3. Adsorption chromatography | 4. Ion-exchange chromatography |
| 5. Molecular-sieve chromatography | |

UNIT-IV

Measurement of pH

[06Hrs]

Principles of glass and reference electrodes, types of electrodes, complications of pH measurement (dependence of pH on ionic strength electrode contamination and sodium error) and use of pH paper.

Electrophoresis

[06Hrs]

Basic principles of agarose electrophoresis, PAGE and SDS-PAGE, Two-dimensional electrophoresis, its importance. Isoelectrofocussing.

UNIT-V Spectroscopic Techniques

[06Hrs]

Beer-Lambert law, light absorption and its transmittance, determination and application of extinction coefficient, application of visible and UV spectroscopic techniques (structure elucidation and numerical excluded)

Immunological Techniques

[04hrs]

Immunodiffusion, immunoelectrophoresis, radioimmunoassay, ELISA, immunofluorescence.

List of Reference Books:

1. Physical Biochemistry by van Holde KE, Prentice hall Inc., New jersey.
2. Physical biochemistry by D Friefelder , WH Freeman & Co., USA..
3. Outlines of biochemistry by Eric E Conn, PK Stumpf, G Bruening and Ray H Doi , John Wiley & sons NY
4. Chromatography : A laboratory handbook of chromatography and electrophoretic methods by Erich Heftman, van Nostrand Reinhold, NY.

B. Sc. (BIOCHEMISTRY) SEMESTER - II
2022-23
LAB COURSE – II

BIOCHEMISTRY PRACTICAL [BBCL02]

Course Outcome (CO):

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

- CO1. To know how to Isolation and assay of glycogen from rat liver.
- CO2. To know how to estimate Carbohydrate.
- CO3. To understand Beer-Lambert's law.
- CO4. To know how to estimate DNA and RNA.
- CO5. To learn about separation of sugar using paper chromatography.

LAB COURSE – II
BIOCHEMISTRY PRACTICAL [BBCL02]

Max.Marks – 25

Min.Marks – 25

1. Estimation of
 - i) Carbohydrate by anthrone method.
 - ii) Blood glucose by the methods
 - (a) Folin-Wu,
 - (b) Nelson-Somogyi
2. Estimation of amino acids by ninhydrin method.
3. Isolation and assay of glycogen from rat liver.
4.
 - i) Extraction of total lipids by Folch method
 - ii) Estimation of food adulterant.
5. Estimation of DNA and RNA.
6. Separation of sugars using paper chromatography.

B.Sc. (CHEMISTRY)

2022-23

Skill Enhancement Course – 2

**BCHS 02: WATER REMEDIATION AND CONSERVATION STUDIES
THEORY AND PRACTICAL [Credits -02, 30 hrs.]**

Course outcome:

After completing the course students will be able to:

CO1: Understand about Sources and Effect Water Pollution

CO2: Learn about various control technique

Water Pollution

Sources of water pollutants, pollutants, Industrial and human contribution, WHO recommendation about potable water, current scenario of drinking water quality.

Remediation Techniques

Remediation, techniques involved such as adsorption, coagulation-filtration, Nalgonda techniques, reverse osmosis, activated charcoal detoxification, mechanisms of detoxification, bio-remediation, need of green chemistry, future scope.

Water Conservation

Introduction to water conservation and erosion of soil, forms of water erosion, factors affecting water erosion, types of water erosion, mechanics of water erosion control,

Practicals

Water analysis (pH, Conductivity, hardness, Acidity, Alkalinity etc.)

Case study/Project

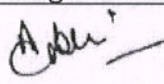

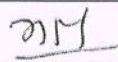
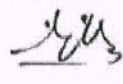
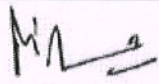
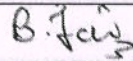

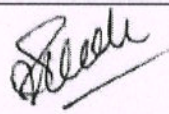
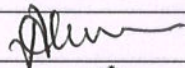


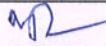
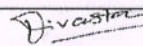

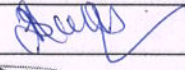



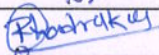
Case study/Project on water pollution, water conservation and water quality.

Recommended Books/references:

1. CITTENDEN J. C. , TRUSSELL J. R., HAND D. W., HOWE K. J., TCHOBANOGLIOUS G. , Water treatment: Principles and Design MWH publication.
2. DE A. K. Environmental Chemistry, Wiley Eastern
3. CLARSON D., DARA S. S. A text book of Environmental chemistry and pollution control, S Chand Co. Soil and water analytical method
4. EDZWALD J., Water Quality & Treatment: A Handbook on Drinking Water (Water Resources and Environmental Engineering Series)

The syllabus of the Skill Enhancement Courses for B.Sc. (Chemistry) Semester I & II is hereby approved for the session 2022-23

**Syllabus approved by Board of study
Members (Board of study)**

S.No.	Category	Nominee Member	Signature
01	Head Department of Chemistry	Dr. Anupama Asthana Govt. V.Y.T.PG Autonomous College, Durg (C.G.)	
02	Subject Expert	Dr. Shushil Chand Tiwari Principal, Govt. Girls College Durg (C.G.)	
03	Subject Expert	Dr. Hemlata Mohobey Former Principal Rajnandgaon	
04	Subject Expert	Dr. Anju Jha Govt. NGP Autonomous College, Raipur (C.G.)	
05	University Nominee	Dr. Arun Mishra Govt. NGP Autonomous College, Raipur (C.G.)	
06	Representative (Industries)	Mr. Dilip Singh Street - 33, Smriti Nagar	
07	Alumni	Dr. Bhavana Jain	
08	Subject Expert (Biochemistry)	Dr. Mrigendra Diwedi Govt. NGP Autonomous College, Raipur (C.G.)	
08	Professor (other Department)	Dr. S. D. Deshmukh (Head Department of Geology) Govt. V.Y.T.PG Autonomous College, Durg (C.G.)	
09	Member	Dr. Alka Tiwari	
10	Member	Dr. S. Chatterjee	
11	Member	Dr. Anil Kashyap	
12	Member	Dr. Manju Kaushal	
13	Member	Dr. Ajaya Singh	
14	Member	Dr. Nutan Rathod	
15	Member	Dr. Uama Shrivastava	
16	Member	Dr. V.S. Geete	
17	Member	Dr. Sunita B. Mathew	
18	Member	Dr. Anupama Kashyap	
19	Member	Dr. Prerna Kathane	
20	Member	Dr. Sunita Sanwaria	
21	Member	Dr. Soma Sengupta	
22	Member	Mrs. Romanchi Chandrakar	
23	Member	Ku. Jyoti Verma	