

**Department of Biochemistry**  
**Govt. M.H. College of Home Science and**  
**Science for Women, Jabalpur**



**Syllabus: Biochemistry (Undergraduate)**

**Academic Session 2023-2024**

**Recommended by Central Board of**  
**Studies and approved by Governor of MP**


**Approved by Board of Studies**  
**Biochemistry**

**Department of Biochemistry**  
**Govt. M H College of Home Science & Science for Women, Jabalpur**  
**Recommended by Central Board of Studies and approved by Governor of MP**  
**Scheme of Marks: Academic Session 2023-2024**


**SCHEME OF EXAMINATION**

**Academic Session 2023-2024**


Semester	Paper Name	CCE	Theory	Practical
BSc Part I	<b>Major - Biochemical Techniques</b>	30	70	100 (30+70)
	<b>Minor - Chemistry of Biomolecules</b>	30	70	100 (30+70)
BSc Part II	<b>(Major - Clinical Biochemistry)</b>	30	70	100 (30+70)
	<b>Minor - Intermediary Metabolism</b>	30	70	100 (30+70)
BSc Part III	<u>Group A</u> <b>I Cell Biology</b> <b>II Microbiology &amp; Microbial Techniques</b> <u>Group B</u> <b>I Human Physiology</b> <b>II Nutritional Biochemistry</b>	30	70	100 (30+70)

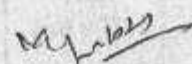
  
**Dr. Sadhana Keshawani**

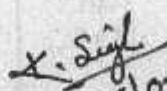
On line meeting  
 (Google Meet)

  
**Dr. Aditya Mishra**

- Dr. Abhay Kumar Pandey  
 - Dr. Divya Bagchi

  
**Dr. Manish Agrawal**



  
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**Govt. M H College of Home Science &  
Science for Women (Auto) Jabalpur M.P.**



**Syllabus**

**BSc Part I**

**( Major )**

**Academic Session 2023-2024**

**(As prescribed by MP Higher Education )**

**NEP 2020**

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Class : B.Sc. Part I

Max. Marks: UE 70+ CCE 30

Subject : Biochemistry Paper : I Biochemical Techniques (BCHE101)

Part A - Introduction

Program: Certificate		Class: B.Sc.	Year: I	Session:2023-2024
Subject: Biochemistry				
1	Course code	SI-BCHE11		
2	Course title	Biochemical Techniques (Paper 1)		
3	Course type (Core Course/Elective/Generic/Elective/Vocational/.....)	Core course		
4	Pre-requisite (if any)	To study this course, a student must have had the subject Biology in class 12 <sup>th</sup> .		
5	Course Learning Outcomes (CLO)	<ul style="list-style-type: none"> <li>The course covers essential techniques used in various laboratories.</li> <li>It trains the learner to work in the laboratories and R&amp;D sections of various industries.</li> <li>Helpful for developing technological skills.</li> <li>Students get exposed to various techniques and their applications in separation and characterization of different biological molecules.</li> </ul>		
6	Credit Value	Theory - 4		
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks: <b>35</b>	

Part B — Content of the course

Total number of Lectures (In hours per week): 4 hours per week

Total Lectures : 60 hours

Unit	Topic	Number of Lectures
I	<p><b>pH AND ITS MEASUREMENT:</b>                      Concept of acids, bases, pH and buffers: Definitions, Ionization of weak acids and bases, Henderson-Hasselbalch equation, Biochemical buffers and their actions, Titration curve for amino acids and the pK values, Physiological buffers and their role.                      Preparation of common solutions based on molarity, normality and percent. Preparation of buffers.                      Measurement of pH: Glass and reference electrodes, types of electrodes, complications of pH measurement (dependence of pH on ionic strength, electrode contamination and sodium error).</p>	12
II	<p><b>CHROMATOGRAPHY:</b>                      General principle of chromatographic separation. Technical details of Column adsorption and column partition chromatography, Paper</p>	10

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	chromatography, Thin-layer Chromatography, Gas chromatography. Principle, Technique and applications of Ion-exchange chromatography, Molecular- sieve chromatography, Affinity chromatography, Hydrophobic ligand Chromatography and HPLC.	
III	<b>ELECTROPHORESIS AND CENTRIFUGATION:</b> Introduction, Principle and Types of Electrophoresis. Factors affecting the rate of electrophoresis, Free and Zonal electrophoresis, Paper electrophoresis. Gel electrophoresis: Technique and uses of Agarose electrophoresis, PAGE and SDS- PAGE, Two-dimensional electrophoresis, its importance and uses. Isoelectric focusing. Principle of Centrifugation, RCF and Factors affecting it, Ultracentrifugation and its applications, Types of ultracentrifuges - Preparative and Analytical, Sedimentation coefficient and sedimentation velocity, Density gradient centrifugation.	14
IV	<b>SPECTROSCOPY:</b> Principle of Spectroscopy, Lambert-Beer's Law and its limitations, Interaction of light with molecules, Light absorption and transmission, Extinction coefficient. Basic design of photoelectric colorimeter and spectrophotometer, Applications of UV- visible spectroscopic techniques, Infrared Spectroscopy, Flame Photometry, Atomic absorption spectrophotometry.	12
V	<b>RADIOACTIVITY:</b> Types of Isotopes, Synthesis of labeled compounds, units of radioactivity, Measurement of radioactivity - Methods based upon Gas ionization, Ionization chamber, Proportional counters, Geiger Muller counter; Methods based upon excitation - Liquid Scintillation Counter, Autoradiography. Isotopes commonly used in biochemical studies — $^{32}\text{P}$ , $^{35}\text{S}$ , $^{14}\text{C}$ and $^3\text{H}$ , Isotopic labelling of biomolecules. Applications of radioisotopes. Biological hazards of radiation and safety measures in handling radioisotopes.	12

**Keywords:** pH, chromatography, electrophoresis, centrifugation, spectroscopy, radioactivity.

**Part C — Learning Resources**

**Text Books, Reference Books, Other resources**

**Suggested Reading:**

1. Boyer, R. F., "Biochemistry Laboratory: Modern Theory and Techniques", Boston, Mass: Prentice Hall, 2012, 6th ed., ISBN- 13: 978-0-13-604302-7.
2. Plummer D. T., "An Introduction to Practical Biochemistry", Tata McGraw Hill Education Pvt. Ltd. (New Delhi), 1998, 3rd ed., ISBN: 13: 9780070994874 / ISBN:1 0: 0070994870.
3. Wilson K. and Walker J., "Principles and Techniques of Biochemistry and Molecular Biology",

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Cambridge University Press, 2010, 7th ed., ISBN 9780521 516358.

4. Voet, D and Voet, J.C. "Biochemistry", John Wiley and Sons, Inc, 2010, 4th Edition, ISBN: 978-0-470-57095-1.
5. Robyt, J.F. and White, B.J." Biochemical Techniques — Theory and Practice", Brooks and Cole Publishing Co., ISBN: 0-534-07944-X.
6. Holme, D.J. and Peck, H. "Analytical Biochemistry", Longman Scientific and Technical ISBN: 0-562-06694-8.

**Suggested equivalent online courses:**

4. <http://www.britannica.com>
5. <http://en.wikibooks.org/wiki/Biochemistry>
6. <http://nptel.ac.in>

**Part D: Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

Maximum Marks: 100 marks

Continuous Comprehensive Evaluation (CCE): 30 marks, University Exam (UE): 70 marks

**Internal Assessment:**

Continuous Comprehensive Evaluation (CCE): 30

Class Test

15

Assignment/Presentation

15

**Total**

**30**

**External Assessment:** University Exam Section: 70 Time: 02:00 Hours

Section (A) : Three Very Short Questions (50 Words Each)

10 x 01 = 10

Section (B) : Four short Question (200 Words Each)

06 x 05 = 30

Section (C) : Two Long Questions (500 Words Each)

03 x 10 = 30

**Total**

**70**

**Any remarks / suggestions:**

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**Part A - Introduction**

<b>Program:</b> Certificate		<b>Class:</b> B.Sc.	<b>Year:</b> I	<b>Session:</b> 20223-2024
<b>Subject: Biochemistry</b>				
1	<b>Course code</b>	SI-BCHEIP		
2	<b>Course title</b>	Application of techniques in Biochemical Analysis (Paper 1)		
3	<b>Course type (Core Course/Elective/Generic Elective/Vocational/.....)</b>	Core course		
4	<b>Pre-requisite (if any)</b>	To study this course, a student must have had the subject Biology in 12 <sup>th</sup> Class.		
5	<b>Course Learning Outcomes (CLO)</b>	The students who complete this course: <ul style="list-style-type: none"> <li>• Will obtain hands-on training in basic separation techniques in biochemistry.</li> <li>• Will gain expertise in the isolation, purification and characterization of biomolecules and organelles.</li> </ul>		
6	<b>Credit Value</b>	Practical - 2		
7	<b>Total Marks</b>	Max. Marks: 30+70	Min. Passing Marks: 35	

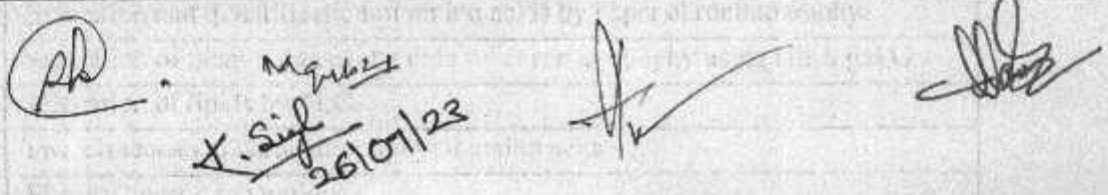
**Part B — Content of the course**

**Total number of Lectures (In hours per week): 2 hours per week**

**Total Lectures :30 hours**

S. No.	List of experiments	Number of Lectures
1.	Preparation of common reagents, acids and alkali of different Strengths/concentrations.	30 Hours
2.	Titration curves for an amino acids and determination of pK value.	
3.	Preparation of biochemical buffers of different ionic strengths.	
4.	Separation and quantification of amino acids by paper chromatography.	
5.	Separation of plant pigments by column chromatography using silica gel-G.	
6.	Separation of lipids by TLC.	
7.	Two dimensional chromatography of amino-acids.	
8.	Electrophoretic separations.	
9.	Demonstration of Polyacrylamide gel electrophoresis and SDS-PAGE of Proteins.	
10.	Differential Centrifugation for organelle separation.	
11.	Verification of Lambert-Beer's Law.	
12.	Colorimetric estimations of sugars, amino acids, proteins.	

Keyword: pk, chromatography, electrophoresis, Lambert Beer's Law, Colorimetric estimation.


  
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**Part C — Learning Resources**

**Text Books, Reference Books, Other resources**

**Suggested Reading:**

- 1 Plummer D. T., "An Introduction to Practical Biochemistry", Tata McG raw Hill Education Pvt. Ltd. (New Delhi), 1998, 3rd ed., ISBN: 13: 9780070994874 / ISBN:10: 0070994870.
- 2 Jayaraman, J., "Laboratory manual in Biochemistry", New Age International Publisher.
- 3 Rao B.S. and Deshpande, V., "Experimental Biochemistry", I.K. International Pvt Ltd.

**Suggested equivalent online courses:**

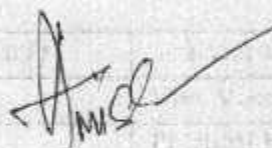
**Part D: Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

Internal Assessment	Marks	External Assessment	Marks
Class Interaction / Quiz		Viva Voce on Practical	
Attendance		Practical Record File	
Assignments (Chart/ Model Seminar/ Rural Service/ Technology Dissemination/ Report of Excursion/Lab Visits/Survey/Industrial visit)		Table work/ Experiments	
<b>Total</b>	<b>30</b>		<b>70</b>

**Any remarks/suggestions:**







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**Syllabus**

**BSc Part I**

**(Minor & Elective)**

**Academic Session 2023-2024**

**(As prescribed by MP Higher Education )**

**NEP 2020**

M. K. Singh

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Class : B.Sc. Part I

Max. Marks: UE 70 + CCE 30

Subject : Biochemistry Paper : II Chemistry of Biomolecules (BCHE 102)

Part A - Introduction			
Program: Certificate		Class: B.Sc.	Year: I Session: 2023 -2024
Subject: Biochemistry			
1	Course code	S1-BCHE 2T	
2	Course title	Chemistry of Biomolecules (Paper II)	
3	Course type (Core Course/Elective/Generic Elective/Vocational/.....)	Core course	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Biology in class 12 <sup>th</sup> .	
5	Course Learning Outcomes (CLO)	<p><b>On successful completion of this course the students</b></p> <ul style="list-style-type: none"> <li>• Are exposed to importance of biological molecules and their role in maintenance of life.</li> <li>• Enthusiastically learn about DNA, RNA, vitamins and lipids and their importance in biological system.</li> <li>• Get the insight of bio-molecular properties which can be used to carry out various studies.</li> <li>• Will be able to pursue research in any field as biomolecules are basis of all researches.</li> </ul>	
6	Credit Value	Theory - 4	
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks: <b>35</b>
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**Part B — Content of the course**

**Total number of Lectures (In hours per week): 4 hours per week**

**Total Lectures : 60 hours**

Unit	Topic	Number of Lectures
I	<p><b>CARBOHYDRATES:</b>                      Applications and scope of Biochemistry, Water as a biological solvent, fitness of the aqueous environment for living organisms.                      Structure of monosaccharide's, stereoisomerism and optical isomerism of sugars, reactions of aldehyde and ketone groups, ring structure and anomeric forms, mutarotation, reactions of sugars due to hydroxyl groups, important derivatives of monosaccharide's.                      Structure, occurrence, and functions of Important disaccharide and trisaccharides.                      Structure, occurrence and biological importance of polysaccharides (starch, glycogen, cellulose, chitin).                      Blood group polysaccharides, Cell wall polysaccharides, Glycoproteins.</p>	10
II	<p><b>LIPIDS:</b>                      Definition and classification of Lipids.                      Fatty acids: introduction, classification, nomenclature, structure, properties of saturated and unsaturated fatty acids, essential fatty acids.                      Triacylglycerols: Nomenclature, physical properties, chemical properties and                      Characterization of fats- hydrolysis, saponification value, rancidity of fats, Reichert- Meissl number and biological significance of fats; reaction of glycerol. Phospholipids: Properties and functions of Glycerophospholipids (lecithins, lysolecithins, cephalins, phosphatidyl serine, phosphatidyl inositol, plasmalogens), Sphingomyelins. Glycolipids: cerebrosides, gangliosides.                      Derived lipids: Prostaglandins, isoprenoids and sterols.</p>	14
III	<p><b>AMINO ACIDS AND PROTEINS:</b>                      Amino acids: Classification and structures, zwitterions, physical and chemical properties.                      Peptides: Peptide bond and its formation, determination of the amino acid sequence of a polypeptide chain, specific chemical and enzymatic cleavage of polypeptide chain and separation of peptides.                      Proteins: Introduction, classification based on solubility, shape, compositions and function; the behavior of proteins in solutions, salting in and salting out of proteins.                      Levels of organization in protein structure: Primary structure of</p>	14

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	<p>proteins, secondary structure (Alpha-helix and Beta-pleated sheets), tertiary structure and quaternary structure; Denaturation and renaturation of proteins.</p> <p>Structure and biological functions of fibrous proteins (keratins, collagen and elastin), globular proteins (hemoglobin, myoglobin).</p>	
IV	<p><b>NUCLEIC ACID:</b></p> <p>Nature of genetic material, Evidence that DNA is the genetic material. Composition of RNA and DNA, generalized structural plan of nucleic acids, other functions of nucleotides - sources of energy, component of coenzymes and second messengers,</p> <p>Features of DNA double helix, Denaturation and annealing of DNA, effect of Ultra- Violet (UV) absorption, acid and alkali on DNA.</p> <p>Structure and roles of different types of RNA.</p>	12
V	<p><b>PORPHYRINS AND VITAMINS:</b></p> <p>Porphyryns: Porphyrin nucleus and classification of porphyryns; Important metalloporphyryns occurring in nature. Detection of porphyryns, spectrophotometrically and by fluorescence.</p> <p>Vitamins: Brief introduction of vitamins, Structure and biological role of water soluble and fat soluble vitamins.</p>	10


**Keywords:** Carbohydrates, lipids, amino acids, proteins, nucleic acid, porphyrin, vitamin.

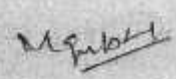
**Part C — Learning Resources**

**Text Books, Reference Books, Other resources**

**Suggested Reading:**

1. Garrett and Grisham, "Biochemistry", Publisher: Belmont CA: Brooks /Cole. Cengage Learning, 5th Ed., ISBN- (e book) 978.1.133.106296, P book -1133106293
2. Matthews, Holde van, and Ahern, "Biochemistry", Publisher: Pearson, 3rd Ed., ISBN- (e book) 100805330666, P book -139780805330663.
3. Berg, Tymoczko and Stryer, "Biochemistry," Publisher: W.H.Freeman & Co, 6th Edition.
4. Lodish, Harvey, Berk, Kaiser Chris. "A Molecular Cell Biology", Publisher: Macmillan, 7th Edition.
5. Devlin T.M., "Textbook of Biochemistry with Clinical Correlations", Publisher: Wiley-Liss, 7th Edition, ISBN- (e book) 9780470281734
6. Voet Donald and Voet Judith, "Biochemistry", Publisher: John Wiley & Sons, 4th edition, ISBN- (e book) 9780470570951
7. Satyanarayana U. "Biochemistry", Publisher: E Iseviei India, 5th Edition, ISBN- (e book) 9788131249406
8. Nelson DL, Cox MM, "Lehninger's Principles of Biochemistry", Publisher: Newyork W II Freeman, 5th Edition, ISBN- (e book) 9781 4641 09621, P Books 1 4641 0962 1
9. Boyer Rodney, "Concepts in Biochemistry", Publisher: John Wiley & Sons, 3rd Edition, ISBN- (e book) 9780471661795, P Books 0471 661791
10. Carlson P., "Introduction to Modern Biochemistry" by Publisher: Academic Press INC. ISBN - (e book) 9780123997630, P Books 0123997631

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11. Purkar SR, Hemant U Chikhale, "A text book of Biochemistry", Publisher: Birla Publications Pvt. Ltd. ISBN- (e book) 9789384266639.

**Suggested equivalent online courses:**

1. <http://www.britannica.com>
2. <http://en.wikibooks.org/wiki/Biochemistry>
3. <http://nptel.ac.in>

**Suggested Continuous Evaluation Methods:**

Maximum Marks : 100 marks  
 Continuous Comprehensive Evaluation (CCE) : 30 marks,  
 University Exam (UE) : 70 marks

<b>Internal Assessment:</b> Continuous Comprehensive Evaluation (CCE): 30	Class Test	15
	Assignment/Presentation	15
	<b>Total</b>	<b>30</b>
<b>External Assessment:</b> University Exam Section: 70Time: 02:00 Hours	Section (A) : Three Very Short Questions (50 Words Each)	10 x 01 = 10
	Section (B) : Four short Questions (200 Words Each)	06 x 05 = 30
	Section (C) : Two Long Questions (500 Words Each)	03 x 10 = 30
	<b>Total</b>	<b>70</b>

**Any remarks/suggestions:**



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Part A - Introduction			
Program: Certificate course		Class: B.Sc.	Year: 1
Session: 2023-2024			
Subject: Biochemistry			
1	Course code	S1-BCHE2P	
2	Course title	Biomolecular Analysis (Paper 2)	
3	Course type (Core Course/Elective/General Elective/Vocational/...)	Core course	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Biology in 12 <sup>th</sup> Class.	
5	Course Learning Outcomes (CLO)	The students who complete this course: <ul style="list-style-type: none"> <li>• Understands good Laboratory practices, Safety &amp; Precautions.</li> <li>• Will acquire proficiency in preparation of laboratory solutions, reagents, use of glassware, and qualitative analysis of biomolecules.</li> <li>• Learn the principles, theory &amp; calculations for each experiment.</li> </ul>	
6	Credit Value	Practical - 2	
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks: 35
Part B — Content of the course			
Total number of Lectures (In hours per week): 2 hours per week			
Total Number : 30 hours			
S. No.	Suggested List of experiments	Number of Lectures	
1.	Introduction to Biochemistry Lab. Safety aspects in Biochemical Laboratory.	30 hrs	
2.	Calibration of instruments & volumetric glassware (burette, pipette etc.).		
3.	Preparation of distilled water in laboratory.		
4.	Biochemical reagent preparations for various solutions with respect to different Normality, Molarity, % Solutions (W/V), (V/V).		
5.	Preparation of buffer and its pH determination.		
6.	Determination of pKa of acetic acid and glycine.		

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7.	Qualitative tests for carbohydrates and microscopic examination of osazones.
8.	Qualitative tests for amino acids, proteins and nucleic acids.
9.	Quantitative estimation of sugars and proteins.
10.	Estimation of vitamin C.
<b>Keyword:</b> Calibrations of instruments and volumetric glassware, normality, molarity, qualitative test for biomolecules, chromatographic separations.	

**Part C — Learning Resources**

**Text Books, Reference Books, Other resources**

**Suggested Reading:**

1. Plummer T., Introduction to Practical Biochemistry, Publication: Mc Graw Hill Education. ISBN e-book 9780070994874
2. Geetha Damodaran K, Practical Biochemistry 11 edition, Jaypee Brothers Medical Publishers. ISBN e-book 9789351529941
3. Litwalk G., Experimental Biochemistry, A Laboratory Manual, Publishers: John Wiley and Sons, ISBN e-book 9780471541202, 0471541206
4. Rajendran Soundravally, Biochemistry practical Manual Publishers: Elsevier India, ISBN e-book 9788131253519
5. Jackson M L, Chemical analysis, Publisher: Scientific Publisher India, ISBN-(ebook) 9788192686028, P Books 819268627
6. KAUSHIK G.G. Practical Manual of Biochemistry, CBS Publishers and Distributors, 2020
7. Experimental Biochemistry, NPTEL

**Suggested equivalent online courses:**

**Part D: Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

Internal Assessment	Marks	External Assessment	Marks
Class Interaction / Quiz	10	Viva Voce on Practical	10
Attendance	10	Practical Record File	10
Assignments (Chart/ Model Seminar/ Rural Service/ Technology Dissemination/ Report of Excursion/Lab Visits/Survey/Industrial visit)	10	Table work/ Experiments	50
<b>Total</b>	<b>30</b>		<b>70</b>

**Any remarks/suggestions:**

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**Govt. M H College of Home Science &  
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***Syllabus***

***BSc Part II***

***( Major )***

***Academic Session 2023-2024***

**(As prescribed by MP Higher Education )**

**NEP 2020**

**Academic Council  
Approved**

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Govt. M H College of Home Science & Science for Women, Autonomous,  
 Jabalpur  
 Approved by Board of Studies Biochemistry Academic Session 2023-2024

Part A: Introduction			
Program: Diploma		Class: B.Sc.	Year: II
		Session: 2023-24	
Subject: Biochemistry			
1.	Course Code	S2-BCHE1T	
2.	Course Title	Clinical Biochemistry (Paper 1)	
3.	Course Type (Core Course/Elective/Generic Elective/Vocational/....)	Core Course	
4.	Pre-requisite (if any)	To study this course, a student must have had the subject Biochemistry in First Year.	
5.	Course Learning outcomes (CLO)	After successful completion of the course, the student will be able to: <ul style="list-style-type: none"> <li>• Gain concepts of assessing the human physiology using various biological fluids.</li> <li>• Attain knowledge about normal composition of body fluids.</li> <li>• Understand the mechanism of metabolic disorders at molecular level and different parameters used for diagnosis of the disease in the clinical laboratories.</li> <li>• Seek employability in diagnostic and research institutes.</li> </ul>	
6.	Credit Value	Theory- 4	
7.	Total Marks	Max. Marks: 30+70.	Min. Passing Marks: 35

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Part B- Content of the Course		
Total No. of Lectures-Tutorials-Practical (in hours per week): 4 Hours/week		
L-T-P: Total lectures- 60 hours		
Unit	Topics	No. of Lectures
1.	<b>INTRODUCTION TO CLINICAL BIOCHEMISTRY:</b> Basic concept of clinical biochemistry, definition and its scope in diagnosis of diseases. Standard units and abbreviation of biological constituents. Quality control: Manual versus automated processes in a clinical laboratory. <b>Key words:</b> Diagnosis of disease, biological constituents, quality control, clinical laboratory.	6
2.	<b>IMPORTANCE OF BIOLOGICAL FLUIDS:</b> Collection and preservation: Blood, Serum, Plasma, Urine and Cerebrospinal fluid (CSF). Importance of biochemical analysis of blood, urine and CSF. Normal values for important constituents in the blood (plasma/serum), CSF and Urine. <b>Key words:</b> Body fluids, blood, serum, plasma, CSF, urine.	12
3.	<b>CLINICAL ENZYMOLOGY:</b> Definition and importance: functional plasma enzymes, non-functional plasma enzymes and isozymes. Enzyme pattern in health and diseases with special reference to serum-alkaline and acid phosphatase, GOT, GPT, LDH, CPK, acetyl choline esterase and lipase. <b>Key Words:</b> Isozymes, plasma enzymes, GOT, GPT.	15
4.	<b>DISEASES RELATED TO METABOLIC DISORDERS:</b> Hypo and hyperglycemia, ketosis, glycosylated hemoglobin (HbA1C), Lipid malabsorption and steatorrhea, role of lipid profile in diagnosis of disease. Inborn errors of amino acid metabolism- alkaptonuria, phenylketonuria, albinism, Gout and hyperuricemia. <b>Key words:</b> Hyperglycemia, diabetes, HbA1C, ketosis, inborn errors, Gout.	15
5.	<b>ORGAN FUNCTION TESTS:</b> Evaluation of functional tests of liver, kidney, pancreas, heart and related disorders. Bile Pigments-Chemical nature and physiological significance, Direct and indirect bilirubin and pathophysiology of Jaundice. <b>Key words:</b> Organ function test, liver disorders, cardiovascular disorders, kidney disorders, pancreatic disorder, Jaundice.	12
<b>Keywords/Tags:</b>		







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**Part C: Learning Resources**

**Text Books, Reference Books, Other resources**

**1. Suggested Readings:**

1. Chatterjea M. N., Shinde R., "Textbook of Medical Biochemistry, Jaypee Publications, Medical publishers, 2012, 8th Ed.
2. Nelson D. L., Cox Michael M., "Lehninger Principles of Biochemistry", International Edition, CBS publishers, 2004, 4th Ed.
3. Murray R.K., Granner D.K., Mayes P.A., Rodwell V.W., "Harper's Biochemistry", Prentice Hall International Inc, 2009, 28th Ed.
4. Zubay Geoffrey L., "Biochemistry", McGraw Hill, 1997.
5. Gupta S.N., "Text book of Biochemistry", Rastogi publications, 2015, 2<sup>nd</sup> edition.
6. Berg J. M., Tymoczko J. L., Stryer L., "Biochemistry", W.H. Freeman, 1995, 4th Ed.
7. Powar C.B. and Chatwal G.R., Biochemistry, Himalaya Publishing House, 2017, 5<sup>th</sup> Edition.
8. Satyanarayana U., Chakrapani U., "Biochemistry", Elsevier, 2013, 4th edition.
9. Hall J.E. and Hall M.E., "Guyton and Hall Textbook of Medical Physiology", Elsevier India, 2017, 2<sup>nd</sup> Edition.
10. Vasudevan D. M., Sreekumari S., Kannan Vadyanathan, "Textbook of Biochemistry for Medical Students", Jaypee Publisher, 2016, 8<sup>th</sup> edition.
11. Books published by M.P. Hindi Granth Academy, Bhopal

**2. Suggestive digital platforms web links**

1. <http://www.britannica.com>
2. <http://en.wikibooks.org/wiki/Biochemistry>
3. <https://www.msdevetmanual.com/>
4. <https://www.mphindigranthacademy.org/>

**Suggested equivalent online courses:**

1. <https://nptel.ac.in>

**Part D: Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30 marks University Exam (UE) 70 marks

<b>Internal Assessment :</b>	Class Test	Total 30
Continuous Comprehensive Evaluation (CCE): 30	Assignment/Presentation	
<b>External Assessment :</b>	<b>Section (A) :</b> Objective Questions	Total 70
University Exam Section: 70	<b>Section (B) :</b> Short Questions	
Time : 03.00 Hours	<b>Section (C) :</b> Long Questions	



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Govt. M H College of Home Science & Science for Women, Autonomous,  
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Approved by Board of Studies Biochemistry Academic Session 2023-2024

Part A: Introduction			
Program: Diploma	Class: B.Sc.	Year: II	Session: 2023-24
Subject: Biochemistry			
1	Course Code	S2-BCHE1P	
2	Course Title	Clinical Investigations (Practical)	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/....)	Core Course	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Biochemistry in First Year.	
5	Course Learning outcomes (CLO)	On completion of this course, students will be able to: <ul style="list-style-type: none"> <li>Gain practical knowledge and develop technical skills towards various tests performed for diagnosis of diseases.</li> <li>Learn the handling of clinical samples and analyze various constituents of these biological samples.</li> <li>Attain knowledge of organ function tests.</li> </ul>	
6	Credit Value	Practical - 2	
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks: 35
Part B: Content of the Course			
Total No. of Lectures-Tutorials-Practical (in hours per week): 4 Hours/week			
L-T-P: Total lectures- 60 hours			
S.No.	Suggested list of Experiments		No. of Lectures
1.	Separation of plasma and serum from blood.		60 Hrs.
2.	Determination of normal and abnormal constituents of urine.		
3.	Estimation of blood glucose by Nelson Somogyii method.		
4.	Estimation of protein from serum by biuret and Lowry methods.		
5.	Estimation of serum albumin and determination of A/G ratio.		
6.	Determination of cholesterol in serum by Zak's method.		
7.	Determination of SGOT and SGPT activity.		
8.	Determination of acid and alkaline phosphatase activity in serum.		
9.	Estimation of conjugated and unconjugated bilirubin in serum.		
10.	Estimation of creatinine in serum and urine by Jaffe's method.		
Keywords/Tags:			

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**Part C-Learning Resources**

**Text Books, Reference Books, Other resources**

**1. Suggested Readings:**

1. Plummer D.T. "An Introduction to Practical Biochemistry", TataMcGraw Hills Publishing Company, 2017, 3<sup>rd</sup> edition.
2. Sadasivan S. Manickam A., "Biochemical Methods", New Age international Publication, 2018, 3<sup>rd</sup> edition.
3. Swarup N., Pathak S. and Arora S., "Laboratory techniques in Modern Biology", Kalyani Publishers, 2004.
4. Gupta R.C. and Bhargava S., "Practical Biochemistry", CBS Publishers & Distributors, 2006, 4<sup>th</sup> edition.
5. Chakravarthy Anuradha, Kanai L Mukherjee, "Medical Laboratory technology (Vol. III) Procedure Manual for Routine Diagnostic Tests", McGraw Hill India, 2017, 3<sup>rd</sup> edition.
6. Varley Harold, "Practical Clinical Biochemistry", CBS Publisher, 2005, 4<sup>th</sup> edition.
7. Soundravally Rajendiran, "Biochemistry Practical Manual", Elsevier India, 2019, 1<sup>st</sup> edition.
8. Sood Ramnik, "Text book of Medical Laboratory technology", Jaypee brothers, 2015, 2<sup>nd</sup> edition.
9. Books published by M.P. Hindi Granth Academy, Bhopal

**2. Suggestive digital platforms web links**

1. <http://www.britannica.com>
2. <http://en.wikibooks.org/wiki/Biochemistry>
3. <http://www.mphindigranthacademy.org>

**Suggested equivalent online courses:**

**Part D- Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30 marks University Exam (UE) 70 marks

Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz		Viva Voce on Practical	
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Table work / Experiments	
<b>TOTAL</b>	<b>30</b>		<b>70</b>

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M. Gupta

Dr. Anil

Dr. Anil

**Govt. M H College of Home Science &  
Science for Women (Auto) Jabalpur M.P.**



***Syllabus***

***BSc Part II***

***(Minor & Elective)***

***Academic Session 2023-2024***

**(As prescribed by MP Higher Education )**

**NEP 2020**

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*J. Singh*

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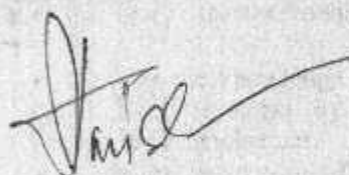
Govt. M H College of Home Science & Science for Women, Autonomous,  
Jabalpur

Approved by Board of Studies Biochemistry Academic Session 2023-2024

Part A Introduction			
Program: Diploma		Class: B.Sc.	Year: II
Session: 2023-24			
Subject: Biochemistry			
1	Course Code	S2-BCHE2T	
2	Course Title	Intermediary Metabolism	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/....)	Core Course Major 2/ Minor/ Elective	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Biochemistry in first year.	
5	Course Learning outcomes (CLO)	On completion of the course the students will be able to: <ul style="list-style-type: none"> <li>• Acquire the knowledge of energy production in living systems by the degradation of various biomolecules.</li> <li>• Gain the knowledge of metabolism which is the basis of drug designing and opens scope for research and development in pharmaceutical industries.</li> <li>• Learn about importance of metabolism which helps in diagnosis of diseases thus will provide opportunities in clinical field.</li> </ul>	
6	Credit Value	Theory -6	
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks: 33



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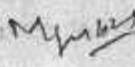
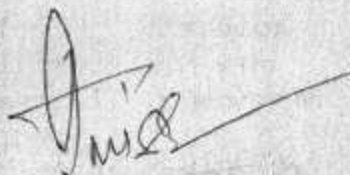




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Part B- Content of the Course		
Total No. of Lectures-Tutorials-Practical (in hours per week): 6 Hours/week		
L-T-P: Total lectures- 90 hours		
Unit	Topics	No. of Lectures
1.	<p><b>THERMODYNAMICS AND CARBOHYDRATE METABOLISM:</b> Introduction, general features of metabolism and its importance. Principles of thermodynamics, free energy, standard free energy. Biological oxidation reduction reactions, redox potential, ATP and high energy phosphate compounds. Carbohydrate metabolism: Reactions and energetics of Glycolysis and Tricarboxylic acid cycle (TCA), substrate level phosphorylation. Regulation of Glycolysis and TCA cycle. Alcoholic and lactic acid fermentation. Reaction and significance of Gluconeogenesis, Glycogenesis, Glycogenolysis, Pentose Phosphate Pathway. <b>Keywords:</b> Thermodynamics, redox reaction, ATP, fermentation, tricarboxylic acid cycle.</p>	20
2.	<p><b>ELECTRON TRANSPORT CHAIN AND OXIDATIVE PHOSPHORYLATION:</b> Structure of mitochondria, electron transport chain (ETC) and its sequence. Site of ATP production in ETC, inhibitors of ETC. Hypothesis of mitochondrial oxidative phosphorylation, inhibitors and uncouplers of oxidative phosphorylation. Transport of reducing potential in mitochondria. <b>Key words:</b> Electron transport chain, inhibitors, uncouplers, oxidative phosphorylation.</p>	16
3.	<p><b>LIPID METABOLISM:</b> Introduction, hydrolysis of triacylglycerol. Transport of fatty acid in mitochondria, <math>\beta</math>-oxidation of saturated fatty acids, ATP production from fatty acids oxidation. Biosynthesis of saturated and unsaturated fatty acids. Metabolism of ketone bodies, oxidation of unsaturated and odd chain fatty acids. Outlines of biosynthesis of triglycerides and important phospholipids, glycolipids, sphingolipids, and cholesterol. Regulation of cholesterol metabolism. <b>Key words:</b> Fatty acids, triacylglycerol, <math>\beta</math>-oxidation, ketone bodies, cholesterol.</p>	18
4.	<p><b>AMINO ACID METABOLISM:</b> General reactions of amino acid metabolism: Transamination, oxidative deamination, decarboxylation. Outline of degradation and biosynthesis of amino acids (Glycine, Serine, Methionine, Glutamic acid, Aspartic acid, Arginine,</p>	18

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	Tyrosine, Proline). Glycogenic and ketogenic amino acids, Urea cycle. <b>Key words:</b> Transamination, deamination, glycogenic amino acids, ketogenic amino acids.	
5.	<b>NUCLEOTIDE AND PORPHYRIN METABOLISM:</b> Sources of atoms in purine and pyrimidine molecules. Biosynthesis and degradation of purines and pyrimidines. Regulation of purine and pyrimidine biosynthesis. Porphyrin metabolism: Biosynthesis and degradation of porphyrins. Production of bile pigments. <b>Key words:</b> Purine metabolism, pyrimidine metabolism, porphyrins metabolism, bile pigment synthesis.	18

**Keywords/Tags:**

**Part-C Learning Resources**

**Text Books, Reference Books, Other resources**

**1. Suggested Readings:**

1. Nelson D. L., Michael M. Cox, "Lehninger Principles of Biochemistry", International Edition, CBS publishers, 2004, 4th Ed.
2. Berg J.M., Tymoczko J.L., Stryer L. "Biochemistry", W.H. Freeman, 1995, 4th Ed.
3. Murray R.K., Granner D.K., Mayes P.A., Rodwell V.W., "Harper's Biochemistry", Prentice Hall International Inc, 2009, 28th Ed.
4. Geoffrey L. Zubay, "Biochemistry", McGraw Hill, 1997.
5. West R., Todd B., Mason M., Bruggen R.V. "Textbook of Biochemistry" - Amerind Publishing Co. Pvt.Ltd., 1986, 4th Ed.
6. Satyanarayana U., Chakrapani U., "Biochemistry", Elsevier, 2013, 4th edition.
7. Voet, Donald, Voet, Judith & Pratt, Charlotte, "Biochemistry", Wiley & Sons, Inc. (New Jersey), 2013, 4th ed.
8. Chatterjea M.N. and Shinde R., "Textbook of Medical Biochemistry", Jaypee Publications, 2012, 8th Ed.
9. Books published by M.P. Hindi Granth Academy, Bhopal

**2. Suggestive digital platforms web links**

1. <http://www.britannica.com>
2. <http://en.wikibooks.org/wiki/Biochemistry>
3. <https://bio.libretexts.org/>
4. <http://www.mphindigranthacademy.org>

**Suggested equivalent online courses:**

1. <https://nptel.ac.in>

**Part-D Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30 marks University Exam (UE) 70 marks

<b>Internal Assessment :</b> Continuous Comprehensive Evaluation (CCE): 30	Class Test Assignment/Presentation	Total 30
<b>External Assessment :</b> University Exam Section: 70 Time : 03.00 Hours	<b>Section(A) :</b> Objective Questions <b>Section (B) :</b> Short Questions <b>Section (C) :</b> Long Questions	Total 70

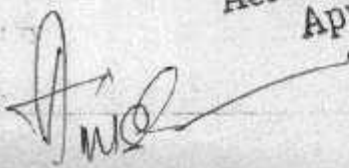
**Any remarks/suggestions:**

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***Syllabus***

***BSc Part III***

***( Major )***

***Academic Session 2023-2024***

**(As prescribed by MP Higher Education )**

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Approved by Board of Studies Biochemistry Academic Session 2023-2024

Part A - Introduction			
Program: Degree	Class: B.Se.	Year: Third	Session: 2023-24
Subject: Biochemistry			
1	Course code	S3- BCHE1D	
2	Course title	Cell Biology	
3	Course type (Core Course/Elective/Generic Elective/Vocational/.....)	Discipline Specific Elective-1 (Group A)	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Biochemistry in Diploma (second year).	
5	Course Learning Outcomes (CLO)	On successful completion of this course, students will be able to: <ul style="list-style-type: none"> <li>• Learn about cell structure and cell theory.</li> <li>• Acquire knowledge about the structure and function of various cell organelles.</li> <li>• Understand cell division and cell death mechanisms.</li> </ul>	
6	Credit Value	Theory- 4	
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks: 35
Part B - Content of the course			
Total No. of Lectures-Tutorials-Practical (In hours per week): 2 Hrs/week			
L-T-P: Total no. of Hrs- 60 Hrs			
Unit	Topic	No. of Lectures	
1	<b>INTRODUCTION TO CELL:</b> Cell theory, Prokaryotic and Eukaryotic cells: Difference between Plant cell and animal cell structure. Structure and composition of plant and bacterial cell wall. Other cellular forms: Mycoplasma, virus, viroid, prion. Keywords: Plant cell, animal cell, cell wall, mycoplasma, virus.	12	
2	<b>CELL MEMBRANE AND TRANSPORT MECHANISM:</b> Models of plasma membrane, Fluid Mosaic Model of membrane structure. Cell membrane proteins and carbohydrates, their properties and role, fluidity of plasma membrane, Transport across membranes: Osmosis, diffusion, active (Primary and Secondary) and passive transport. Keyword: Fluidity, diffusion, osmosis, active transport, passive transport	12	

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3	<p><b>CELL ORGANELLES- I:</b></p> <p>Endoplasmic reticulum - types, ultrastructure and functions. Protein sorting and signal hypothesis. Golgi apparatus- ultrastructure and functions. Different types of vesicular transport. Lysosomes- structure and functions. Ribosomes – types, structure and functions. <b>Keywords:</b> Endoplasmic reticulum, protein sorting, golgi apparatus, vesicular transport, lysosomes, ribosomes.</p>	14
4	<p><b>CELL ORGANELLES- II:</b></p> <p>Mitochondria - ultrastructure and function. Cytoskeleton - Microtubules (especially cilia and flagella), microfilaments, intermediate filaments and their functions. Nucleus – structure (nuclear membranes, nucleoplasm and nucleolus) <b>Keywords:</b> Mitochondria, microtubules, microfilament, intermediate filaments, nucleus.</p>	10
5	<p><b>CELL CYCLE:</b></p> <p>Chromosome- Structure of eukaryotic chromosome. The cell cycle - phases of cell cycle. Meiotic and mitotic cell divisions, Cell- cell communications, cell recognition, cell adhesion and cell functions. Apoptosis and necrosis. <b>Keyword:</b> Chromosome, meiosis, mitosis, cell-cell communications, cell recognition, cell adhesion, necrosis.</p>	12

**Part C – Learning Resources**

**Text Books, Reference Books, Other resources**

**1. Suggested Reading:**

1. Gupta P.K., "Cell and Molecular Biology", Rastogi Publications, 2008.
2. Verma P.S., Agarwal V.K., "Cytology", S. Chand Publications.
3. Arumagam N., "Cell Biology" Saras Publications.
4. Powar C.B., "Cell Biology", Himalya Publishing House, Bombay.
5. De Robertis "Cell Biology", W. B. Saunders, Philadelphia.
6. All subject related books published by Madhya Pradesh Hindi Granth Academy.

**2. Suggestive digital platforms/ web links**




1. <http://www.britannica.com>
2. <http://en.wikibooks.org/wiki/Biochemistry>
3. [www.mphindigranthacademy.org](http://www.mphindigranthacademy.org)
4. <https://www.eshiksha.mp.gov.in/mpdhe/>

**Suggested equivalent online courses:**

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1. <a href="https://nptel.ac.in">https://nptel.ac.in</a>		
<b>Part D-Assessment and Evaluation</b>		
<b>Suggested Continuous Evaluation Methods:</b>		
Maximum Marks : 100		
Continuous Comprehensive Evaluation (CCE) : 30 marks		
University Exam (UE) : 70 marks		
<b>Internal Assessment :</b> Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	30
<b>External Assessment :</b> University Exam Section: Time : 03.00 Hours	Section (A) : Very Short Questions Section (B) : Short Questions Section (C) : Long Questions	70
Any remarks/ suggestions:		

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**Govt. M H College of Home Science & Science for Women, Autonomous,  
Jabalpur**  
**Approved by Board of Studies Biochemistry Academic Session 2023-2024**

Part A - Introduction			
Program: Degree	Class: B.Sc.	Year: Third	Session: 2023-24
Subject: Biochemistry			
1	Course code	S3- BCHE1Q	
2	Course title	Techniques in Cell Biology	
3	Course type (Core Course/Elective/Generic Elective/Vocational/.....)	Discipline specific elective- 1 (Group A)	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Biochemistry in Diploma (second year).	
5	Course Learning Outcomes (CLO)	On successful completion of this paper, students will be able to: <ul style="list-style-type: none"> <li>• Understand the cell structure and organelles.</li> <li>• Acquire knowledge about cell division.</li> <li>• Get training about various stages of meiosis and mitosis.</li> </ul>	
6	Credit Value	Practical- 2	
7	Total Marks	Max. Marks (30+70)	Min. Passing Marks: 35

Part B – Content of the course		
Total No. of Lectures-Tutorials-Practical (In hours per week): 2 Hrs/ week		
L-T-P: Total no. of Hrs- 60 Hrs		
S.No.	List of experiments	No. of Lectures
1.	Preparation of temporary and permanent slides.	60 Hrs
2.	To study different stages of mitosis in onion root tip.	
3.	To study different stages of meiosis in onion flower buds.	
4.	Study of cell organelles by using electron micrographs.	
5.	Observation of permanent slides – Bacterial cell, plant cell, animal cell, cardiac muscle, sperm cell, nerve cell, stages of mitosis and meiosis.	
6.	Preparation of permanent slide of barr body using cheek cells.	
Keywords:		
Part C – Learning Resources		
Text Books, Reference Books, Other resources		
1. Suggested Reading:		

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1. Mathur J. P., "Methods in Cell Biology", Volume 57, and David Barnes, 1998.
2. Edward, G. "Manual of laboratory experiments in Cell Biology".
3. Gupta R., Makhija S., Toteja R., "Cell Biology: Practical Manual" Prestige Publishers, 2018.
4. Trigunayat M.M. , Trigunayat Kritika, "A Manual of Practical Zoology: Biodiversity, Cell Biology, Genetics and Developmental Biology" Scientific Publishers, 2019.
5. Sahu A. C., "Essentials of Biomolecules and Cell Biology with Practical" Kalyani Publishers.
6. Reddy N., Saidulu C., "Comprehensive Practical manual of Cell Biology Genetics and Ecology", Ishika Publishers, 2018.
7. All subject related books published by Madhya Pradesh Hindi Granth Academy.

**2. Suggested digital platforms/weblinks**

1. <https://www.eshiksha.mp.gov.in/mpdhe/>

**Suggested equivalent online courses:**

**Part D-Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Table work / Experiments	
		<b>Total Marks : 100</b>	

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Part A Introduction			
Program: Degree		Class: B.Sc.	Year: Third
		Session: 2023-24	
Subject: Biochemistry			
1	Course Code	S3-BCHE2D	
2	Course Title	Microbiology and Microbial Techniques	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/.....)	Discipline Specific Elective- 2 (Group A)	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Biochemistry in Diploma (second year).	
5	Course Learning outcomes (CLO)	After completion of course, students will be able to- <ul style="list-style-type: none"> <li>Identify bacteria using light microscope</li> <li>Explore the characteristics of microorganisms</li> <li>Learn routine microbiological techniques like sterilization, media preparation, maintenance of microbial culture, staining etc.</li> <li>Understand the microscopy techniques for specimen examination in laboratories.</li> <li>Learn the role of microbes in industrial, medical and domestic applications.</li> </ul>	
6	Credit Value	Theory -4	
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks:35
Part B- Content of the Course			
Total No. of Lectures-Tutorials-Practical (in hours per week): 2 Hours/week			
L-T-P: Total lectures- 60 hours			
Unit	Topics	No. of Lectures	
1.	<b>MICROORGANISMS AND MICROBIAL CELL ORGANIZATION;</b> Historical development of microbiology, classification of microorganisms. Cellular organization of bacteria and archaea; cell wall, cell membrane and various external and internal structures. Chemotaxis. Identification of bacteria. Keywords: Bacterial cell structure, chemotaxis, identification of bacteria.	10	
2.	<b>MICROBIAL TECHNIQUES:</b> Introduction to sterilization and disinfection in microbiological work. Physical methods - dry heat, moist heat, filtration, radiations. Chemical methods- by use of phenols, alcohols, halogens, heavy metals, aldehydes and gases. Microscopy- Light microscopy and electron microscopy. Preparation of specimens for light and electron microscopy.	12	

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	Staining - simple staining, Gram staining. <b>Keywords:</b> Electron microscope, light microscope, staining, sterilization.	
3.	<b>MICROBIAL NUTRITION AND GROWTH:</b> Nutritional types of microorganisms, growth factors and culture media. Methods of isolation of pure culture. Bacterial growth and its kinetics, Effect of environmental factors on bacterial growth. <b>Keywords:</b> Culture media, environmental factors, bacterial growth, pure culture.	10
4.	<b>INTRODUCTION TO VIRUSES:</b> Properties, structure and classification of viruses, virions, viroids and prions. Isolation, cultivation, purification and assay of viruses. Viral vaccines and prevention of diseases. <b>Keywords:</b> properties of viruses, purification of viruses, virions, viroids, prions, viral vaccines.	12
5.	<b>MICROORGANISMS IN FOOD AND FERMENTATION INDUSTRY</b> Application of microbes in food industry and dairy products. Food spoilage, food borne diseases, food preservation. Basic design of fermenter, continuous and discontinuous culture. Production of alcoholic beverages like wine and beer, single cell proteins, antibiotics (penicillin, tetracycline) with the help of microorganisms. <b>Keywords:</b> Antibiotic production, fermenter, food spoilage, food borne diseases, single cell protein.	16

**Part C-Learning Resources**

**Text Books, Reference Books, Other resources**

**1. Suggested Readings:**

1. Willey J., Sherwood L. and Woolverto C. J. "Prescott's Microbiology", Publisher : McGraw-Hill Education; 2017, 10th Edition.
2. Ryan K. J., Ahmad N., Drew W. L., Lagunoff M., Pottinger P., Barth Reller L. , and Sterling C. R., "Sherris Medical Microbiology", McGraw-Hill Education, 2018, 7th Edition.
3. Tortora G. J., Funke B. R., Case, Christine L. "Microbiology: An Introduction", Pearson, 2016. 12th Edition.
4. Chan, E.C.S., Peleczar, M. J., Jr., Krieg, N. R., "Microbiology", Tata McGraw-Hill Education Pvt. Ltd , 1998, 5<sup>th</sup> Edition.
5. Powar, C.B., Dagainawala, H.F. "General Microbiology", Himalaya Publishing House, Vol. I & II, 2019, 2<sup>nd</sup> Edition.
6. Stanier, R.Y., Adelberg, E.A., Ingraham, J.L. "General Microbiology", Macmillan, London 4<sup>th</sup> Edition.
7. Madigan, M.T., Mertinko, J.M. and Stahl, D.A. "Brock Biology of Microorganisms", Pearson Education International, 2015, 14<sup>th</sup> Edition.
8. All subject related books published by Madhya Pradesh Hindi Granth Academy.

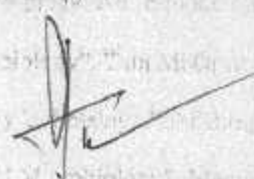
**2. Suggestive digital platforms web links:**

1. <http://www.britannica.com>
2. <http://en.wikibooks.org/wiki/Biochemistry>
3. [www.mphindigranthacademy.org](http://www.mphindigranthacademy.org)
4. <https://www.eshiksha.mp.gov.in/mpdlc/>

**Suggested equivalent online courses:**



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1. <a href="http://epgp.inflibnet.ac.in/">http://epgp.inflibnet.ac.in/</a>		
<b>Part D-Assessment and Evaluation</b>		
<b>Suggested Continuous Evaluation Methods:</b>		
Maximum Marks : 100		
Continuous Comprehensive Evaluation (CCE) : 30 marks		
University Exam (UE) : 70 marks		
<b>Internal Assessment :</b> Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	30
<b>External Assessment :</b> University Exam Section: Time : 03.00 Hours	<b>Section (A) : Very Short Questions</b> <b>Section (B) : Short Questions</b> <b>Section (C) : Long Questions</b>	70
Any remarks/suggestions:		

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**Govt. M H College of Home Science & Science for Women, Autonomous,  
Jabalpur**

**Approved by Board of Studies Biochemistry Academic Session 2023-2024**

Part A - Introduction			
Program: Degree	Class: B.Sc.	Year: Third	Session: 2023-24
Subject: Biochemistry			
1	Course code	S3-BCHE2Q	
2	Course title	Microbial Techniques	
3	Course type (Core Course/Elective/Generic Elective/Vocational/.....)	Discipline Specific Elective - 2 (Group A)	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Biochemistry in Diploma (second year).	
5	Course Learning Outcomes (CLO)	On completion of this course, learners will be able to: <ul style="list-style-type: none"> <li>• Learn sterilization of glasswares, culture media etc.</li> <li>• Prepare sterile media and culture microorganisms on them.</li> <li>• Perform monochrome and Gram staining.</li> <li>• Handle simple microscopes to examine the specimens in laboratories.</li> </ul>	
6	Credit Value	Practical- 2	
7	Total Marks	Max. Marks (30+70)	Min. Passing Marks: 35
Part B – Content of the course			
Total No. of Lectures-Tutorials-Practical (In hours per week): 2 hrs/week			
L-T-P: Total no. of Hrs- 60			
S.No.	List of Experiments	No. of Lectures	
1.	Working knowledge of instruments like Autoclave, Laminar flow, Hot air Oven, Colony counter, bright field microscope etc.	60 hrs	
2.	Sterilization of glass wares, such as, conical flasks, pipettes, Petri plates etc using hot air oven and autoclave.		
3.	Preparations of solutions, culture media and their sterilization.		
4.	Cultivation of microorganisms from air on media.		
5.	Study of microbial cell by monochrome staining and Gram staining.		
6.	Isolation of microorganisms by sector plate method.		
7.	Isolation of microorganisms by pour plate method.		
8.	To study effect of temperature and pH on microbial growth		
Part C – Learning Resources			
Text Books, Reference Books, Other resources			
<b>1 Suggested Reading:</b>			
1. Cappuccino, J.G. and Welsh C., "Microbiology: A Laboratory manual", Pearson, 2019, Loose leaf edition.			
2. Dubey R.C and Maheshwari D.K. "Practical Microbiology", S. Chand. 2010, First Edition.			
3. Patel B. and Phanse N. "Microbiology – A Practical Approach", Print Care, 2000, Edition 1.			
4. Jain, A., Agarwal J., Venkatesh V., "Microbiology Practical Manual", Elsevier India, 2018, 1 <sup>st</sup> edition.			
5. All subject related books published by Madhya Pradesh Hindi Granth Academy.			
<b>2. Suggestive digital platforms web links:</b>			
1. <a href="https://www.eshiksha.mp.gov.in/mpdhe/">https://www.eshiksha.mp.gov.in/mpdhe/</a>			

Govt. M H College of Home Science & Science for Women, Autonomous,  
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 Approved by Board of Studies Biochemistry Academic Session 2023-2024

Suggested equivalent online: **Part D-Assessment and Evaluation**

Suggested Continuous Evaluation Methods:

Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Table work / Experiments	
		<b>Total Marks : 100</b>	

Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Table work / Experiments	
		<b>Total Marks : 100</b>	

**Govt. M H College of Home Science & Science for Women, Autonomous,  
Jabalpur**  
**Approved by Board of Studies Biochemistry Academic Session 2023-2024**

Part A - Introduction			
Program: Degree	Class: B.Sc.	Year: Third	Session: 2023-24
Subject: Biochemistry			
1	Course code	S3-BCHE3D	
2	Course title	Human Physiology	
3	Course type (Core Course/Elective/Generic Elective/Vocational/.....)	Discipline specific elective- 1 (Group B)	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Biochemistry in Diploma (second year).	
5	Course Learning Outcomes (CLO)	On successful completion of this paper, students will be able to: <ul style="list-style-type: none"> <li>Get a holistic understanding of the different organ systems to their components and basic functioning.</li> <li>Learn about various physiological pathways and mechanism for normal functions of the human body.</li> </ul>	
6	Credit Value	Theory - 4	
7	Total Marks	Max. Marks (30+70)	Min. Passing Marks: 35
Part B – Content of the course			
Total No. of Lectures-Tutorials-Practical (In hours per week): 2 Hrs/week			
L-T-P: Total no. of Hrs – 60 Hrs			
Unit	Topic	No. of Lectures	
1	<b>INTRODUCTION TO HUMAN PHYSIOLOGY:</b> Definition and an overview, levels of structural organization, organ system. Body fluid compartments: intracellular, extracellular and interstitial fluid. Homeostasis: definition and control mechanisms (negative and positive feedback mechanisms). Keywords: Organ System, intracellular fluid, extracellular fluid, interstitial fluid, homeostasis.	10	
2	<b>BLOOD CIRCULATION AND RESPIRATION:</b> Blood- Blood components and their functions. Blood groups: the ABO system, Rhesus system. Blood clotting factors, intrinsic and extrinsic pathways for blood clotting. Respiration—Components of respiratory system and mechanism of respiration. Role of hemoglobin in the transport of gases, dissociation curve of oxyhemoglobin and its significance. Bohr's effect, chloride shift. Factors affecting the transport of	14	

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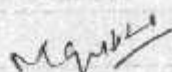
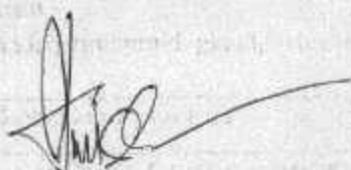
	gases. <b>Keywords:</b> Blood groups, Rhesus system, blood clotting factors, hemoglobin, Bohr's effect, chloride shift.	
<b>3</b>	<b>DIGESTION AND EXCRETION:</b> Digestion – Physiology of digestion, role of enzymes and Gastrointestinal hormones. Absorption of carbohydrates, proteins, lipids. Excretion - Nitrogenous waste products – Ammonia, urea, uric acid. Structure of human kidney and nephron with structural and functional characteristics of tubules. Mechanism of urine formation, glomerular filtration and glomerular filtration rate (GFR), counter-current mechanism. <b>Keywords:</b> Gastro-intestinal hormones, digestive enzymes, kidney, nephrons, glomerular filtration rate, counter-current mechanism.	<b>12</b>
<b>4</b>	<b>NERVOUS SYSTEM AND MUSCLE SYSTEM:</b> Nerve Coordination – Structure and types of neuron and synapses. Physiology of transmission of impulse across axons and synapses (chemical and electrical), neuro inhibitors and neurotransmitters, action potential, reflex action and reflex arc. Muscle contraction – Ultrastructure of striated muscle, Contractile (actin and myosin) and regulatory proteins (tropomyosin and troponin), neuro-muscular junction, Biochemistry of muscle contraction, Sliding filament mechanism. <b>Keywords:</b> Neuron, synapse, neurotransmitters, actin, myosin, neuro-muscular junction.	<b>14</b>
<b>5</b>	<b>ENDOCRINE SYSTEM:</b> General organization of mammalian endocrine system. Endocrine glands (Pituitary, thyroid, parathyroid, pancreas, adrenal and gonads) – structure and functions. Hormones: properties, classification, general mode of action of hormones (Steroid and peptides), feed-back mechanism. <b>Keywords:</b> Pituitary gland, thyroid gland, parathyroid gland, pancreas, adrenal gland, gonads, hormones.	<b>10</b>

**Part C – Learning Resources**

**Text Books, Reference Books, Other resources**

**1. Suggested Reading:**

1. Guyton A.C. & Hall J.E. "Textbook of Medical Physiology", W.B. Saunders & Co.
2. Prema Sembulingam, K. Sembulingam, " Medical Human Physiology and Biochemistry", Jaypee Publishers.
3. Widmaier, E.P., Raff, H. and Strang, K.T., "Vander's Human Physiology" McGraw Hill International Publications (New York), (2019) 15th ed., ISBN: 978-1259903885
4. Stuart Ira Fox. "Human Physiology" McGraw Hill International Publications, (New York) (2018) 15th


ed., ISBN 978-125986462

5. K.V. Sastry "Endocrinology and Reproductive Biology" – (Rastogi Publications, 2008).
6. Arora M.P. "Animal Physiology" Himalaya Publishing House (1989).
7. Hoar W.S. "General and Comparative Physiology" (Prentice Hall Publication) (1983).
8. Hurkat P.C. & Mathur P.N. "A textbook of Animal Physiology" (S. Chand & Co.) (1976).
9. Nagabhushanam R. & Kodarkar M.S. "Textbook of Animal Physiology" (IBI) (1978).
10. Turner C.D. & Gangara J.T. "General Endocrinology" – (W.B. Saunders & Co.) (1971).
11. All subject related books published by Medhya Pradesh Hindi Granth Academy.

**2 Suggestive digital platforms web links:**

- 1 <http://www.britannica.com>
- 2 <http://en.wikibooks.org/wiki/Biochemistry>
- 3 [www.mphindigranthacademy.org](http://www.mphindigranthacademy.org)
- 4 <https://www.cshiksha.mp.gov.in/mpdhe/>

**Suggested equivalent online:**

1. <https://nptel.ac.in>

**Part D-Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30 marks

University Exam (UE) : 70 marks

<b>Internal Assessment :</b> Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	30
<b>External Assessment :</b> University Exam Section: Time : 03.00 Hours	<b>Section (A) :</b> Very Short Questions <b>Section (B) :</b> Short Questions <b>Section (C) :</b> Long Questions	70

*M. K. Singh*

**Govt. M H College of Home Science & Science for Women, Autonomous,  
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**Approved by Board of Studies Biochemistry Academic Session 2023-2024**

Part A - Introduction			
Program: Degree	Class: B.Se.	Year: Third	Session: 2023-24
Subject: Biochemistry			
1	Course code	S3-BCHE3Q	
2	Course title	Physiological Analysis	
3	Course type (Core Course/Elective/Generic Elective/Vocational/.....)	Discipline specific elective- 1 (Group B)	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Biochemistry in Diploma (second year).	
5	Course Learning Outcomes (CLO)	On successful completion of this paper, students will be able to: <ul style="list-style-type: none"> <li>• Get knowledge about the different components of blood.</li> <li>• Learn about blood group and blood clotting.</li> <li>• Measure blood pressure which is useful in determining early stages of various diseases.</li> </ul>	
6	Credit Value	Practical- 2	
7	Total Marks	Max. Marks (30+70)	Min. Passing Marks: 35

Part B – Content of the course		
Total No. of Lectures-Tutorials-Practical (In hours per week): 2 Hrs/week		
L-T-P: Total no. of Hrs- 60 Hrs		
S.No.	List of experiments	No. of Lectures.
1.	Measurement of blood pressure.	60 Hrs
2.	Separation of plasma and serum from blood.	
3.	Determination of bleeding time and clotting time.	
4.	Blood group determination.	
5.	Determination of RBC and WBC count in blood.	
6.	Estimation of Hemoglobin by Sahli's method.	
7.	Detection of normal and abnormal constituents of urine.	



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**Keywords:** Blood pressure, blood components, bleeding time, clotting time, urine constituents.

**Part C - Learning Resources**

**Text Books, Reference Books, Other resources**

**1. Suggested Readings:**

1. Geetha N, "Practical Physiology", Jaypee publication, 2017.
2. Nageswari K Sri, Sharma Rajeev, "Practical Workbook of Human Physiology", Jaypee publication 2006.
3. Jain A.K., "Manual of Practical Physiology", Arya Publications; 5th edition 2018.
4. Varshney V.P., Bedi Mona, "Textbook of Practical Physiology", Jaypee Brothers Medical Publishers; 2018.
5. All subject related books published by Madhya Pradesh Hindi Granth Academy.

**2. Suggestive digital platforms web links:**

1. <https://www.eshiksha.mp.gov.in/mpdhe/>

**Suggested equivalent online:**

**Part D-Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Table work / Experiments	
		<b>Total Marks : 100</b>	

**Govt. M H College of Home Science & Science for Women, Autonomous,  
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**Approved by Board of Studies Biochemistry Academic Session 2023-2024**

Part A Introduction			
Program: Degree		Class: B.Sc.	Year: Third
Session: 2023-24			
Subject: Biochemistry			
1	Course Code	S3-BCHE4D	
2	Course Title	Nutritional Biochemistry	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/.....)	Discipline specific elective - 2 (Group B)	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Biochemistry in Diploma (second year).	
5	Course Learning outcomes (CLO)	After successful completion of the course, the student shall be able to: <ul style="list-style-type: none"> <li>• Understand the importance of nutritional biochemistry and contribute to the health and wellness of human beings.</li> <li>• Get acquainted with biological role of macro and micronutrients.</li> <li>• Learn to evaluate requirement of energy for various age groups.</li> <li>• Gain knowledge of anti-nutrient components of foods.</li> <li>• Get insight of processing methods to retain the nutritional quality of food.</li> </ul>	
6	Credit Value	Theory -4	
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks:35
Part B- Content of the Course			
Total No. of Lectures-Tutorials-Practical (in hours per week): 2 Hours/week			
L-T-P: Total lectures- 60 hours			
Unit	Topics		No. of Lectures
1.	<b>NUTRITION AND ENERGY REQUIREMENT:</b> Basic concept of nutrition and its relation to health. Energy value of foods, Direct and Indirect Calorimetry, thermal equivalent of oxygen, respiratory quotient (RQ), Specific Dynamic action (SDA) of the foods. Balanced diet – Recommended dietary allowances (RDA) for various groups. Basal metabolic rate (BMR) – definition, measurement and factors affecting it, energy		12

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	requirement for various groups in human beings. Keywords: Nutrition, calorimetry, respiratory quotient, BMR, SDA, balance diet.	
2.	<b>NUTRITIONAL QUALITY OF CARBOHYDRATES AND LIPIDS:</b> Digestion and absorption of Carbohydrates. Nutritional importance, requirement and biological functions of various dietary carbohydrates, available and unavailable carbohydrates, Special role of the non-starch polysaccharides. Digestion and absorption of lipids. Nutritional importance, requirement and biological functions of various dietary lipids, Essential fatty acids and their physiological significance. Keywords: Available and unavailable carbohydrates, non-starch polysaccharides, dietary lipids, essential fatty acids	12
3.	<b>NUTRITIONAL QUALITY OF PROTEINS:</b> Digestion and absorption of proteins. Nutritional importance, requirement and biological functions of various dietary proteins. Essential amino acids, Quality of proteins, digestibility coefficient, Net protein utilization (NPU), biological value of protein and amino acid score, Protein digestibility-corrected amino acid scores (PDCAAS) Nitrogen balance and factors influencing it. Keywords: Essential amino acids, protein quality, NPU, biological value of protein, nitrogen balance	12
4.	<b>NUTRITIONAL CHARACTERISTICS OF VITAMINS AND MINERALS:</b> Vitamins- Structure, dietary sources, biochemical function and deficiency disorders of Fat soluble and water soluble vitamins, Hypervitaminosis. Minerals- Nutritional significance, sources, daily requirement and deficiency disorders of dietary calcium, phosphorus, magnesium, iron, zinc and copper, Mineral toxicity. Keywords: Fat soluble and water soluble vitamins, nutritional significance of minerals, hypervitaminosis, mineral toxicity.	12
5.	<b>FOOD PROCESSING AND NUTRITIONAL DISORDERS:</b> Food processing methods and loss of nutrients during processing and cooking. Naturally occurring anti-nutrients. Disorders related to nutrition - Protein-energy malnutrition (PEM), Starvation, Obesity. Keywords: Recommended dietary allowances, food processing, anti-nutrients, PEM, starvation, obesity	12
<b>Keywords/Tags:</b>		
<b>Part C-Learning Resources</b>		
<b>Text Books, Reference Books, Other resources</b>		



M. J. Singh





**Govt. M H College of Home Science & Science for Women, Autonomous,  
Jabalpur**  
**Approved by Board of Studies Biochemistry Academic Session 2023-2024**

**1. Suggested Readings:**

1. Antin, F.P. and Abraham, "Clinical Dietetics and Nutrition", P. Oxford University Press, Delhi, 2002, 4<sup>th</sup> edition.
2. Davidson and Passmore, "Human Nutrition and Dietetics", Churchill Livingstone 1986, 8<sup>th</sup> revised edition
3. Shubhangini A. J., "Nutrition and Dietetics", McGraw hill education India, 2017, 4<sup>th</sup> edition.
4. Bamji M.S., Rao, N.P. and Reddy, V. "Textbook of Human Nutrition", Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 2009.
5. Chatterjea M.N. and Shinde, R. "Text book of Medical Biochemistry", Jaypee Brothers, Medical publishers.2012. 8<sup>th</sup> edition.
6. Swaminathan M.S., "Advanced Textbook on Food and Nutrition", Vol. I & II, The Bangalore Printing & Publishing Co. Ltd. Bangalore, 2008.
7. Khanna, K., Gupta, S. and Seth, R., "Text book of Nutrition and Dietetics", Phoenix Pub. House Pvt. Ltd., New Delhi, 2016, 6<sup>th</sup> edition.
8. Robinson, C.H. and Lawler, M.R., "Normal and Therapeutic Nutrition", Macmillan, New York, 1990, 17<sup>th</sup> edition.
9. Sabarwal B., "Applied Nutrition And Health", Common, Wealth, 1999
10. Gopalan C., Rama Sastri, B.V, and Balasubramian, S.C. "Nutritive Value of Indian Foods", NIN, IC, 2014, 4<sup>th</sup> edition.
11. All subject related books published by Madhya Pradesh Hindi Granth Academy.

**2 Suggestive digital platforms web links**

1. <http://www.britannica.com>
2. <http://en.wikibooks.org/wiki/Biochemistry>
3. [www.mphindigranthacademy.org](http://www.mphindigranthacademy.org)
4. <https://www.eshiksha.mp.gov.in/mpdhe/>

**Suggested equivalent online courses:**

1. <https://nptel.ac.in>

**Part D-Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30 marks

University Exam (UE) :70 marks

<b>Internal Assessment :</b>	Class Test Assignment/Presentation	30
Continuous Comprehensive Evaluation (CCE)		
<b>External Assessment :</b>	Section (A) : Very Short Questions	70

Govt. M H College of Home Science & Science for Women, Autonomous,  
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University Exam Section: Time : 03.00 Hours	Section (B) : Short Questions Section (C) : Long Questions	
Any remarks/ suggestions:		

    
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**Govt. M H College of Home Science & Science for Women, Autonomous,  
Jabalpur**  
**Approved by Board of Studies Biochemistry Academic Session 2023-2024**

Part A Introduction			
Program: Degree	Class: B.Sc.	Year: Third	Session: 2023-24
Subject: Biochemistry			
1	Course Code	S3-BCHE4Q	
2	Course Title	Techniques in Nutritional Biochemistry	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/.....)	Discipline specific elective – 2 (Group B)	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Biochemistry in Diploma (second year).	
5	Course Learning outcomes (CLO)	After successful completion of the course, the student will be able to: <ul style="list-style-type: none"> <li>Get an insight of Nutritional Biochemistry and importance of nutrients.</li> <li>Develop skills of qualitative and quantitative analysis of nutrients.</li> <li>Understand the analysis of nutritional quality of food.</li> <li>Learn the parameters of biochemical process for energy requirement for human nutrition.</li> </ul>	
6	Credit Value	Practical-2	
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks: 35
Part B- Content of the Course			
Total No. of Lectures-Tutorials-Practical (in hours per week): 2 hours per week			
L-T-P: Total Number of Hrs-60 Hrs			
S.No.	List of Experiments	No. of Hours	
1.	Estimation of protein in pulses.	60 Hrs	
2.	Determination of acid number, saponification and iodine value in oil.		
3.	Separation of egg proteins and their quantification.		
4.	Isolation of casein from milk and its quantification.		
5.	Estimation of total fats in milk.		
6.	Estimation of moisture content of food.		
7.	Estimation of calcium, phosphorus and iron in leafy vegetables.		
8.	Estimation of ascorbic acid (Vitamin C) in-citrus fruits.		



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9.	Estimation of Riboflavin and Vitamin A in food/vitamin tablet.
10.	Anthropometric identifications for Kwashiorkor, Marasmus and Obesity.
11.	Determination of BMI and BMR.
12.	Estimation of calorific value of food.
13.	Estimation of oxalate and flavonoids in raw and cooked food.

**Keywords/Tags:** Egg proteins, Vitamins in food, Minerals in food, calorific value, BMI, BMR.

**Part C-Learning Resources**

**Text Books, Reference Books, Other resources**

**1. Suggested Readings:**

1. Yadav A., Arora M., "Practical manual for Nutrition and dietetics", Kalpaz Publication, 2019.
2. Pender F., Van kaathoven N., "Nutrition and Dietetics: A practical Guide to Normal and Therapeutic Nutrition in Clinical Practice", Nelson Thrones Ltd., 1994.
3. Robinson C.H. and Lawler M.R., "Normal and Therapeutic Nutrition", Macmillan, New York.1990, 17<sup>th</sup> edition.
4. Sadasivan S. and Manickam A., "Biochemical methods ", New age international publication.2018, 3<sup>rd</sup> edition.
5. Gupta R.C. and Bhargava S., "Practical Biochemistry", CBS Publishers & Distributors.2006, 4<sup>th</sup> edition.
6. All subject related books published by Madhya Pradesh Hindi Granth Academy.

**2. Suggestive digital platforms web links**

1. <https://www.eshiksha.mp.gov.in/mpdhe/>

**Suggested equivalent online courses:**

**Part D-Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Table work / Experiments	
		<b>Total Marks : 100</b>	

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**Govt. M H College of Home Science &  
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**Syllabus**

**BSc Part III**

**(Minor & Elective)**

**Academic Session 2023-2024**

**(As prescribed by MP Higher Education )**

**NEP 2020**



**Govt. M H College of Home Science & Science for Women, Autonomous,  
Jabalpur**

**Approved by Board of Studies Biochemistry Academic Session 2023-2024**

Part A Introduction			
Program: Degree		Class: B.Sc.	Year: Third
Session: 2023-24			
Subject: Biochemistry			
1	Course Code	S3-BCHE2T	
2	Course Title	Food Biochemistry and Technology	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/.....)	Minor	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Biochemistry in Diploma (second year).	
5	Course Learning outcomes (CLO)	After successful completion of the course, the student will be able to: <ul style="list-style-type: none"> <li>• Learn the importance of food biochemistry and technology for health and wellness of the mankind.</li> <li>• Grasp the functional role of food components and their importance in food products.</li> <li>• Get insight about food manufacturing, processing and preserving.</li> </ul>	
6	Credit Value	Theory -4	
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks: 35
Part B- Content of the Course			
Total No. of Lectures-Tutorials-Practical (in hours per week): 4 Hours/week			
L-T-P: Total lectures- 60 hours			
Unit	Topics	No. of Lectures	
1.	<b>CONCEPT OF FOOD BIOCHEMISTRY:</b> Basic food groups- Energy giving, body building and protective food. Macronutrients - Sources and biological functions of carbohydrates, proteins and fats. Micronutrients - Sources and biological importance of vitamins and minerals. Importance of edible fibre and water. Functional foods: milk, egg, prebiotics, probiotics. Key words: Macronutrients, micronutrients, edible fibre, prebiotics, probiotics.	12	

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2.	<b>FOOD SPOILAGE AND FOOD BORNE DISEASES:</b> Biochemistry of food spoilage and food contamination. Types of food spoilage and factors affecting it (Physical, chemical, microbial). Spoilage of different foods- meat, fish, poultry, fruits, vegetables, cereal and cereal products, milk and milk products. Outline of various food borne diseases and food poisoning. <b>Keywords:</b> Food spoilage, food contamination, food borne diseases, food poisoning.	12
3.	<b>FOOD ADULTERATION AND PRESERVATION:</b> Commonly used food adulterants and their harmful effects, detection of food adulterants. Importance of food preservation, Various physical and chemical methods for food preservation. <b>Key words:</b> Food adulteration, food adulterants, detection of food adulterants, food preservation.	12
4.	<b>FOOD PROCESSING AND TECHNOLOGY:</b> Dairy industry- handling of milk, purity check of milk, thermal processing, Pasteurization (LTLT and HTST), Sterilization, Fermentation of milk and fermented milk products (Cheese, yogurt etc), evaporated and dried milk products- Milk powder, infant formula milk. Bakery- Introduction to baking, bakery ingredients and their functions, machines and equipments. Testing of flour, Manufacturing of bread, cake and biscuits. <b>Keywords:</b> Dairy, pasteurization, sterilization, milk fermentation, bakery, infant formula milk.	12
5.	<b>FOOD ADDITIVES AND FOOD SAFETY:</b> Brief outline of Food Additives - role and types of flavouring agents, leavening agents, emulsifiers, stabilizers. Food Safety and Assurance System- Need, Benefits and Principles of Hazard Analysis Critical Control Point (HACCP). <b>Keywords:</b> Food additive, flavouring agent, leavening agents, emulsifiers, food stabilizers, HACCP.	12

Keywords/Tags:

**Part C-Learning Resources**

**Text Books, Reference Books, Other resources**

**1. Suggested Readings:**

1. Prescott S.C. & Dunn C.G., "Industrial Microbiology", CBS Publishers, 1982, 4<sup>th</sup> ed.
2. Jay J.M. "Modern Food Microbiology", CBS Publishers, 2004, 7<sup>th</sup> ed.
3. Casida L.R. "Industrial Microbiology", New Age International Pvt. Ltd., 2019.
4. Pelczar, Chan, and Krieg, "Microbiology", McGraw Hill, 1985, 5<sup>th</sup> ed.
5. Mathlouthi M., "Food Packaging and Preservation" (theory & practice)-Elsevier Applied Science Publisher, London and New York, 1994, 1<sup>st</sup> ed.
6. Stanley S. & Roger C. G., "Food Packaging", The AVI Publishing Company Inc., 1980.
7. Robinson R. K. "Modern Dairy Technology", (Vol.1&2), Elsevier Applied Science Pub., 1996.
8. Herrington B.L. "Milk & Milk Processing", McGraw-Hill BookCompany, 2000.

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Jabalpur

Approved by Board of Studies Biochemistry Academic Session 2023-2024

9. Shubhangini A. J. "Human Nutrition and Dietetics", McGraw Hill Education India. 2017, 4<sup>th</sup> ed.
10. Swaminathan M.S., "Advanced Textbook on Food and Nutrition", The Bangalore Printing & Publishing Co. Ltd., Vol. I & II, 2014.
11. All subject related books published by Madhya Pradesh Hindi Granth Academy.

**2. Suggestive digital platforms web links**

1. <http://www.britannica.com>
2. <http://en.wikibooks.org/wiki/Biochemistry>
3. [www.mphindigranthacademy.org](http://www.mphindigranthacademy.org)
4. <https://www.eshiksha.mp.gov.in/mpdhe/>

**Suggested equivalent online courses:**

1. <https://nptel.ac.in>

**Part D-Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30 marks

University Exam (UE) : 70 marks

<b>Internal Assessment :</b> Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	30
<b>External Assessment :</b> University Exam Section: Time : 03.00 Hours	<b>Section (A) :</b> Very Short Questions <b>Section (B) :</b> Short Questions <b>Section (C) :</b> Long Questions	70

**Any remarks/ suggestions:**

Member

**Govt. M H College of Home Science & Science for Women, Autonomous,  
Jabalpur**  
**Approved by Board of Studies Biochemistry Academic Session 2023-2024**

Part A Introduction			
Program: Degree		Class: B.Sc.	Year: Third
Session: 2023-24			
Subject: Biochemistry			
1	Course Code	S3-BCHE2P	
2	Course Title	Biochemical analysis of food	
3	Course Type (Core Course/Elective/Generic Elective/Vocational/.....)	Minor	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Biochemistry in Diploma (second year).	
5	Course Learning outcomes (CLO)	After successful completion of the course, the student will be able to: <ul style="list-style-type: none"> <li>• Get an insight of Food Biochemistry and importance of nutrients.</li> <li>• Develop skills of qualitative and quantitative analysis of nutrients.</li> <li>• Understand the analysis of nutritional component of food.</li> </ul>	
6	Credit Value	Practical- 2	
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks: 35
Part B- Content of the Course			
Total No. of Lectures-Tutorials-Practical (in hours per week): 2 hours per week			
L-T-P: Total Number of Hrs-60 Hrs			
S.No.	List of Experiments	No. of Hours	
1	Extraction of soluble proteins from any food material and their quantification by Lowry's method.	60 Hrs	
2	Quantitative estimation of Ascorbic acid from any citrus fruit by titrimetric method.		
3	Isolation of casein from milk and its quantification.		
4	Qualitative and quantitative bacteriological examination of milk.		
5	Quantitative estimation of Calcium and phosphorus in milk.		
6	Microbial analysis of fruits and vegetables.		
7	Quantitative estimation of gluten content in bakery flour (Processed wheat flour).		
8	Isolation of Yeast from curd.		



M. G. B. 2024





**Govt. M H College of Home Science & Science for Women, Autonomous,  
Jabalpur**

**Approved by Board of Studies Biochemistry Academic Session 2023-2024**

9	Qualitative detection of adulterants in edible oil, pulses and milk.
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**Keywords/Tags:** Vitamins in food, Minerals in food.

**Part C-Learning Resources**

**Text Books, Reference Books, Other resources**

**1. Suggested Readings:**

1. Yadav A., Arora M., "Practical manual for Nutrition and dietetics", Kalpaz Publication, 2019.
2. Pender F., Van kaathoven N., "Nutrition and Dietetics: A practical Guide to Normal and Therapeutic Nutrition in Clinical Practice", Nelson Threnes Ltd., 1994.
3. Robinson C.H. and Lawler M.R., "Normal and Therapeutic Nutrition", Macmillan, New York.1990, 17<sup>th</sup> edition.
4. Sadasivan S. and Manickam A., "Biochemical methods ", New age international publication.2018.3<sup>rd</sup> edition.
5. Gupta R.C. and Bhargava S., "Practical Biochemistry", CBS Publishers & Distributors.2006, 4<sup>th</sup> edition.
6. All subject related books published by Madhya Pradesh Hindi Granth Academy.

**2. Suggestive digital platforms web links**

1. <https://www.eshiksha.mp.gov.in/mpdhe/>

**Suggested equivalent online courses:**

**Part D-Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Table work / Experiments	
		<b>Total Marks : 100</b>	

  
M. K. Singh



