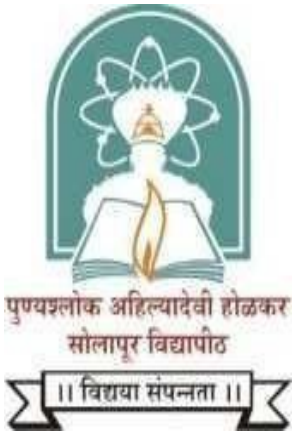
**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**




**NAACAccredited-2022**
**'B++ Grade' (CGPA 2.96)**

# Name of the Faculty: Science & Technology

(Asper New Education Policy 2020)

# Syllabus: BIOCHEMISTRY

**(Additional Interdisciplinary Subject)**

## Name of the Course: B.Sc.II (Sem. III & IV)

**(Syllabus to be implemented from June 2025)**

# Structure as per NEP-2020

| Level Difficulty | Sem. | Faculty | | | Generic/ Open Elective GE/OE | Vocational And Skill Enhance- ment Course (SEC/VSC) | Ability Enhancement Course(AEC), IKS, VEC | Field Project/ RP/Internship/ Apprenticeship/ Community Engagement & Services | Credits | Cumulative Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Major | | Minor | | | | | | |
| | | DSC | DSE | | | | | | | |
| 4.5 100-200 | I | DSC1-1 (2+2)<br>DSC2-1 (2+2)<br>DSC3-1 (2+2) | -- | -- | GE1/OE 1(2) | SEC-1 (2) | L1-1(2)<br>IKS-1(2)<br>VEC-1(2)(IndianConstitutionandDemocracy) | -- | 22 | **44 UG CERTIFICATE (44)** |
| | II | DSC1-2 (2+2)<br>DSC2-2 (2+2)<br>DSC3-2 (2+2) | | | GE2/OE 2(2) | SEC-2 (2) | L1-2(2)<br>VEC-2(2) | CC-1(2) | 22 | |
| 5.0/200 | III | DSC1-3 (2+1)<br>DSC1-4 (2+1) | -- | DSC2-3 (2+1)<br>DSC2-4 (2+1) | GE3/OE 3(2) | VSC1(2)(DSC1)<br>VSC2(2)(DSC2) | L2-1(2) | CC-2(2) | 22 | **44 UG DIPLOMA(88)** |
| | IV | DSC1-5 (2+1)<br>DSC1-6 (2+1) | | DSC2-5 (2+1)<br>DSC2-6 (2+1) | GE4/OE 4(2) | VSC3(2)(DSC1)<br>VSC4(2)(DSC2) | L2-2(2) | FP1/CEP1 (2) | 22 | |
| 5.5/300 | V | DSC1-7 (3+2)<br>DSC1-8 (3+2)<br>DSC1-9 (3+2) | DSE1-1 (2+1)ORDSE1-2 (2+1) | -- | -- | VSC5(2)(HandsonTrainingrelated to DSE) | IKS-2(2) (RelatedtoMajorSubject) | | 22 | **44 UG DEGREE(132)** |
| | VI | DSC1-10 (3+2)<br>DSC1-11 (3+2)<br>DSC1-12 (3+2) | DSE1-3 (2+1)ORDSE1-4 (2+1) | -- | -- | VSC 6 (2)(HandsonTrainingrelated to DSE) | -- | FP2/CEP2/OJT1(2) | 22 | |
| **OR** | | | | | | | | | | |
| 6.0/400 | VII | DSC1-13 (4+2)<br>DSC1-14 (4+2) | DSE1-5 (4+2) | ResearchMethodology(4) | -- | -- | -- | -- | 22 | **44 UG HONORS DEGREE IN MAIN SUBJECT** |
| | VIII | DSC1-15 (4+2)<br>DSC1-16 (4+2) | DSE1-6 (4+2) | -- | -- | -- | -- | OJT/In HouseProject/Internship/Apprenticeship(4) | 22 | |

**Abbreviations:**

| | | |
|---|---|---|
| **VSC:** Vocational Skill Course<br>**SEC:** Skill Enhancement course<br>**VSEC:**VocationalSkillandSkill Enhancement Course | **GE/OE:**Generic/Open Elective | **IKS:** Indian Knowledge System<br>**AEC:**AbilityEnhancementCourse<br>**VEC:** Value Education Course |
| **CC:**Co-curricularCourse | **FP:**Field Project<br>**RP:**ResearchProject | **OJT:**OnJob Training |

# Structure as per NEP-2020
# (BIOCHEMISTRY)

| SEMESTER-III | | | | | |
|---|---|---|---|---|---|
| **Sr.No.** | **Course Type** | **Course** | **Code** | **PaperTitle** | **Credit** |
| 3. | Minor | DSC2-3(T) | | Biochemistry Paper I ( Biomolecules) | 2 |
| | | DSC2-3(P) | | Practicals - Biochemistry Paper I ( Biomolecules) | 1 |
| 4. | Minor | DSC2-4(T) | | Biochemistry Paper II ( Biochemical Techniques) | 2 |
| | | DSC2-4(P) | | Practicals - Biochemistry Paper II ( Biochemical Techniques) | 1 |
| 6. | VSC | VSC-2 | | VSC 2 - Biochemistry | 2 |
| | | | | **Total** | **08** |
| **SEMESTER-IV** | | | | | |
| 3. | Minor | DSC2-5(T) | | Biochemistry Paper III (Nutrition and Metabolism) | 2 |
| | | DSC2-5(P) | | Practicals - Biochemistry Paper III (Nutrition and Metabolism) | 1 |
| 4. | Minor | DSC2-6(T) | | Biochemistry Paper IV (Molecular Biochemistry and Diseases) | 2 |
| | | DSC2-6(P) | | Practicals - Biochemistry Paper IV ( Molecular Biochemistry and Diseases) | 1 |
| 6. | VSC | VSC-4 | | VSC 4 - Biochemistry | 2 |
| | | | | **Total** | **08** |

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## Second Year BSc. Semester-III

## Vertical : DSC 2-3

## Course Name: Biochemistry Paper I - Biomolecules (Theory)

| *Teaching Scheme: | *Examination Scheme |
|---|---|
| Lectures-02 Hrs/Week,02 Credits | UA:30 Marks<br>CA:20 Marks |

**Course Objectives:**
**During this course, the student is expected to :**

- Learn about the structure and importance of biomolecules.
- Learn about the properties and role of biomolecules
- Learn about biomolecules as important biologically active components.

**Course Outcomes:**
**At the end of this course:**

- Students get information about the structure and importance of biomolecules.
- Students learn about the properties and role of biomolecules
- Students understand the role of biomolecules as important biologically active components.

## DSC2-3: Biochemistry Paper I - Biomolecules (Theory)

| Unit - I | No. of Lectures:15 | Weightage(UA): 15-23 Marks |
|---|---|---|

1. **CARBOHYDRATES: (06 L)**
   Definition, classification, structures of-
   A) Monosaccharides- aldoses & ketoses
   i) Trioses- glyceraldehyde & dihydroxyacetone
   ii) Tetroses-erythrose, erythrulose
   iii) Pentoses-ribose, ribulose, xylose, xylulose
   iv) Hexoses-glucose, mannose, galactose, fructose.
   Reactions of monosaccharides, Derivatives of monosaccharides
   B) Oligosaccharides: glycosidic bond, maltose, isomaltose, sucrose, cellobiose
   C) Polysaccharides- starch, glycogen, cellulose

2. **AMINO ACIDS**: **(04 L)**
   Classification of amino acids. Properties of amino acids: physical properties, chemical properties, zwitterions, pI, ninhydrin reaction.

3. **PROTEINS & ENZYMES: (05 L)**
   Formation of peptide bond, definition of proteins.
   Structure of proteins: Primary, Secondary (α helix & β pleated), Tertiary & Quaternary structure, Forces involved in stabilizing native structure of protein.
   Enzymes - Definition, apoenzyme, coenzyme, holoenzyme, prosthetic group, cofactor.

| Unit - II | No. of Lectures:15 | Weightage (UA):15-23 Marks |
|---|---|---|

1. **LIPIDS: (05 L)**
   Definition & classification with two examples of each class. Structure & functions of- a) Simple lipids- Fatty acids & triglycerides.
   b) Compound lipids- phospholipids, sphingolipids, glycolipids
   c) Derived lipids- steroids (cholesterol), carotenes.
   Lipid bilayer- Fluid mosaic model of plasma membrane.
2. **NUCLEIC ACIDS: (05 L)**
   Meaning, distinction between DNA & RNA. Components of nucleic acids-nitrogenous bases, sugars, phosphoric acid, nucleosides & nucleotides phosphodiester linkage, representation of primary structure of polynucleotide. Watson-Crick model of DNA. Structure and function of t-RNA, m-RNA and r-RNA.

3. **VITAMINS: (05 L)**
   Definition, water soluble vitamins. Source, requirement, biochemical role & deficiency disorders of vitamins- niacin, riboflavin, pyridoxine & their coenzyme forms.

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## Second Year BSc. Semester-III

DSC2-3 : BIOCHEMISTRY PAPER I (Biomolecules) - PRACTICALS

| *Teaching Scheme: | *Examination Scheme |
|---|---|
| Lectures-02 Hrs/Week, 01 Credit | UA:15 Marks<br>CA:10 Marks |

**Course Objectives:**
**During this course, the student is expected to :**

- To learn about the qualitative estimation techniques for prescribed carbohydrate compounds.
- To learn about the qualitative estimation technique for the prescribed lipid compounds.
- To learn about the volumetric estimation of prescribed amino acid compounds.

**Course Outcomes:**
**At the end of this course:**

- Students learn about the qualitative estimation techniques for prescribed carbohydrate compounds.
- Students learn about the qualitative estimation technique for the prescribed lipid compounds.
- Students learn about the volumetric estimation of prescribed amino acid compounds.

DSC2-3 : BIOCHEMISTRY PAPER I (Biomolecules) - PRACTICALS
(Credits - 01)

| Sr. No. | Name of Experiment |
|---|---|
| 01 | Qualitative analysis of glucose |
| 02 | Qualitative analysis of lactose |
| 03 | Qualitative analysis of starch. |
| 04 | Qualitative analysis of Lipids – oleic acid, palmitic acid, |
| 05 | Qualitative analysis of Lipids – cholesterol, glycerol. |
| 06 | Volumetric estimation: Estimation of glycine by formal titration. |
| | |

**Reference Books:**


1. Lehninger, Principles of Biochemistry. 5th Edition (2008), David Nelson & Michael
2. Biochemistry – Lubert Stryer, 5th Edition, W.H. Freeman and Company, New York.
3. Fundamentals of Biochemistry - Voet & Voet& Pratt.
4. Fundamentals of Biochemistry – J. L. Jain, S. Chand & Company Ltd, New Delhi.
5. Biochemistry – U. Satyanarayan, 3rd Edition, Books and allied (P) Ltd.
6. Biochemistry - S.C.Rastogi.
7. Textbook of Biochemistry - R. C. Dubey.


**List of reference books for practical**


1. Laboratory manual in Biochemistry – J. Jaynaraman
2. Practical Biochemistry – David Plummer
3. Hawk's physiological chemistry - Oser
4. A manual of laboratory technique (Ed) – N. Raghuramulu, K. Madhavan Nair & S. Kalyansundaram
5. Biochemistry methods – Sadasivan & Manikam.
6. Introductory Practical Biochemistry – Sawhney S. K. and Ranabir Singh
7. Viva and Practical Biochemistry – A. C. Deb

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## Second Year BSc. Semester-III

## Vertical : DSC 2-4
## Course Name: Biochemistry Paper II - Biochemical Techniques

**(Theory)**

| *Teaching Scheme: | *Examination Scheme |
|---|---|
| Practical -02 Hrs/Week, 02 Credits | UA:30 Marks<br>CA:20 Marks |

**Course Objectives:**
**During this course, the student is expected to :**

- Learn about the basic and modern biochemical techniques
- Get introduced to bioinformatics
- Learn about the principle and working of colorimeter and spectrophotometer.
- Learn the chemical basis of various assay methods for biomolecules.

**Course Outcomes:**
**Attheendofthis course:**

- Students learn about the basic and modern biochemical techniques
- Students get introduced to bioinformatics .
- Students learn about the principle and working of colorimeter and spectrophotometer.
- Learn the chemical basis of various assay methods for biomolecules.

## DSC2-4: Biochemistry Paper II - Biochemical Techniques (Theory)

| Unit - I | No. of Lectures:15 | Weightage(UA): 15-23 Marks |
|---|---|---|

1. **CHROMATOGRAPHY (06 L)**
   Definition & classification, principle, technique & applications of
   i) Thin layer chromatography
   ii) Gel permeation chromatography
   iii) High pressure liquid chromatography
   Selection of gel, preparation of plate/column packing, application of sample, mechanism of separation, important applications & advantages of the methods.

2. **ELECTROPHORESIS: (06 L)**
   Definition, electrophoretic mobility, factors affecting electrophoretic mobility. Principle, technique and applications of-
   i) Polyacrylamide gel electrophoresis: Native and SDS
   ii) Agarose gel electrophoresis
   Preparation of gel plates, application of sample, mechanism of separation, developing the plates, important applications and advantages of the methods.

3. **BIOINFORMATICS (03 L)**
   Introduction to bioinformatics, Databases, NCBI as Information sources (NCBI), Data retrieval tools (ENTREZ, and PubMed), Database similarity searching (BLAST), Applications of Bioinformatics

| Unit - II | No. of Lectures:15 | Weightage (UA):15-23 Marks |
|---|---|---|

1. **ABSORPTION SPECTROSCOPY (05 L)**
   Beer-Lambert's law, meaning of the terms- transmittance, absorbance, molar and specific absorbance.
   Electromagnetic spectrum
   Difference between photoelectric colorimeter and spectrophotometer
   Advantages of spectrophotometer over colorimeter.

2. **ESTIMATION OF BIOMOLECULES (05 L)**
   A) Carbohydrates – principles of DNSA, phenol-$H_2SO_4$
   B) Protein – principle of Lowery's assay, UV absorbance
   C) Lipid – saponification value, iodine number. Principle of Liberman Burchard method for cholesterol estimation.

3. **MODERN TECHNIQUES (05 L)**
   A) Blotting techniques- Western, Southern & Northern blotting.
   B) Polymerase chain reaction-technique & applications.
   C) Enzyme linked immunosorbent assay (ELISA)-technique & applications.

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## Second Year BSc. Semester-III

DSC2-4 : BIOCHEMISTRY PAPER II (Biochemical Techniques) - PRACTICALS

| *Teaching Scheme: | *Examination Scheme |
|---|---|
| Lectures-02 Hrs/Week, 01 Credit | UA:15 Marks<br>CA:10 Marks |

**Course Objectives:**
**During this course, the student is expected to :**

- To perform and learn about the prescribed biochemical techniques.
- To perform and learn about the biomolecular estimation technique for proteins.
- To perform and learn about the biomolecular estimation technique for oils.

**Course Outcomes:**
**At the end of this course:**

- Students can perform and learn about the prescribed biochemical techniques.
- Students get knowledge about the biomolecular estimation technique for proteins.
- Students can perform and learn about the biomolecular estimation technique for oils.

| DSC2-4 : BIOCHEMISTRY PAPER II (Biochemical Techniques) - PRACTICALS (Credits - 01) | |
|---|---|
| Sr. No. | Name of Experiment |
| 01 | Paper chromatographic separation and identification of amino acids from binary mixture. |
| 02 | Paper chromatographic separation and identification of carbohydrates from binary mixture. |
| 03 | Estimation of protein by Biuret method |
| 04 | Estimation of RNA by Bial's Orcinol method. |
| 05 | Estimation of acid value of oil. |
| 06 | Estimation of saponification value of oil. |
| | |

**Reference Books:**


1. Protein purification –Robert Scoopes
2. Instrumental Methods of Chemical Analysis – Gurudeep R. Chatwal, Sham K. Anand (Himalaya Publishing House).
3. Handbook on Analytical Instruments –R. S. Khandpur. (McGraw Hill).
4. Biophysical Chemistry - Upadhyay, Nath, Upadhyay (Himalaya Publishing House).
5. A TextBook of Biotechnology – R. C. Dubey.
6. Practical Biochemistry –Wilson & Walker.


**List of reference books for practical**


1. Laboratory manual in Biochemistry – J. Jaynaraman
2. Practical Biochemistry – David Plummer
3. Hawk's physiological chemistry - Oser
4. A manual of laboratory technique (Ed) – N. Raghuramulu, K. Madhavan Nair & S. Kalyansundaram
5. Biochemistry methods – Sadasivan & Manikam.
6. Introductory Practical Biochemistry – Sawhney S. K. and Ranabir Singh
7. Viva and Practical Biochemistry – A. C. Deb

# Punyashlok Ahilyadevi Holkar Solapur University,Solapur

## Second Year BSc. Semester-III

## Vertical : VSC-2

**CourseName: VSC 2 : Based on DSC-2 BIOCHEMISTRY (Credits - 02)**

| *Teaching Scheme: | *Examination Scheme |
|---|---|
| Practical -04Hrs/Week,02 Credits | UA:30 Marks<br>CA:20 Marks |

**Course Objectives:**
**During This Course, the student is expected to:**

- Use or demonstrate the prescribed basic techniques of biochemistry
- Perform the prescribed skill based laboratory experiments of biochemistry.
- Understand the concepts, terminologies, principles and technical aspects of the prescribed skill based experiments

**Course Outcomes:**
**Attheendofthis course:**

- Students can Use or demonstrate the prescribed basic techniques of biochemistry
- Students are able to perform the prescribed skill based laboratory experiments of biochemistry.
- Students can understand the concepts, terminologies, principles and technical aspects of the prescribed skill based experiments

| VSC 2 : Based on DSC-2 BIOCHEMISTRY (Credits - 02) | |
|---|---|
| 1 | Qualitative analysis of xylose |
| 2 | Qualitative analysis of fructose |
| 3 | Qualitative analysis of maltose |
| 4 | Qualitative analysis of sucrose |
| 5 | Isolation and characterization of starch from potatoes |
| 6 | Isolation and characterization of casein from milk |
| 7 | Study of uptake of Na+ ions by ion exchange resin |
| 8 | Thin layer chromatographic separation and identification of amino acids/carbohydrates from binary mixture. |
| 9 | Isolation and characterization of albumin and globulin from egg yolk. |
| 10 | Separation of Plant pigments by paper chromatography. |

**List of reference books for practical**


1. Laboratory manual in Biochemistry – J. Jaynaraman
2. Practical Biochemistry – David Plummer
3. Hawk's physiological chemistry - Oser
4. A manual of laboratory technique (Ed) – N. Raghuramulu, K. Madhavan Nair & S. Kalyansundaram
5. Biochemistry methods – Sadasivan & Manikam.
6. Introductory Practical Biochemistry – Sawhney S. K. and Ranabir Singh
7. Viva and Practical Biochemistry – A. C. Deb

# SEMESTER IV

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## Second Year BSc. Semester-IV

## Vertical : DSC 2-5
## Course Name: Biochemistry Paper III - Nutrition and Metabolism

**(Theory)**

| *Teaching Scheme: | *Examination Scheme |
|---|---|
| Lectures-02 Hrs/Week, 02 Credits | UA:30 Marks<br>CA:20 Marks |

**Course Objectives:**
**During this course, the student is expected to :**

- Learn about the importance of nutrition, electrolyte and acid base balance.
- Learn about important biochemical pathways of metabolism
- Learn about mechanisms and aspects related to oxidative phosphorylation.

**Course Outcomes:**
**Attheendofthis course:**

- Students learn about the importance of nutrition, electrolyte and acid base balance.
- Students learn about important biochemical pathways of metabolism
- Students learn about mechanisms and aspects related to oxidative phosphorylation.

## DSC2-5: Biochemistry Paper III- Nutrition and Metabolism (Theory)

| Unit - I | No. of Lectures:15 | Weightage(UA): 15-23 Marks |
|---|---|---|

1. **Nutrition and its components (05 L)**
   A) Nutrition, balanced diet, calorific values of food and its measurement (bomb calorimeter) respiratory quotient, basal metabolic rate (BMR), Factors affecting BMR.
   B) Electrolyte & acid base balance:
   Functions of water, Mechanism of electrolyte balance, acid base balance in body
2. **Metabolism of Carbohydrates (06 L)**
   Carbohydrate metabolism: Glycolysis , its energetics & Regulation, Fate of pyruvate, TCA cycle, energetics & regulation
3. **Metabolism of Lipids (04 L)**
   Lipid metabolism: Biosynthesis of palmitic acid and its energetic, β -oxidation of palmitic acid and its energetics.

| Unit - II | No. of Lectures:15 | Weightage (UA):15-23Marks |
|---|---|---|

1. **Biological oxidation: (06 L)**
   ATP as a high energy compound.
   Mitochondrial respiration-components of respiratory chain, respiratory chain, Oxidative phophorylation, mechanism of oxidative phosphorylation (Chemiosmotic coupling hypothesis), inhibitors of electron transport chain.
2. **Metabolism of Nucleic acids (05 L)**
   Sources of the atoms in the purine and pyrimidine molecules
   Outline of degradation of purines and pyrimidines
3. **Metabolism of Amino acids (04 L)**
   General reactions of amino acid metabolism viz. transamination, deamination, decarboxylation. Urea cycle

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## Second Year BSc. Semester-IV

DSC2-5 : BIOCHEMISTRY PAPER III (Nutrition and Metabolism) - PRACTICALS

| *Teaching Scheme: | *Examination Scheme |
|---|---|
| Lectures-02 Hrs/Week, 01 Credit | UA:15 Marks<br>CA:10 Marks |

**Course Objectives:**
**During this course, the student is expected to :**

- To perform and learn about the prescribed estimation techniques.
- To perform the analysis of abnormal constituents in urine.
- To interpret the presence of abnormal constituents in urine.

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**Course Outcomes:**
**At the end of this course:**

- Students can perform and learn about the prescribed estimation techniques.
- Students can perform the analysis of abnormal constituents in urine.
- Students can interpret the presence of abnormal constituents in urine.

DSC2-5 : BIOCHEMISTRY PAPER III (Nutrition and Metabolism) - PRACTICALS
(Credits - 01)

| Sr. No. | Name of Experiment |
|---|---|
| 01 | Estimation of inorganic phosphate in blood by Fiske-Subbarao method. |
| 02 | Abnormal constituents in urine (blood, reducing sugar). |
| 03 | Abnormal constituents in urine (proteins, bilirubin, ketone bodies). |
| 04 | Estimation of lactose in milk by Fehling's method. |
| 05 | Estimation of iodine number of oil. |
| 06 | Estimation of creatinine in urine. |
| | |

**Reference Books:**


1. Lehninger's Principles of Biochemistry –Nelson & Cox, 5th Edition, W.H. Freeman and Company, New York.
2. Fundamentals of Biochemistry – Voet & Voet, 3rd Edition, W.H. Freeman and Company, New York.
3. Biochemistry – Lubert Stryer, 5th Edition, W.H. Freeman and Company, New York.
4. Nutritional Biochemistry - Dr.S.Ramakrishna & Dr. S. Vyankatrao.
5. Fundamentals of Biochemistry – J. L. Jain, S. Chand & Company Ltd, New Delhi.
6. Biochemistry – U. Satyanarayan, 3rd Edition, Books and allied (P) Ltd.


**List of reference books for practical**


1. Laboratory manual in Biochemistry – J. Jaynaraman
2. Practical Biochemistry – David Plummer
3. Hawk's physiological chemistry - Oser
4. A manual of laboratory technique (Ed) – N. Raghuramulu, K. Madhavan Nair & S. Kalyansundaram
5. Biochemistry methods – Sadasivan & Manikam.
6. Introductory Practical Biochemistry – Sawhney S. K. and Ranabir Singh
7. Viva and Practical Biochemistry – A. C. Deb

| | |
|---|---|
| पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ<br>।। विद्यया संपन्नता ।।<br>NAAC Accredited-2022<br>'B++' Grade (CGPA-2.96) | **Punyashlok Ahilyadevi Holkar Solapur University, Solapur**<br>**Second Year BSc. Semester-IV**<br>**Vertical : DSC 2-6**<br>**Course Name: Biochemistry Paper IV - Molecular Biochemistry and Diseases (Theory)** |
| ***Teaching Scheme:**<br>**Practical -02 Hrs/Week, 02 Credits** | ***Examination Scheme**<br>**UA:30 Marks**<br>**CA:20 Marks** |

**Course Objectives:**
**During this course, the student is expected to :**

- Learn mechanism of enzyme catalysis and various units of enzyme activity.
- Learn about basic aspects of prescribed molecular biochemistry fields.
- Understand the biochemical basis of AIDS and diabetes mellitus.

**Course Outcomes:**
**Attheendofthis course:**

- Students learn the mechanism of enzyme catalysis and various units of enzyme activity.
- Students learn about basic aspects of prescribed molecular biochemistry fields.
- Students understand the biochemical basis of AIDS and diabetes mellitus.

## DSC2-6: Paper IV - Molecular Biochemistry and Diseases (Theory)

| Unit - I | No. of Lectures:15 | Weightage(UA): 15-23 Marks |
|---|---|---|

1. **ENZYMOLOGY (06 L)**
   A) Enzyme as a catalyst: concept of activation energy, Lock & key model, Induced fit hypothesis. Active site of enzyme and its features.
   B) Enzyme activity: Definition & Unit of enzyme activity, specific activity and turnover number, Factors affecting enzyme activity-pH, temperature and substrate concentration.
   C) Enzyme kinetics: Statement of Michaelis-Menten equation for single substrate. Significance of Km and Vmax. Enzyme inhibition-irreversible, competitive and non competitive inhibition.

2. **MOLECULAR BIOLOGY (05 L)**
   Replication of DNA (semi conservative), transcription in prokaryotes. Translation in prokaryotes. Regulation of gene expression: constitutive & inducible genes. Operon concept, Lac operon in E. coli.

3. **GENETIC ENGINEERING: (04 L)**
   Genetic engineering: Restriction endonucleases, S1 nucleases, reverse transcriptase, cloning vectors-pBR322. Gene cloning technique illustrated with insulin gene cloning. Applications of generic engineering.

| Unit - II | No. of Lectures:15 | Weightage (UA):15-23Marks |
|---|---|---|

1. **BASICS OF IMMUNOLOGY: (05)**
   Innate & acquired immunity. Types and properties of antibodies, Structure of IgG. Introduction to the cells involved in immune response: B cells and T cells

2. **BIOCHEMISTRY OF AIDS: (05 L)**
   AIDS: Structure of HIV, transmission of HIV, Lysis of CD4 cells. natural course of AIDS- acute, chronic, crisis phases. Anti AIDS drugs-AZT, didanosine (structure & mechanism of action).

3. **BIOCHEMISTRY OF DIABETES MELLITUS (05 L)**
   Structure of insulin, metabolic effects of insulin, mechanism of action of insulin.
   Types of diabetes mellitus, Symptoms, hyperglycemia, hypoglycemia, glycosuria and kidney threshold, Hypoglycemic drugs: metformin and sulfonylurea.

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## Second Year BSc. Semester-IV

DSC2-6 : BIOCHEMISTRY PAPER IV (Molecular Biochemistry and Diseases) - PRACTICALS

| *Teaching Scheme: | *Examination Scheme |
|---|---|
| Lectures-02 Hrs/Week, 01 Credit | UA:15 Marks<br>CA:10 Marks |

**Course Objectives:**
**During this course, the student is expected to :**

- To perform and learn about the prescribed estimation techniques.
- To perform the qualitative and quantitative estimation of enzyme activity.
- To learn about the effect of physicochemical parameters on enzyme activity.

.

**Course Outcomes:**
**At the end of this course:**

- Students can perform and get knowledge about the prescribed estimation techniques.
- Students can perform the qualitative and quantitative estimation of enzyme activity.
- Students get knowledge about the effect of physicochemical parameters on enzyme activity.

DSC2-6 : BIOCHEMISTRY PAPER IV (Molecular Biochemistry and Diseases) - PRACTICALS

| Sr. No. | Name of Experiment |
|---|---|
| 01 | Quantitative Estimation of amylase activity. |
| 02 | Effect temperature/pH on amylase enzyme |
| 03 | Effect substrate concentration on amylase enzyme |
| 04 | Detection of invertase enzyme by qualitative tests |
| 05 | Estimation of DNA by Diphenylamine method. |
| 06 | Estimation of blood urea by DAM method. |
| | |

**Reference Books:**


1. Cell and Molecular biology - P. K. Gupta.
2. Molecular Biology; R. Weaver; 2nd Edition, McGraw Hill.
3. Molecular Cell Biology; Lodish; 6th Edition; W. H. Freeman & Company.
4. Gene VII; Benjamin Lewin; Pearson Education.
5. Elements of Biotechnology - P. K. Gupta.
6. Genetic engineering - Sandhya Mitra.
7. Biotechnology - B. D. Singh.
8. Immunology .-Kuby.
9. Essential Immunology- Roitt
10. Bioinformatics : Principle and applications - Harshawardhan P. Bal.
11. Introduction to Bioinformatics - T. K. Attwood & D. J. Parry- Smith


**List of reference books for practical**


1. Laboratory manual in Biochemistry – J. Jaynaraman
2. Practical Biochemistry – David Plummer
3. Hawk's physiological chemistry - Oser
4. A manual of laboratory technique (Ed) – N. Raghuramulu, K. Madhavan Nair & S. Kalyansundaram
5. Biochemistry methods – Sadasivan & Manikam.
6. Introductory Practical Biochemistry – Sawhney S. K. and Ranabir Singh
7. Viva and Practical Biochemistry – A. C. Deb.

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| पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ<br>॥ विद्यया संपन्नता ॥<br>NAAC Accredited-2022<br>"B++" Grade (CGPA-2.96) | **Punyashlok Ahilyadevi HolkarSolapur University,Solapur**<br>**Second Year BSc. Semester-IV**<br>**Vertical : VSC 4**<br>**CourseName: VSC 4 : Based on DSC-2 BIOCHEMISTRY (Credits - 02)** |
| ***Teaching Scheme:**<br>**Practical -04 Hrs/Week, 02 Credits** | ***Examination Scheme**<br>**UA:30 Marks**<br>**CA:20 Marks** |

**Course Objectives:**
**During This Course, the student is expected to:**

- Use or demonstrate the prescribed basic techniques of biochemistry
- Perform the prescribed skill based laboratory experiments of biochemistry.
- Understand the concepts, terminologies, principles and technical aspects of the prescribed skill based experiments

**Course Outcomes:**
**Attheendofthis course:**

- Students can Use or demonstrate the prescribed basic techniques of biochemistry
- Students are able to perform the prescribed skill based laboratory experiments of biochemistry.
- Students can understand the concepts, terminologies, principles and technical aspects of the prescribed skill based experiments

| VSC 4 : Based on DSC-2 BIOCHEMISTRY (Credits - 02) | |
|---|---|
| 1 | Verification of Beer-Lambert's law using copper sulphate |
| 2 | Estimation of Vitamin C using Dichlorophenol Indophenol |
| 3 | Study and Detection of alkaline phosphatase enzyme by qualitative tests |
| 4 | Immobilization of baker’s yeast cells by gel entrapment for invertase activity. |
| 5 | Antigen antibody interaction by Ouchterlony immunodiffusion procedure. |
| 6 | Soxhlet extraction of lipids from ground nuts/ egg yolk. |
| 7 | Colorimetric estimation of reducing sugar by DNSA method |
| 8 | Estimation of glucose in urine by Benedict's method. |
| 9 | Estimation of glucose in blood by Folin-Wu method. |
| 10 | Estimation of blood cholesterol by Liebermann-Burchard method. |

**List of reference books for practical**


8. Laboratory manual in Biochemistry – J. Jaynaraman
9. Practical Biochemistry – David Plummer
10. Hawk’s physiological chemistry - Oser
11. A manual of laboratory technique (Ed) – N. Raghuramulu, K. Madhavan Nair & S. Kalyansundaram
12. Biochemistry methods – Sadasivan & Manikam.
13. Introductory Practical Biochemistry – Sawhney S. K. and Ranabir Singh
14. Viva and Practical Biochemistry – A. C. Deb

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur.**
**Faculty of Science & Technology.**
Nature of Question Paper for B.Sc./B.C.A.(Part-II)

**w.e.f. A.Y. 2025-26**

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# External Evaluation (UA)

Time: Total Marks:30

**Instructions**

1) All Questions are compulsory.
2) Figure to the right indicates full marks.

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| | | |
|---|---|---|
| **Q.1** | **Choose correct alternative (MCQ)** | **6 Marks** |
| 1) | Question _____<br>a) b) c) d) | |
| 2) | | |
| 3) | | |
| 4) | | |
| 5) | | |
| 6) | | |
| **Q.2.** | **Answer the following (Any three)** | **6 Marks** |
| A) | | |
| B) | | |
| C) | | |
| D) | | |
| E) | | |
| **Q.3.** | **Answer the following(Any two)** | **6 Marks** |
| A) | | |
| B) | | |
| C) | | |
| **Q.4.** | **Answer the following (Any two)** | **6 Marks** |
| A) | | |
| B) | | |
| C) | | |
| **Q.5.** | **Answer the following (Any one)** | **6 Marks** |
| A) | | |
| B) | | |

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**w.e.f. A.Y. 2025-26**

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# Internal Evaluation (CA)

Time: Total Marks:20

**Internal Evaluation System for 20 Marks**

Choose any two of the following:

- ➢ Home Assignment/ Unit Test/ Tutorial/ Seminar

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