**KONGUNADU ARTS AND SCIENCE COLLEGE**

**(AUTONOMOUS)**

**COIMBATORE – 641029**

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**SCHEME AND SYLLABUS FOR**

**DEPARTMENT OF BIOCHEMISTRY (PG)**

**CURRICULUM AND SCHEME OF EXAMINATIONS (CBCS)**

***(2022 - 2023 and onwards)***

**PBC 1**

**KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)**

**COIMBATORE – 641029, TAMIL NADU, INDIA.**

**Course Name: M.Sc. Biochemistry**

**Curriculum and Scheme of Examination under CBCS**

**(Applicable for the Students Admitted during the Academic Year 2022-2023)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Semester** | **Subject code** | **Title of the paper** | **Instruction hours/cycle** | **Exam Marks** | | | **Duration of Exam (Hrs)** | **Credits** |
| **CIA** | **ESE** | **Total** |
| I | 22PBC101 | C.P.1 Biomolecules | 5 | 50 | 50 | 100 | 3 | 4 |
| 22PBC102 | C.P.2 Bioanalytical Techniques | 5 | 50 | 50 | 100 | 3 | 4 |
| 22PBC103 | C.P.3 Enzymes and Enzyme Technology | 5 | 50 | 50 | 100 | 3 | 4 |
| 22PBC104 | C.P.4 Cellular Biochemistry | 5 | 50 | 50 | 100 | 3 | 4 |
| 22PBC1CL | C.Pr.1 Lab in Biomolecules, Bioinstrumentation, Enzymology and Cell Biology | 5 | 50 | 50 | 100 | 6 | 4 |
|  | 22PBC1E1 | E.P.1 Major Elective- I | 5 | 50 | 50 | 100 | 3 | 5 |
| **Total Hours** | | | **30** | **300** | **300** | **600** |  | **25** |
| II | 22PBC205 | C.P.5 Plant Biochemistry and Biotechnology | 5 | 50 | 50 | 100 | 3 | 4 |
| 22PBC206 | C.P.6 Metabolism and Metabolic Regulation | 5 | 50 | 50 | 100 | 3 | 4 |
| 22PBC207 | C.P.7 Genetics and Molecular Biology | 5 | 50 | 50 | 100 | 3 | 4 |
| 22PBC208 | C.P.8 Drug Biochemistry | 5 | 50 | 50 | 100 | 3 | 4 |
| 22PBC2CM | C.Pr.2 Lab in Plant Biochemistry,Genetics and Molecular Biology | 5 | 50 | 50 | 100 | 5 | 4 |
| 22PBC2E2 | E.P.2 Major Elective- II | 5 | 50 | 50 | 100 | 3 | 5 |
| **Total Hours** | | | **30** | **300** | **300** | **600** |  | **25** |
| III | 22PBC309 | C.P.9 Immunology | 6 | 50 | 50 | 100 | 3 | 5 |
| 22PBC310 | C.P.10 Genetic Engineering | 7 | 50 | 50 | 100 | 3 | 4 |
| 22PBC311 | C.P.11 Clinical Biochemistry | 7 | 50 | 50 | 100 | 3 | 4 |
| 22PBC3CN | C.Pr.3 Lab in Immunology, Genetic Engineering and Clinical Biochemistry | 5 | 50 | 50 | 100 | 5 | 4 |
| 22PBC3N1 | E.P.1 Non-major Elective –I (On-line) | 3 | 50 | 50 | 100 | 3 | 4 |
| 22PBC3ST | Summer training\* | - | - | - | - | - | - |
|  | 22PBC3X1 | EDC-Nutritional Biochemistry | 2 | 50 | 50 | 100 | 3 | 2 |
| **Total Hours** | | | **30** | **300** | **300** | **600** |  | **23** |
| IV | 22PBC412 | C.P.12 Hormonal Biochemistry | 5 | 50 | 50 | 100 | 3 | 4 |
| 22PBC413 | C.P.13 Biostatistics and Research Methodology | 5 | 50 | 50 | 100 | 3 | 4 |
| 22PBC4N2 | E.P.2 Non-major Elective –II (On-line) - SM | 5 | 50 | 50 | 100 | 3 | 4 |
| 22PBC4Z1 | Project and Viva-voce | 15 | 50 | 50 | 100 | - | 3 |
|  |  | **SWAYAM – MOOC** | **-** | **-** | **-** | **-** | **-** | **2** |
| **Total Hours** | | | **30** | **200** | **200** | **400** |  | **17** |
| **GRAND TOTAL** | | | **120** | **1100** | **1100** | **2200** |  | **90** |
| \*Project record 120 marks + Viva-voce examination 40 marks | | | | | | | | |

**PBC 2**

**Note:**

CBCS – Choice Based Credit system

CIA – Continuous Internal Assessment

ESE – End of Semester Examinations

**Major Elective Papers**

**(2 papers are to be chosen from the following 4 papers)**

**1.**Nanobiotechnology

**2.** Microbiology

**3.** Bioinformatics

**4.** Bioethics, Biosafety and IPR

**Non Major Elective Papers**

**(2 papers are to be chosen from the following 4 papers)**

**1.** Information security **#**

**2.** Competitive Sciences

**3.** Bioprocess Technology

**4.** Cancer Biology

**#** to be offered by the respective departments.

**Sub. Code & Title of the Extra Departmental Course (EDC) :**

**22PBC3X1 – EDC Paper 1 -** Nutritional Biochemistry

**Tally Table:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Subject** | **No. of Subjects** | **Total**  **Marks** | **Credits** |
| Core – Theory / Practical / Project | 17 | 1700 | 68 |
| SWAYAM – MOOC | - | - | 2 |
| Major Elective Papers | 2 | 200 | 10 |
| EDC Paper | 1 | 100 | 2 |
| Non Major Elective Paper | 2 | 200 | 8 |
| **Grand Total** | **22** | **2200** | **90** |

* 50 % CIA is applicable to all subjects except EDC, JOC, COP and SWAYAM courses which are considered as extra credit courses.
* The students should complete a **SWAYAM-MOOC** before the completion of the 3rd semester and the course completed certificate should be submitted through the HOD to the Controller of Examinations. Two credits will be given to the candidates who have successfully completed. In case the students have completed more than one online course, the appropriate 2 extra credits shall be awarded to such candidates upon the submission of certificate through the HOD to the Controller of Examinations.
* A **Field Trip** preferably relevant to the course should be undertaken every year.

**Components of Continuous Internal Assessment (50 Marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Components** | | **Marks** | **Total** |
| **Theory** | | | |
| CIA I | 75 | (75+75 )  converted to 30 | 50 |
| CIA II | 75 |
| Problem based Assignment\*\* | | 10 |
| Attendance | | 5 |
| |  |  | | --- | --- | | Others\* |  | | | 5 |
| **Practical** | | | |
| CIA Practical | | 50 (Converted to 30) | 50 |
| Observation Notebook | | 15 |
| Attendance | | 5 |
| **Project** | | | |
| Review | | 45 | 50 |
| Regularity | | 05 |

**Components of Continuous Internal Assessment (30 Marks & 25 Marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Components** | | **Marks** | **Total** |
| **Theory** | | | |
| CIA I | 45 | (45+45)  converted to 15 | 30 |
| CIA II | 45 |
| Problem based Assignment**\*\*** | | 5 |
| Attendance | | 5 |
| Others**\*** | | 5 |
| **Practical** | | | |
| CIA Practical | | (25)  converted to 10 | 25 |
| Observation Notebook | | 10 |
| Attendance | | 5 |

\* Class Participation, Case Studies Presentation, Field Work, Field Survey, Group Discussion, Term Paper, Workshop/Conference Participation. Presentation of Papers in Conferences, Quiz, Report/Content writing. Etc.

**\*\*** Two Assignments to be given. (Each 5 marks).

**BLOOM’S TAXONOMY BASED ASSESSMENT PATTERN**

**K1**-Remembering;**K2**-Understanding;**K3**-Applying;**K4**-Analyzing;**K5**-Evaluating

**Theory Examination**

**i) CIA I & II and ESE: 75 Marks**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Knowledge**  **Level** | **Section** | **Marks** | **Description** | **Total** |
| K1 – K2  Q1 to 20 | A (Answer all) | 20 x 1 = 20 | MCQ-10/  Fill ups-5/  One word-5 | 75\*\* |
| K2 – K5  Q21 to 28 | B (5 out of 8) | 5 x 5 = 25 | Short Answers |
| K2 – K5  Q29 to 33 | C (3 out of 5) | 3 x 10 = 30 | Descriptive / Detailed |

**\*\*For ESE 75 marks converted to 50 marks.**

1. CIA I & II and ESE: 45 Marks

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Knowledge  Level | Section | Marks | Description | Total |
| K1 – K2  Q1 to 10 | A (Answer all) | 10 x 0.5 = 5 | MCQ | 45 |
| K2 – K5  Q11 to 15 | B (either or type) | 5 x 3 = 15 | Short Answers |
| K2 – K5  Q16 to 20 | C (either or type) | 5 x 5 = 25 | Descriptive / Detailed |

**ESE Practical Examination:**

**Option 1 :**

|  |  |  |  |
| --- | --- | --- | --- |
| Knowledge  Level | Section | Marks | Total |
| K3 | Experiments  Record Work | 45 | 50 |
| K4 | 05 |
| K5 |

|  |  |  |  |
| --- | --- | --- | --- |
| Knowledge  Level | Section | Marks | Total |
| K3 | Experiments  Record Work | 20 | 25 |
| K4 | 05 |
| K5 |

**ESE Project Viva Voce:**

**Option 1:**

|  |  |  |  |
| --- | --- | --- | --- |
| Knowledge  Level | Section | Marks | Total |
| K3 | Project Report  Viva voce | 35 | 50 |
| K4 | 15 |
| K5 |

**ESE Practical Examination:**

**Option 2 :**

|  |  |  |  |
| --- | --- | --- | --- |
| Knowledge  Level | Section | Marks | Total |
| K3 | Experiments  Record Work | 40 | 50 |
| K4 | 10 |
| K5 |

|  |  |  |  |
| --- | --- | --- | --- |
| Knowledge  Level | Section | Marks | Total |
| K3 | Experiments  Record Work | 20 | 25 |
| K4 | 05 |
| K5 |

**ESE Project Viva Voce:**

**Option 2:**

|  |  |  |  |
| --- | --- | --- | --- |
| Knowledge  Level | Section | Marks | Total |
| K3 | Project Report  Viva voce | 30 | 50 |
| K4 | 20 |
| K5 |

**ADVANCED LEARNERS COURSE UNDER SELF STUDY SCHEME (Optional)**

|  |  |
| --- | --- |
| 22PBCOD1 | Forensic Sciences |
| 22PBCOD2 | Nutraceuticals and Functional foods |
| 22PBCOD3 | Stem Cell Biology |

**JOB ORIENTED COURSE**

|  |  |
| --- | --- |
| 22PBCOJ1 | Bio entrepreneurship |
| 22PBCOJ2 | Food safety and Qualitycontrol |
| 22PBCOJ3 | Clinical and therapeutic nutrition |

**CERTIFICATE COURSE IN MEDICAL LABORATORY TECHNOLOGY**

|  |  |
| --- | --- |
| 22PBC0F1 | Paper I: Biochemistry |
| 22PBC0F2 | Paper II: Clinical Pathology andMicrobiology-I |
| 22PBC0F3 | Practical I |
| 22PBC0F4 | On the Job training |

**DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY**

|  |  |
| --- | --- |
| 22PBC0F5 | Paper I: Anatomy, Physiology and Laboratorysafety |
| 22PBC0F6 | Paper II: Clinical Pathology and Medical Microbiology II |
| 22PBC0F7 | Practical II |
| 22PBC0F8 | On the Job training |

**Sub.Code:22PBC101**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Programme Code:** 07 | | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper:** Core Paper 1 – Biomolecules | | | | |
| Batch  2022-2023 | Hours / Week  5 | | Total Hours  75 | Credits  4 | |

**Course Objectives**

1. To learn about the chemistry and structures ofbiomolecules
2. To know the properties of different biomolecules
3. To know the physiological functions ofbiomolecules

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Corelate the classification and functions of biomolecules inenergy  production. |
| CO2 | Apply the link between the structure and function of aminoacids and  proteins in biological system. |
| CO3 | Able to know about execute of biomolecules in human health |
| CO4 | analyse and study the chemical and biochemical properties of biomolecule. They will be able to enter into drug design and  pharmacogenetics field |
| CO5 | Apply the structural studies to biological processes like replication, transcription and translation. |

**UnitI (15Hours)**

**Carbohydrates:** Structure, occurrence, properties and biological functions of Monosaccharides, Disaccharides, O-linked and N-linked oligosaccharides, Polysaccharides: Homoglycans: Structure, occurrence, properties and biological functions of starch, cellulose, glycogen and chitin. Heteroglycans: Structure, occurrence, properties and biological functions of glycosaminoglycans. Structure and biological role of peptidoglycans, lipopolysaccharides and proteoglycans.

## UnitII (15Hours)

**Amino acids:** Classification, structure and physicaland chemical properties of amino acids (Ionization), Amphoteric molecule, Zwitterion, pKvalues; Isoelectric point, Functions of aminoacids,.Physical properties of aminoacids:acid-base and UV-light absorption. Non-protein amino acids.Aminoacidderivatives.

## UnitIII (15Hours)

**Proteins:** Structural organization of protein: Primary structure. Determination of protein structure: Ramachandranplot. Polypeptide synthesis.Secondary structures – α-helix, β-sheet and β-turns, Pauling and Corey model for fibrous proteins, Reverse turns and super secondary structures, Collagen triple helix.Tertiary structure – αand β domains. Conformational properties of silk fibroin. Quarternary structure of proteins: Structure and functions of myoglobin and haemoglobin.

## UnitIV (15Hours)

**Lipids: \*Classification**, structure, functions and properties of lipids. Fatty acids- saturated and unsaturated. Structure and functions: Phospholipids and glycolipids. Eicosanoids-structure and biological role of prostaglandins, thrombaxanes and leucotrienes. Steroids: structure and functions of cholesterol. Lipoproteins- classification and composition.Amphipathic lipids-emulsions and liposomes.

## UnitV (15Hours)

**Nucleic acids:** Structure of nucleic acids, DNA double helical structure– Watson and Crick model. A, B and Z DNA, Palindromes, Inverse repeats, cruciform and hairpins, Triple and quadruple structures. DNA sequencing procedures – House Stream Geometry method and Sanger’s Dideoxy chain termination method. Properties of DNA: UV absorption spectra, buoyant density, denaturationand renaturation, cot curves, DNA hybridization, DNA supercoiling and linking number. Chemical synthesis of DNA.Structure and biological functions of major forms of RNA: mRNA, rRNAandtRNA.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text Books**

1. Nelson,DavidL.andCox.(2017).LehningerPrinciplesofBiochemistry.7th

edition, W.H.Freemanand Co.,NY

1. U.Sathayanarayana. (2017). Biochemistry. 5thedition, Books and allied (P) Ltd., India

## Reference Books.

1. Voet, D, Voet, J.G. and Pratt, C.W. (2013). Principles of Biochemistry. 4th edition, John Wiley &Sons, New Delhi -10002.
2. GarretteR.H and Grisham, C. M. (2013). Principles of Biochemistry. 5thedition, Saunders collegepublishers.
3. Eric E.Conn, P.K. Stumpf, G.Brueinsand Ray H.Doi, John. (2005). Outlines of Biochemistry. 5thedition. Wiley and sons,Singapore.
4. Moran, Horton, Scrimgeour, Perry &Rawn (2013). Principles of Biochemistry, 5th edition Pearson New International Edition, UK.

## MAPPING

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | S | S | M | H |
| **CO2** | M | H | H | S | M |
| **CO3** | S | M | S | H | H |
| **CO4** | S | H | S | M | H |
| **CO5** | S | H | M | S | H |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub.Code :: 22PBC102

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Programme Code:** 07 | | **Programme Title:** M.Sc Biochemistry | | | |
| **Title of the paper** Core Paper 2 – Bioanalytical Techniques | | | | | |
| Batch  2022-2023 | Hours / Week  5 | | Total Hours  75 | Credits  4 |

**Course Objectives**

1. To learn the principle and instrumentation of various separationtechniques
2. To know the applications of various separation techniques in biologicalfields
3. Tolearntheconceptofradioactivityandexploreitsroleinvariousfields.

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | recall the principle and applications of bioinstrumentation |
| CO2 | The students will discern the principle, Instrumentation of different types of  bioanalytical techniques |
| CO3 | The students also discern about applying the instrumentation techniques of Centrifugation, Electrophoresis andChromatography in various research |
| CO4 | The students will determine the knowledge and practice concerning modern analytical instrumentation and students can able to enter into large scale  industries. |
| CO5 | Appreciate the principle,insrumentaion and difference between various spectroscopicmethods. |

**UnitI (15Hours)**

**Chromatography:** Principle, technique and applications of TLC, HPTLC, column, ion-exchange, affinity, gel-filtration chromatography. Principle, instrumentation and applications of GLC and HPLC.Principle and applications of GC-MS, HPLC-MS, LC-MS/MS, Reverse phase chromatography andFPTLC.

## UnitII (15Hours)

**Electrophoresis:** Principle, technique and applications of paper, Agarosegel, SDS- PAGE, 2D-PAGE electrophoresis, Immunoelectrophoresis. Isoelectricfocusing

techniqueand application. Principle, instrumentation, technique and applications of capillary electrophoresis and pulse-field gelelectrophoresis.

## UnitIII (15Hours)

**Spectroscopy:** Principle, technique, instrumentation and applications of UV-Visible, FTIR spectroscopy, spectro-fluorimetry, flame photometry, molecular luminescence, atomic absorption spectrophotometry, Electron spinresonance (ESR), NuclearMagnetic Resonance (NMR),Mass Spectrometry - Matrix assisted LASER desorption/ionization time of flight-mass spectroscopy (MALDI-TOF MS), LC MS. X- ray crystallography,XRD.

## UnitIV (15Hours)

**Centrifugation:** Types of rotors- swing bucket, fixed angle, vertical. Types of centrifuge: Micro centrifuge, High speed and Ultracentrifuges Principle, technique, instrumentation and applications of ultracentrifuge: preparative and analytical centrifugation, differential centrifugation, density gradient centrifugation, Rate zonal and isopycnic centrifugation. Methods of disrupting cellsandtissues–homogenization andFractionation.

## UnitV (15Hours)

**Microscopy and Radioactivity:** Principles, instrumentation andapplications of microscopy: Bright field, phase-contrast, fluorescence and confocal microscopy. Electron microscope – SEM and TEM.Radioactivity: nature, types of Radioactivedecay, Units of radioactivity (Curie, Rutherford andBecquerrel), detection and measurement of radioactivity by GM and scintillation counter. Autoradiography anditsapplications.Therapeuticapplicationofradioisotopesanditssafetymeasures.

## \*Radio Immuno Assay.

**\* denotes Self study Teaching Methods**

Power point presentation/ Seminar/ Quiz/ Discussion/ Assignment/ Google Classroom/ GoogleClassroom

**Text Books**

1. Upadhyay, Upadhyayand Nath. (2012). Biophysical Chemistry – Principles and Techniques,4thRevisededition,HimalayaPublishingHousePvt.Ltd.
2. KeithWilson,John Walker. (2000). A biologist’s guide to Principles and Techniques of Practical Biochemistry, 5thedition, Cambridge University Press, NewYork.

## Reference Books

1. D.J. Homieand H. Peck. (2003). Analytical Biochemistry. 1stedition, RastogicCBSPublisher.
2. Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch. (2008). Fundamentalsof AnalyticalChemistry.4thedition,BarkhaNathPrinters,India.
3. Keith Wilson and John Walker. (2011). Principles and Techniques of Biochemistry andMolecularBiology.7thedition,CambridgeUniversityPress,NewYork.
4. Chatwal, Gand Anand, S. (2005). Instrumental methodsofchemical analysis. Himalaya PublishingHouse.

## MAPPING

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | M | S | H | M |
| **CO2** | H | S | M | M | S |
| **CO3** | H | M | S | H | M |
| **CO4** | M | S | S | H | S |
| **CO5** | M | S | H | S | S |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub.Code :: 22PBC103

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Core Paper 3 – Enzymes and Enzyme Technology | | | |
| Batch  2022-2023 | Hours / Week  5 | Total Hours  75 | Credits  4 |

**Course Objectives**

1. To know the classification and properties ofenzymes
2. To learn about the mechanism of enzymeaction
3. To know the applications of enzymes in clinical and diagnosticfields

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Remember the fundamentals of enzyme properties |
| CO2 | Conceive the different procedures involved in enzyme technology |
| CO3 | Able to assay the enzyme and their kinetics and also apply to this in the  industry and other technologicalfield |
| CO4 | Estimate enzyme technology for thecommercialization purpose of  biotechnological products |
| CO5 | Apply purification techniques of enzymes and immobilization techniques. |

**UnitI (15Hours)**

**Enzymes:** Introduction, nomenclature and **\*classification of enzymes**, Factors affecting enzyme activity. Unit of enzyme: Kataland IU. Measurement of enzyme activity: Active site- Definition, investigations of 3D structure of active site. Mechanism of enzyme action-Lock and key, induced fit model enzyme modification bytreatment with proteases, Isoenzymes-LDH, CPKand ALP.

## UnitII (15Hours)

**Enzyme catalysis and regulation:** Acid base catalysis, covalent catalysis, Mechanisms of reaction catalyzed by enzyme ,pancreatic amylase,alcohol dehydrogenase, Lipase,chymotrypsin, carboxy peptidase A and ribonuclease. Metal

activated enzymes and metallo enzyme. Enzyme regulation: feed forward stimulation, feedback inhibition and its types. Covalent modification of enzyme activities.Multienzymecomplex and reactions: Structure and mechanism of action andregulation of pyruvate dehydrogenasecomplex.

## UnitIII (15Hours)

**Enzyme kinetics and Inhibition:** Kinetics of single substrate catalyzed reaction- MM equation and turnover number, LB plot, Eadie-Hofsteeplot and Hanes plot. Importance of Km andVmax .Allosteric enzymes- Cooperavity, Hill plot,K&Vseries of Enzyme. Bisubstrate reaction. Enzyme inhibition: Reversible inhibition - competitive, uncompetitive, noncompetitive, mixed, substrate and allosteric inhibition. Suicide inhibition.Inhibitorykinetics.

## UnitIV (15Hours)

**Co-enzymes:** Prostatic group and cofactors. Structure, functionsand mode of action of TPP in oxidative decarboxylation, FMN, FAD, NAD, NADP in redox reactions, PALP and PAMP in transamination, Co A in acetylationreactions, biotin in carboxylation, THFin onecarbon transfer, cobalaminecoenzymes-cyano, hydroxol, methyl and deoxyadenosylcobalamine- role in methyl group transfer and mutasereactions. Co-enzymicfunctions of vitamin C, lipoic acid andCo Q in metabolicreactions.

## UnitV (15Hours)

**Enzymes application:** Industrial application of enzymes: Enzymes as analytical reagents, Enzymes in Textile, Food anddetergent industry. Enzymes usedin diagnosis and various diseases- Alkaline phosphatase, Lactate Dehydrogenase.Lipaseand Aspartate transaminase. Immobilization techniques and applications: Adsorption, microencapsulation, entrapment, covalent and ionic bonding. Biosensors: Calorimetric, Potentiometric, Amperometric, immunosensorsand optical biosensors. Ribozyme, abzyme .Purification of protein.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar*/*Quiz/Discussion/Assignment/Google Classroom

**Text Books**

1. TrevorPalmer.(2001). Enzymes: Biochemistry, Biotechnology and Clinical Chemistry. Horwood Chemical Science Series. HorwoodPublishers.
2. Anil Kumar &SarikaGarg, (2015), Enzymes and Enzyme Technology, Viva books, Newdelhi.

## ReferenceBooks

1. Talwar. G.P (2012), Text book of biochemistry and Human Biology, 3rd edition, Prentice Hall of India Private Ltd, NewDelhi.
2. Balasubramanian et al., (2015). Concepts in Biotechnology, Universities Press IndiaLtd.
3. EE. Conn and PK. Stumpf, G. Bruening and RY. Doi (2010), Outlines of biochemistry, 5thed, John Wiley and Sons, New York,USA.
4. Robert J. Whitehurst, Maarten Van Oort. (2010). Enzymes in Food Technology.2nd

edition, John Wiley and SonsLtd.

1. David L Nelson, MichealM Cox. (2013). Lehninger’s Principles of Biochemistry, 6thedition, ReplikaPress (P) Ltd,India.
2. Julio Polainaand Andrew P. (2007). Industrial Enzymes: Structure, Function and Applications (Springer). MacCabe(Editors).

## MAPPING

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | M | M | H | S |
| **CO2** | S | H | M | S | H |
| **CO3** | M | S | H | M | M |
| **CO4** | S | H | S | H | S |
| **CO5** | S | M | H | S | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub.Code :: 22PBC104

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Core Paper 4 – Cellular Biochemistry | | | |
| Batch  2022-2023 | Hours / Week  5 | Total Hours  75 | Credits  4 |

**Course Objectives**

1. To learn the models and functions of biologicalmembrane
2. To learn about the structure and functions of cytoplasmicorganelles
3. To learn the mechanism of membrane transport incells

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Recall the basic concepts of cells. |
| CO2 | Understand the knowledge of cell structure and function |
| CO3 | Employ their knowledge of cell biology to selected examples of changes or  losses in cell function. |
| CO4 | Analyse the cell structure, cell signaling and cell functions |
| CO5 | Decipher the intracellular signaling modes in mitochondria |

**UnitI (15Hours)**

**Membrane structure and function:** Membrane bilayer Models, Fluidmosaicmodel- composition and functions. Membrane lipids- fluidity, Asymmetry phase transition, Liposome experiments. Membrane proteins - Types, Orientation, Mobility Experiments, flippases, proteins of RBC membrane, Bacteriorhodopsin, Porins- aquaporin. RBC ghosts, solubilisationof proteins, lipid anchored proteins. Cell surface carbohydrates-Lectins, selectins..Extracellular matrix- Integrinand Hyaluronicacid.

## UnitII (15Hours)

**Endoplasmic reticulum:** history, occurrence, morphology, components, types, enzymes associated, functions and biogenesis. **Ribosomes:** history, occurrence, location,

Ultrastructure, chemical composition, biogenesis. Association and dissociation of ribosomal subunits, functions of ribosomes. **Golgi bodies:** history, origin, occurrence, morphology, polarity, compartmentalization, chemical composition and functions. **Centriole:** origin, occurrence, ultrastructure and functions.Protein transportation into golgi apparatus.

## UnitIII (15Hours)

**Nucleus:** occurrence, structure: nuclear envelope (nuclear transport, disassembly & reassembly, nuclear pores, pore complex, nucleocytoplasmic transport), nucleoplasm, nucleolus, nuclear reticulum (euchromatin, heterochromatin and functions) and its functions. Cell cycle, cell division, amitosis, mitosis, meiosis, salient features of meiosis, mechanism of crossing over.

## UnitIV (15Hours)

**Mitochondria:** history, ultrastructure, electron transport chain, mt DNA, mtRNA, ribosomes and protein synthesis in mitochondria. Semi-autonomous nature of mitochondria (symbiont hypothesis).Biogenesis, degeneration and functions of mitochondria.**Membrane transport:** Overview, Passive transport: osmosis, simple diffusion and facilitated diffusion; active transport: Ca2+ ATPase, Na+K+ATPase, Gastric H+K+ATPase. Ion concentration gradients. Bulk transport: exocytosis, phagocytosis and Receptor mediated endocytosis.

## UnitV (15Hours)

**Cytoskeleton:** Microfilaments–Actin-Structures, Assembly, Myosin. Microtubules- Organization and dynamics, Kinesin and dynein.Striated muscle -structure, excitation-contraction.**Cell signaling:** Cell-Cell signaling-Signaling molecules and their receptors: functions of cell surface receptors, pathways of intracellular signal transduction, second messengers-G-protein coupled receptors, neurotransmitters, receptor tyrosine kinases, Ras, MAP kinases. Signal transduction: cAMP, cGMP, phosphatidyl inositol, Ca2+.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom/

**Text Books**

* 1. Dr.VeerBalaRastogi (2018).A Textbook of Cell Biology and Genetics. KNRN Publishers.Meerut.
  2. P.S. Vermaand V.K. Agarwal. (2014). Cell Biology, Genetics, Molecular biology,EvolutionandEcology,S.ChandandCompany,NewDelhi.

## Reference Books

1. Harvey Lodish, Arnold Berk*et al*., (2007). Molecular CellBiology.6thedition, W H Freeman and Company, NewYork.
2. GarretteR.H and Grisham, C. M. (2013). Principles of Biochemistry. 5thedition, Saunders CollegePublishers.
3. Albertset al., (2014). Molecular biology of the cell. 6th edition, Garland Publishers.
4. David E Sadava. (2004). Cell Biology-Organelle structure and Function. Panima publishing Corporation, NewDelhi.
5. G. Karp. (2001). Cell and Molecular Biology. 3rdedition, John Wiley &Sons publisher.
6. Geoffrey M.Cooperand Robert E. Hausman. (2009). TheCell: A Molecular Approach. 5thedition, ASM Press, WashingtonD.C.

## MAPPING

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| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | S | H | M | S |
| **CO2** | H | S | S | M | M |
| **CO3** | S | H | S | S | M |
| **CO4** | S | M | M | H | S |
| **CO5** | S | M | M | S | S |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub.Code :: 22PBC1CL

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title :** Core Practical 1 – Lab in Biomolecules, Bioinstrumentation, Enzymology and CellBiology | | | |
| Batch  2022-2023 | Hours / Week  5 | Total Hours  75 | Credits  4 |

**Course Objectives**

1. To get practical experience in analyzing the biochemical metabolites in biological samples, bioinstrumentation, enzyme technology and cell biologytechniques
2. To have hands on experience on chromatography, electrophoresis, enzyme and cell biologytechniques
3. Todevelop familiarity with bioanalytical techniques andapplications ofenzymeand cell biology in research andindustries

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Reproduce various concepts in Biomolecules, enzyme and cell biology. |
| CO2 | Conceive the amount of Biomolecules, isolation, purification and  determination of enzyme, preparation of buccal smears |
| CO3 | Apply the enzyme technology and cell biology skill in basic research  projects |
| CO4 | Assign the principles of Biomolecules, enzyme and cellbiology  techniques to discovery novel drugdevelopment |
| CO5 | Be competent to perform various biochemical analysis. |

**Biomolecules**

* 1. Estimation of Starch in potato 2.Estimation of Fructose in Fruits 3.Estimation of Glycogen inliver

1. Etimationof Ascorbicacid
2. Estimation of Total Free Aminoacidsby ninhydrinmethod 6.Extraction of total carotenoids and estimation of β-Carotene 7.Separation of plant pigments by paper chromatography 8.Separationofaminoacidsbythinlayerchromatography

9.PCR and Agarose gel electrophoresis (Demo) 10.Gel Documentation (Demo)

11. GC and HPLC(Demo)

12 .Determination of Alanine transaminaseactivity

13. Determination of Lactate dehydrogenaseactivity

14 .Isolation of mitochondria and estimation of succinate dehydrogenase

1. Animal cell types(Demo)
2. Cell Counting – RBC andWBC
3. Buccal smear – Identification of Barr body 18.Mitosis in onion root tip

## Teaching Methods

Demonstration/Video lectures/Laboratory visits/Institutional visits

**MAPPING**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | S | H | M | M |
| **CO2** | H | S | S | M | M |
| **CO3** | M | H | H | S | S |
| **CO4** | M | M | M | S | S |
| **CO5** | M | M | S | H | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub.Code :: 22PBC205

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper:** Core Paper 5–Plant Biochemistry and Biotechnology | | | |
| Batch  2022-2023 | Hours / Week  5 | Total Hours  75 | Credits  4 |

**Course Objectives**

* 1. To learn the mechanism and importance of photosynthesis inplants
  2. To learn the role of hormones in the growth metabolism ofplants
  3. To know the latest genetic engineering techniques for plant development

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Recall the biosynthesis of primary and secondary metabolites, nitrogen  metabolism involved in plants |
| CO2 | Understand the concept of plant tissue culture and plant transformation  techniques |
| CO3 | Know about applications of phytoconstituents in development of new  drug |
| CO4 | Experiment on new technologies in plant biotechnology |
| CO5 | Evaluate various gene transfer techniques |

**UnitI (15Hours)**

**Photo synthesis:** Overview, Pigments and factors affecting photosynthesis. Light reactions: Red dropand Emerson’s enhancement effect, Hill’sreaction,Arnonswork, pigment systems I and II, photo oxidation of water, production of assimilatory powers, electron transport chain, cyclic and non-cyclic photophosphorylation. Dark reactions: C3, C4 and CAM pathway.Photorespiration.

## UnitII (15Hours)

**Nitrogen metabolism:** Role of micro and macronutrients .Significance of nitrogen. Ammonification, nitrification, nitrate reduction, Physical and biological nitrogen fixation-symbiotic, non-symbiotic. Symbiotic nitrogen fixation in leguminous plants, biochemistry of nitrogen fixation, denitrification and nitrogen cycle.

## UnitIII (15Hours)

**Plant hormones:** Factors affecting thegrowth of plants, characteristics and classification of plant hormones. Chemistry, biosynthesis, physiological effects, applications of auxins, gibberellins, cytokinins, abscicicacid, ethylene.

## UnitIV (15Hours)

**Secondary metabolites and plant tissue culture:** Biosynthesis and functions of msand terpenoids. Functions of alkaloids, anthocyanins, Tanninsandlignin.Applications of secondary metabolites.Plant tissue culture-Micropropagation, Callus induction, cell and protoplast culture, organogenesis and somatic embryogenesis. Haploid production-Anther, pollen, embryo and ovule culture and their applications.Applications of plant tissue culture.**\*Soma clonal variation.**

## UnitV (15Hours)

**Techniques for plant transformation:** Agrobacterium mediated genetransfer and its applications, Ti plasmid, the process of T-DNA transfer to plants: Mechanism. Agrobacterium mediated gene transfer in tobacco. Btcrops and golden rice production. Drought and herbicide resistance.Transformation methods: Particle bombardment, polyethyleneglycol(PEG) mediated transformationand electroporation. Validation of transformation – resistance genes, marker genes and transgeneDNA.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text Books**

1. V.K. Jain. (2016). Fundamentals of Plant Physiology, 18 thedition, S.Chandand Company Pvt.Ltd, NewDelhi.
2. S.K.VermaandMohitVerma. (2008). A Textbook of Plant Physiology, Biochemistry and Biotechnology. 2ndedition. S.Chandand Company Pvt.Ltd, New Delhi.

## Reference Books

1. Plant Biochemistry, DeyJ.B. Harborne, (2000). AcademicPress.
2. Adrian Slater, Nigel W. Scott, Mark R. (2008). Plant Biotechnology: The genetic manipulation of plants. Fowler Oxford UniversityPress.
3. C. Neal Stewart. (2008). Plant Biotechnology and Genetics-Principles, Techniques and Applications. Jr. John Wileyand sons Publishers, UK.
4. William G. Hopkins. (2008). Introduction to Plant Physiology, 2 ndedition, John Wiley and sons Publishers,UK.
5. RazdanM.K. (2003). An introduction toPlant Tissue culture. 2ndedition, Oxford &IBH Publishing Co, NewDelhi.

## MAPPING

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| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | M | S | H | S | M |
| **CO2** | H | S | M | M | M |
| **CO3** | M | H | M | S | S |
| **CO4** | S | M | S | H | M |
| **CO5** | S | M | H | S | H |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub.Code :: 22PBC206

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Programme C** | **ode:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper:** Core Paper 6 – Metabolism and Metabolic Regulation | | | | |
| Batch  2022-2023 | | Hours / Week  5 | Total Hours  75 | Credits  4 |

**Course Objectives**

1. To learn the metabolism of various biomolecules in oursystem
2. To provide a basic understanding of the biochemical reactions ofmolecules
3. To study the interrelationship of various metabolicpathways

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Remember commemorate the overall concept of cellular metabolism |
| CO2 | Explain the metabolism of various biochemical pathways |
| CO3 | Execute the diseases associated with defective nucleotide biosynthesis |
| CO4 | Analyze the role of fat in energy production and membrane synthesis |
| CO5 | Define and explain the metabolism in various nutritional status and starvation . |

**UnitI (15Hours)**

**Carbohydrate Metabolism and regulation:** An overview, energetics and regulation of glycolysis and gluconeogenesis. TCA cycle: steps: amphibolic nature of the Citric acid cycle- Anaplerotic mechanism. Electron transport chain and ATP production.Glycogen metabolism and its regulation.HMPshunt,Cori's cycle.

## UnitII (15Hours)

**Lipid metabolism and regulation:** An overview of fatty acid metabolism. Oxidation of fatty acid: alpha, beta and omega. Biosynthesis of fatty acid.Regulation of fattyacid metabolism. Metabolism of Ketone bodies - Formation, Utilization, Excretionand significance.Metabolism of triacylglycerol and phospholipids.Biosynthesis of cholesterol and its regulation.Metabolism oflipoproteins.

## UnitIII (15Hours)

**Amino acid metabolism and regulation:** Amino acid degradation: transamination, oxidative and non-oxidative deamination, decarboxylation. An overview on ɣ- glutamyl cycle.An overview: Methionine as methyl donor (SAM pathway). Urea cycle and its regulation.Catabolism of asparagine, glutamine, proline, cysteine and cysteine. Conversion of amino acids to Histamine, Serotonin, epinephrine and nor- epinephrine: Metabolism and function. Synthesis and regulation of pyruvate family, 3- Phosphoglyceratefamily and aspartate family of amino acids. Allosteric regulation of glutaminesynthetase.

## UnitIV (15Hours)

**Nucleic acid metabolism and regulation: \*Fate of dietary nucleic acids,** Purines and pyrimidines biosynthesis (both de novo and salvage pathways) and degradation. Regulation of purine biosynthesis: PRPP aminotransferases. Regulation of pyrimidine biosynthesis: Aspartate carbamoyl transferase. Regulation of deoxyribonucleotidesby activators andinhibitors.

## UnitV (15Hours)

**Integration of metabolism:** Interconversionof food stuffs. Metabolic profile of the liver, adipose tissue and brain.Altered metabolism in starvation.Compartmentalization of metabolic pathway in the cell.Metabolic fuels: definition. Caloric value of metabolic fuels, metabolic relationship of tissues in various nutritional and hormonalstates.

\*denotes Self study Teaching

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

## Methods

**Text Books**

* 1. Satyanarayana, U and Chakrapani, U. (2013). Biochemistry. 4 thedition, Books and Allied Pvt. Ltd, Kolkata, 700010.
  2. Robert K. Murray, Daryl K. Grannerand Victor W. Rodwell. (2008), Harper’s IllustratedBiochemistry.29thedition,McGrawHillCompanies,Inc.NewDelhi.

## Reference Books

1. Voet, D., Voet, J.G. and Pratt, C.W. (2013). Fundamentals of Biochemistry, Life at theMolecularLevel.4thedition,JohnWiley&Sons,NewDelhi,110002
2. GarretteR.H and Grisham, C. M. (2012), Principles of Biochemistry. 5th edition, Saunders collegepublishers.
3. David L. Nelson, MichealM. Cox. (2008). Lehninger’s Principles of Biochemistry. Replikapress (P) Ltd, India
4. VasudevanD.M., SreekumariS. and KannanVaidyanathan(2011). Text Book of Biochemistry for Medical Students, 6th ed., JAYPEE BrothersMedical PublishersPvt. Ltd., New Delhi,110002.

## MAPPING

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| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | S | S | M | S |
| **CO2** | S | H | M | S | M |
| **CO3** | M | S | H | S | S |
| **CO4** | H | S | S | M | H |
| **CO5** | S | H | S | M | H |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub.Code :22PBC207

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper:** Core Paper 7 –Genetics and Molecular Biology | | | |
| Batch  2022-2023 | Hours / Week  5 | Total Hours  75 | Credits  4 |

**Course Objectives**

1. To understand the molecular organization of genes andchromosomes
2. To learn the process of DNA synthesis, repair andfunction
3. To learn the various molecular events occurring in DNA withproposed theories

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Able to define the basic concepts of gene |
| CO2 | Recognize the different processes involved in replication, transcription and  Translation |
| CO3 | Integrate scientific and technological knowledge on the use of genetics and molecular biology for industrial products on the cell and process level |
| CO4 | Examine the molecular mechanisms behind DNA damage and repair |
| CO5 | Appraise the various concepts of regulation of genes. |

**UnitI (15Hours)**

**Concept of gene:** Molecular structure of gene and chromosomes. Mendelian Principles: Mono and dihybridcross. Incomplete Dominance, Overdominance, Codominance, Epistasis. Linkage and crossing over, Sex determination and Sexlinkage in diploids. Polygenic inheritance. Chromosomal aberrations .Karyotyping. Human Genetic Diseases - Down’s syndrome, Turner’s syndrome, Klinefelter’s syndrome.

## UnitII (15Hours)

**Gene mutation and recombination:** Gene Mutation-Classification of mutations, DNAas a genetic material (Transformation, Conjugation andTransduction).

Genetics of viruses: Lytic and Lysogenic life cycles of phages. Genetic Recombination (Homologous recombination-Holliday model). Modern concept of genes.Population genetics: Hardy-Weinberg law. Quantitative genetics and multifactorial interactions, causes of variation and artificialselection.

## UnitIII (15Hours)

**Replication:** Mechanism of replication in prokaryotes and eukaryotes, Theta and rolling circle model, Enzymology of replication. Replication of RNA genome- replicase and reverse transcriptase.Termination of replication-circular and linear replications.

## UnitIV (15Hours)

**Transcriptionand Translation:** Universal genetic code and itsfeature. Prokaryotic and eukaryotic transcription.RNA processing and post- transcriptional modification. Regulatory sequences in protein coding genes. Transcription initiation by RNA polymerase I, II and III. Processing of eukaryoticpre mRNA, hnRNA proteins, RNA splicing, snRNA, spliceosome.RNA editing.

Translation-activation of aminoacids, initiation, elongation, terminationin prokaryotes and eukaryotes.Translational proof-reading-Posttranslational processing ofprotein.

## UnitV (15Hours)

**Regulation of transcription andtranslation:** Positive andnegative control, Repressor and Inducer, concept of operon, lac-, ara-, trpoperons. Catabolic repression, attenuation, anti- termination and methylation. Macromolecular transport across thenuclear envelope.Synthesis andtargeting of peroxisomal proteins.Overview of secretory pathway.Translocation of secretory products across ER membrane.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text Books**

* 1. P.S. Vermaand V.K. Agarwal. (2014). Cell Biology, Genetics, Molecular biology, EvolutionandEcology.S.ChandandCompany,NewDelhi.
  2. Lodish, D. *et al*., (2007). Molecular Cell Biology. 6thedition, Scientific American Books,Inc.

## Reference Books

1. De Robertis. (2001). Cell and MolecularBiology. 8thEdition, DhanpatRaiPublisher.
2. NaliniChandar, Susan Viselli. (2010). Lippincott Illustrated Reviews: Cell and Molecular Biology. LWW: North AmericanEdition.
3. Robert Franklin Weaver. (2011). Molecular Biology. 5thedition, Mc-GrawHill science.
4. Alberts*et al.,* (2014). Molecular Biology of the Cell. 6thedition, Garland Publishers.
5. Benjamin Lewin. (2007). Genes IX. 9thedition, Jones &BartlettLearning.

## MAPPING

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| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | S | S | M | S |
| **CO2** | S | M | M | S | H |
| **CO3** | S | M | M | H | S |
| **CO4** | M | S | H | M | S |
| **CO5** | S | M | H | S | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub.Code :22PBC208

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper:** Core Paper 8–Drug Biochemistry | | | |
| Batch  2022-2023 | Hours / Week  5 | Total Hours  75 | Credits  4 |

**Course Objectives**

1. To learn the mechanism of drug action in variousdiseases
2. To learn about different drugs available fortreatment
3. To learn about the designing mechanisms for drugdevelopment

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Repeat the concept ofpharmacology |
| CO2 | Describe the mechanism of action of drug inside the system |
| CO3 | Employ the drug discovery and drug design procedures. |
| CO4 | Examine the treatment of various disorders using drug molecules |
| CO5 | Contribute in understanding the mode of action of antibiotics. |

**UnitI (15Hours)**

**Pharmacology:** Classification of drugs, sources and preparation; natural source, synthetic drugs, drug preparation: crude drug, pure drug compounds, pharmaceutical preparations. Routes of drugadministration: sublingual, buccal, oral, rectal, intravenous, intramuscular, subcutaneous, transdermal, inhalational andtopical administration. Pharmacokinetics: Overview,drugabsorption, drug distribution,drug biotransformation (role, formation and phases), drug excretion: quantitative pharmacokinetics, drug-plasma concentration curve, bioavailability, volume of distribution, drug clearance. Single dose pharmacokinetics, continuous and multiple dose kinetics, dosagecalculations.

## UnitII (15Hours)

**Pharmacodynamics:** Definition. Drug receptors: Types,classification,drug- receptor interaction (binding and affinity, signal transduction, efficacy, receptor regulation and drug tolerance). Dose-response relationships (gradaland quantal). Drug development and safety: Drug discovery and characterization, preclinicalstudies, clinical trials, drug Safety and efficacy laws, drug abuse prevention laws, adverse effects of drugs, Factors affecting drug safety and efficacy. Antidepressant drugs: Overview and mechanism. Mechanism of action, therapeutic uses, kinetics and adverse effects of tricyclic antidepressants and mono amine oxidase inhibitors.

## UnitIII (15Hours)

**Pharmacokinetics:** Mechanism of action, therapeutic uses, pharmacokinetics and adverse effects of Anti-inflammatory drugs -aspirin and colchicine, Anti-peptic ulcer drugs -H2 receptor antagonists and inhibitors of H+K+ATP-asepump. Antihypertensive drugs: Overview,mechanism of controlling blood pressure, treatment strategies. Action, therapeutics uses, kinetics, adverse effects of β-adreno receptor-blocking agents and ACE inhibitors. Anticoronadrugs.

## UnitIV (15Hours)

**Treatment of neurodegenerative diseases:** Overview, neurotransmission in CNS, synaptic potentials, overview and drugs used for Alzheimer disease and Parkinson disease. Mechanism of action, therapeutic uses, kinetics and adverse effects of Hypnotic drug (barbiturates). Anesthetics: patient factors in selection of anesthesia, induction, maintenance and recovery from anesthesia, features, potency, uptake, distribution, action and adverse effects of inhalation anesthetics. \*Intravenous and localanesthetics.

## UnitV (15Hours)

**Anticancer drugs:** overview and principles of chemotherapy, treatment strategies, treatment regimens and scheduling, limitations of chemotherapy. Mechanism of action, therapeutic uses, pharmacokinetics and adverse effects of antimetabolites(Methotrexate and 5–fluorouracil), antibiotics (Dactinomycinand Bleomycin), alkylating agents (Cyclophosphamide), microtubule inhibitor(Vincristine and Vinblastine), steroid hormones and their antagonist (Tamoxifen), monocloncal antibody (Rituximab) andinterferons.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text books:**

1. Richard.D.Howland, Mary. J.Mycek. Lippincott William and Wilkins. (2006). Lippincott’s illustrated reviews: pharmacology. 3rdedition, WoltersKluwer health (India) Pvt. Ltd., NewDelhi.
2. R.S.Satoskar, NirmalaN. Reje, S. D.Bhandarkar. (2011). Pharmacologyand Pharmacotherapeutics. 22ndedition, Popular PrakashanPvt.Ltd.

## Reference Books:

1. H L Sharma and K KSharma. (2011). Principles of Pharmacology 2ndedn. Paras Medical Publisher,India.
2. George M.Brunner, Craig W. Stevans. (2011). Pharmacology. 3rdedition, Saunders, an imprint of ElsevierInc.
3. James Ritter, Rod Flower, Graeme Henderson and Humphrey Rang (2011). Rang & Dale's Pharmacology. 7th Edition. Churchill Livingstone.

## MAPPING

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| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | M | S | M | S |
| **CO2** | S | M | S | H | L |
| **CO3** | H | S | M | S | M |
| **CO4** | S | H | M | M | H |
| **CO5** | S | H | M | S | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub.Code :22PBC2CM

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper:** Core Practical 2 – Lab in Plant Biochemistry, Microbiology, Genetics and Molecular Biology | | | |
| Batch  2022-2023 | Hours / Week  5 | Total Hours  75 | Credits  4 |

**Course Objectives**

1. To learn the techniques of plant tissueculture
2. To get an hands-on-training on moleculartechniques
3. To implement the applications of plant tissue culture, microbes, genetics and molecular techniques in research andindustries

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Corelate the principles of plant biochemistry, microbes, molecular biology  and genetic techniques |
| CO2 | Demostrate the technical skills involved in plant tissue culture, counting  cells, identification of gene and its expressions |
| CO3 | Develop and apply the modern technology of plant biochemistry, microbial techniques, molecular biology and genetics in industries and research |
| CO4 | Examine the results obtained using plant biochemistry, sterilization  techniques, molecular biology and genetics |
| CO5 | Be competent in handling the microbial cultures and plant samples. |

**Plant Biochemistry**

1. Preparation of plant tissue culture media andsterilization\*
2. Estimation ofchlorophyll
3. Estimation offlavonoids
4. Estimation of totalphenols
5. Maintenance of microbialcultures
6. Isolation and biochemical identification of bacteria fromsoil
7. Motilitytest
8. Bacterial growth curve(Demo)
9. Antibiotic susceptibility test by Kirby-Bauermethod
10. Isolation of Genomic DNAfrom onion and Agarosegel electrophoresis\*
11. Isolation of Plasmid DNA frombacteria\*
12. Extraction of total RNA\*
13. Estimation of DNA by Diphenylaminemethod
14. Estimation of RNA by Orcinolmethod
15. SDS-PAGE\*
16. Blotting techniques (anyone)\*
17. Animal housekeeping, care, feed preparation and breeding of common laboratory animal-mice
18. Laboratory ethics (IAECguidelines)

\*Denotes group experiments

## Teaching Methods

Demonstration/Video lectures/Laboratory visits/Institutional visits

**MAPPING**

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| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | S | H | M | M |
| **CO2** | H | S | M | H | M |
| **CO3** | M | H | H | S | S |
| **CO4** | H | M | M | S | H |
| **CO5** | S | H | M | S | H |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub.Code :22PBC309

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper:** Core Paper 9 – Immunology | | | |
| Batch  2022-2023 | Hours / Week  6 | Total Hours  75 | Credits  4 |

**Course Objectives**

1. To learn about thevarious cells of immune system and their functions
2. To know about the specificity of antigen-antigen interaction and their possible mechanisms
3. Toknowtheroleofimmunologicalcellsinthetreatmentofdifferentdiseases

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Recall the types and functions of different immune cells |
| CO2 | Employ the mechanism of action of different immune cells and their  resultant reaction responses |
| CO3 | Decipher the underlying causes of inherited or autoimmune diseases and  consequences |
| CO4 | Experimentthe new technologies involving immune cells intreating  many diseases |
| CO5 | Contribute in understanding the important concepts of recombinant  vaccine. |

**UnitI (15Hours)**

**Cells of the immune system:** Macrophages, B and T lymphocytes, Dendritic cells, Natural killer and Lymphokineactivated killer cells, Eosinophils, Neutrophils and Mast cells. Organs of the immune system: Thymus, Bone marrow, Spleen, lymph nodes, MALT, GALT. Haemopoiesisand differentiation, lymphocyte trafficking. Antigen- biology, structure and functions of different classes of Immunoglobulin.Biology ofSuperantigens.

## UnitII (15Hours)

**Antigen and antibody:** Antibody types and structural properties, characteristics of antigen. **\*Antigen antibody reactions**, Applications of Immunological techniques, genetic control of immune response, effector mechanisms, MHC, antigen recognitionand presentation, activation of B and T lymphocytes.

## UnitIII (15Hours)

**Humoraland cell mediated immunity:** Cell mediated Cytotoxicity: Mechanism of T cell and NK Cell mediated lysis, Antibody dependent cell mediated Cytotoxicityand macrophage mediated Cytotoxicity. Cytokines and their role inimmune regulation, Biology of Complement system, Complementfixationtestand assessment of immune complexes in tissues. Immune suppression and immune tolerance.

## UnitIV (15Hours)

**Hyper sensitivity reactions:** Autoimmune disorders –Systemic Lupus Erythmatosisand Rheumatoid Arthritis ,Transplantation immunology- MLR, HLA Typing, Bone marrow transplantation, Organ transplants. Immunity to Infectious agents - Bacteria, Viruses, Malaria, and Helminthes.Tumor immunology, Tumor antigens, immune response to tumors, cancer immunotherapy, Vaccines.AIDS and other immunodeficiencies, Structure of HIV, envelope glycoproteins, destructionof T cells: immunologic symptoms of AIDS, AIDSvaccine.

## UnitV (15Hours)

**Vaccine technology:** recombinant vaccines, Identification of B and T epitopes for vaccine development. *In situ* characterizationof cellsfromtissues, Immunoscreeningof Recombinant library,Hybridoma– Monoclonal Antibody production and applications; MAbsindiagnosis and therapy.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom

**Text Books**

1. J.Kuby. (2018). Immunology. 10th edition, W.H. Freeman and Company,Newyork.
2. C.V.Rao. (2002). An Introduction to Immunology. Narosa Publishing House, Chennai.

## Reference Books

1. Ivan M. Roittand PeterJ. Delves (2001) Essential Immunology, Blackwell Science Ltd.Oxford.
2. Stefan E. Kaufmann, Alan Sherand Rafi Ahmed (2002) Immunology of Infectious diseases , ASM Press,USA.

## MAPPING

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| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | S | S | M | H |
| **CO2** | M | H | H | S | M |
| **CO3** | S | M | S | H | H |
| **CO4** | S | H | S | M | H |
| **CO5** | S | S | M | S | H |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub.Code :: 22PBC310

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper :**Core Paper 10 –Genetic Engineering | | | |
| Batch  2022-2023 | Hours / Week  7 | Total Hours  75 | Credits  4 |

**Course Objectives**

1. Toenablethestudentstolearntheprincipleandapplicationofgeneticengineering
2. Toimplement and transmission of a genetic material at molecular andcellular levels.

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Enshrine the principles of genetic engineering and the vectors used in  cloning and expression |
| CO2 | Grasp the different cloning strategies and their expression |
| CO3 | Demonstrate about implementation of genetic engineering for different purposes |
| CO4 | Investigate thedifferentstrategies of rDNAtechnology and resolve the  problems encountered |
| CO5 | Analyse the various techniques of gene therapy. |

**UnitI (15Hours)**

**Genetic engineering:** Introduction and its applications. Properties and applications of Restriction enzymes (Type I, Type II, Type III, Type IV and Type V), DNases, Polymerases, Modifying enzymes and Ligases. Linkers, Adaptors and Homopolymertailing.Benefits of gene cloning.Isolation of nucleic acids, characterization and purification of plasmid, bacteriophagegenomic DNA for cloning purpose

## UnitII (15Hours)

**Cloning vectors:** Plasmids (pBR322 and pUC18), Phages (l phageand M13 vectors), Phagemids (pBluescript, pGEM), Cosmids (pJB8) and Artificial Chromosomes (BAC and YAC). Plant and Animal viruses as vector, binary andshuttle vectors, expression vectors for prokaryotes and eukaryotes, expression cassettes.

## UnitIII (15Hours)

**cDNAlibraries:** Construction of genomic and cDNAlibraries, selectionand screening of recombinants, probes types, synthesis and uses of probes. Blotting techniques (Southern, Northern and Western),PCRtypes andapplications.Chromosome walking, jumping, DNA finger printing and foot printing.Screening with antibodies, rescreening and subcloning.

## UnitIV (15Hours)

**Gene transfer methods in animal cells:** Microinjection, electroporation, particle bombardment gun, ultrasonication, liposome mediatedanddirecttransfer. Restriction analysis of DNA, molecular markers: **\*RFLP,** RAPD,VNTR,SSR,AFLP,STS,SCAR,SNP.Microarrays.Humangenomicprojectandapplications.

## UnitV (15Hours)

**Application:** Transgenic animals as models in the prevention of human diseases like muscular dystrophy andanticancer therapy.Production of recombinant insulin, vaccines and growth hormone.Gene therapy: Stemcellgene therapy, Somatic cell gene therapy,AntisenseRNAtherapy,genetherapyforinheriteddiseases; familial hypercholesterolemia, hemophilia, ADA deficiency (SCID) and Cystic fibrosis.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text Books**

* 1. Twyman, B. Old and S. B. Primrose (2001). Principles of Gene Manipulation: An IntroductiontoGeneticEngineering,6thed.,JohnWileyandsonsPublishers,UK.
  2. Primrose *et al*., (2001). Principles of gene manipulation. 6th edition, Blackwell ScientificPublishers.

## Reference Books

1. T.A. Brown (2015), Gene Cloningand DNA analysis, 7th ed.,Blackwell publishing Ltd,UK.
2. Bernard R.Glick, JackJ.Pasternak, Cheryl L. Patten (2010). Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4th ed., ASM Press,USA
3. Winnacker, E.L. (2003). From Genes to Clones. Panima Publishing Corporation, NewDelhi.
4. Old et al. (2001). Principles of Gene Manipulation, 6th Edition. Blackwell Science,London.

## MAPPING

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| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | S | H | S | M |
| **CO2** | H | S | H | M | M |
| **CO3** | M | H | H | H | H |
| **CO4** | M | S | M | S | M |
| **CO5** | M | S | M | S | H |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub.Code :22PBC311

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Core Paper11– ClinicalBiochemistry | | | |
| Batch  2022-2023 | Hours / Week  2 | Total Hours | Credits  2 |

**Course Objectives**

* 1. To learn the methodologies for the detection of abnormalities inblood
  2. To learn the process of different sample collection andprocessing
  3. To know about the markers in the various metabolic disorders likecancer

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Corelatethe important laboratory biochemicaltests |
| CO2 | Employ the methods of specimen collection and processing and  analyzing the results |
| CO3 | Investigate the role of enzymes in clinical diagnosis of diseases |
| CO4 | Critisize the diagnostic procedures for tumor development |
| CO5 | Evaluate the role of free radicals in various diseases. |

**UnitI (15Hours)**

**Specimen collection andprocessing:** Collection of blood vein puncture, skin puncture, arterial puncture. **Collection of urine:** Timed urine specimens, urine preservatives. Clinical significance of urinary components with reference to sugars, proteins, ketone bodies, bilirubin and porpyrins. Microscopic examination of urine, Abnormal and normal constitute of urine. Body fluids-CSF, gastricjuice, ascitic fluid, synovial fluid and amniotic fluid: Composition, collection and analysis.Quality control in clinicallaboratory.

## UnitII (15Hours)

**Serology and hematology:** Introduction. Anti serum, anti seraraising, chick andsnake venom antibody. Principle of agglutination and precipitation.C-reactive proteinand pregnancy test, Rhumatoid arthritis (RA) test. ESR, Coagulation test, prothrombintest.WIDAL test, ELISA, chemiluminescence, CMIA, ECLIA, flow cytometry.**Hemoglobin:** Normal and abnormal Hb, Separation of hemoglobin by electrophoresis. Hemoglobinopathiesand itstypes.GlycatedHb. Erythrocyte metabolic pathways, Disorder of erythrocyte metabolic pathways, Porphyrinsand porphyrias.

## UnitIII (15Hours)

**Clinical enzymology and endocrinology:** Factors affecting enzyme levels in blood. Principle, assay and clinical significance of liver markers: AST, ALT, gamma- glutamyltransferase, amylase and lipase. Cardiac markers: creatine kinase, CKMB, lactate dehydrogenase, troponin (I and T). Bone markers: ALP. Prostate marker: ACP.Clinicalsignificanceofsteroid,proteinandthyroidhormones.

## UnitIV (15Hours)

**Organ function test and related disorders:** Jaundice, cirrhosis, hepatitis(HBV virus and types ), fatty liver and gall stones. Renal function test and related disorder: Acute renal failure, glomerular disease. Gastric and pancreaticfunction test. Estimation of GFR and cystatinC in serum. Hyper and hypo lipoproteinemiasand diagnostic test for lipoprotein disorders. Diabetes mellitus.Fattyacid disorder – atherosclerosis.

## UnitV (15Hours)

**Free radicals in diseases:** Introduction, \*Types of free radicals. Free radical induced lipid peroxidation and antioxidants (Enzymic: SOD, Catalase, Glutathione Peroxidase, Glutathione Reductase; Non Enzymic: Vitamin A, Ascorbic acid, Tocopherol, ReducedGlutathione).

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text Books**

1. AmbikaShanmugam (2008), Fundamentals of Biochemistry for Medical Students, 7th edition
2. Stevans, C.D. (2016). Clinical Immunology and Serology: A Laboratory Perspective. 4thedition. F.A. DavisCompany

## Reference Books

1. Carl A. Burtis, Edward R. Ashwood, Norbert W. Tietz. (2012). TietzTextbook of Clinical Chemistry and molecular diagnostics. 5th ed, Saunders college publishing, Harcourt Brace College Publishers, Philadelphia, Newyork,Tokyo.
2. VasudevanD.M, SreekumariS and KannanVaidyanathan, (2011), Text Book of Biochemistry for Medical Students,6th ed., Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi,110002.
3. Thomas M. Devlin (2010) Textbook of Biochemistrywith Clinical Correlations, 7th Edition, john Wiley &Sons, Inc,US.
4. Larry Jameson *et al*., (2015). Harrison’s Principles of internal medicineVol. I and

II. 14th edition, McGraw HillPublishers

## MAPPING

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| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | S | S | M | H |
| **CO2** | M | H | H | S | M |
| **CO3** | S | M | S | H | H |
| **CO4** | S | H | S | M | H |
| **CO5** | S | M | H | S | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub.Code :20EDC301

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper :** EDC - NutritionalBiochemistry | | | |
| Batch  2022-2023 | Hours / Week  2 | Total Hours  30 | Credits  5 |

**Course Objectives**

1. To impart the knowledge on historical overview of nutrition, essential nutrients for metabolism
2. To provide an overview of the major macro and micronutrients relevant to humanhealth
3. To discuss the scientific rationale for defining nutritional requirements in healthy individuals and populations, with reference to specific conditions such as pregnancy, lactation, and older age

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Assess the nutritional status of community in order to determine the type magnitude and  distribution of malnutrition |
| CO2 | Describe the biochemical and physiological functions of the nutrients and their  integrated role. |
| CO3 | Evaluate the therapeutic role of key nutrients in maintaining health. |
| CO4 | Discriminate the diseases caused due to protein deficiency |
| CO5 | Employ the role of diet in various diseases. |

**UnitI (6 Hours)**

**Introduction:** Nutrition – concepts - role of nutrition in maintaining health, basic food groups - energy yielding, body building and protective foods. Basic concepts of energy expenditure, unit of energy – Kcal - energy requirements of different categories of people - RQ of foods - Body Mass Index (BMI) - Basal Metabolic Rate (BMR) – determination and factorsinfluencing

## UnitII (6 Hours)

**Nutritional significance of dietary components:** Physiological role and nutritional significance of carbohydrates, lipids, proteins, vitamins (water soluble and fat soluble) minerals and fiber, Dietary sources, Functions, Digestion, absorption and storage, metabolism of carbohydrates – lipids – proteins.

## UnitIII (6 Hours)

**Nutritive value of proteins:** Essential amino acids, Biological values of Proteins(animal and plant proteins). Evaluation of proteins by nitrogen balance method-DC, BV, NPU and NAP of animal and plant proteins, single cell proteins, factors influencing protein requirements, Effect of excess proteinintake

## UnitIV (6 Hours)

**Protein calorie malnutrition:** Protein malnutrition (Kwashiorkor) and under nutrition (marasmus) their preventive and curative measures – composition of balanced diet and RDA for infants, children, adolescent, adult male and female, pregnant, lactating women and geriatrics

## UnitV (6 Hours)

**Nutrition and body defenses:** Effect of drugs on food and nutrients, drug - nutrient interaction - nutritional therapy food preparation and management. Role of diet and nutrition in the prevention and treatment of diseases – Diabetes mellitus, hypertension, infections, CVD, liver and kidney disorders.

## Teaching Methods

PowerPoint presentation/Seminar/Quiz/Discussion/Assignment, Model preparation

**Text Books**

1. Srilakshmi, B. (2013) Nutrition Science Revised Fourth Edition, New Age International Publishers, NewDelhi.
2. Paul, S. (2005) A Textbook of Bio-nutrition – Curing Diseases through Diet, First Edition, CBS Publishers and Distributors, NewDelhi.
3. Swaminathan, M.(2004) Advanced Textbook of Food and Nutrition, Volume II, Second Edition, The Bangalore Printing and Publishing Co. Limited,India.

## Reference Books:

1. Geissler, C. and Powers, H.(2010)Human Nutrition, Twelfth Edition, Churchill Livingstone,USA.
2. Brody, T. (2006) Nutritional Biochemistry, Second Edition, Academic Press,USA.
3. Eastwood, M. (2003) Principles of Human Nutrition, Second Edition, Wiley - Blackwell Science Ltd Publishers, USA.

## MAPPING

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| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | S | H | S | M |
| **CO2** | H | S | H | M | M |
| **CO3** | M | H | H | H | H |
| **CO4** | M | S | M | S | M |
| **CO5** | M | S | M | S | H |

**S**–Strong **H**–High **M**–Medium **L** –Low

Sub.Code : **22PBC3CN**

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Core Practical 3 – Lab in Immunology, Genetic Engineering and Clinical Biochemistry | | | |
| Batch  2022-2023 | Hours / Week  5 | Total Hours  75 | Credits  4 |

**Course Objectives**

1. To enhance the students to have practical experience on techniques in immunologicaltests
2. To learn the methods of estimation of clinicalparameters
3. Tohave hands on experience in geneticengineering

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Recall the basic principles involved in immunology, clinical  biochemistry and genetic engineering |
| CO2 | Demonstrate the techniques involved in immunology, clinical biochemistry and geneticengineering |
| CO3 | Develop and apply the recent technology involved in diagnostic  techniques of immunology, clinical biochemistry and genetic |
| CO4 | Examine and analyze theresults involved in immune techniques,clinical biochemistry and geneticengineering |
| CO5 | Be competent in handling the blood and urine samples. |

**Immunology**

* 1. ELISAmethod
  2. WIDALtest
  3. Single radialimmunodiffusion
  4. Doubleimmunodiffusion
  5. Ouchterlorydoublediffusion
  6. Immunoelectrophoresis
  7. Rocketimmunoelectrophoresis
  8. Restriction digestion andligation\*
  9. cDNAsynthesis\*
  10. Bacterialtransformation\*

## Estimation of the following parameters in urine

* 1. Urea
  2. Uricacid
  3. Creatinine
  4. Glucose by Benedictsmethod
  5. Bilirubin
  6. Sodium

## Estimation of the following parameters in blood

* 1. Hemoglobin
  2. Totalcholesterol
  3. Glucose tolerancetest
  4. Glucose by GOD/PODmethod

\*Denotes group experiments

## Teaching Methods

Demonstration/Video lectures/Laboratory visits/Institutional visits

**MAPPING**

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| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | M | S | M | S |
| **CO2** | H | S | S | S | M |
| **CO3** | M | M | H | M | S |
| **CO4** | S | H | M | H | M |
| **CO5** | S | M | H | S | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub.Code :22PBC412

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Core Paper 12 – Hormonal Biochemistry | | | |
| Batch  2022-2023 | Hours / Week  5 | Total Hours  75 | Credits  4 |

**Course Objectives**

1. To learn about the system of hormonal functioning in biologicalsystems
2. Toknowtheregulationandactionofdifferenthormonesatdifferentconditions
3. To get an in depth knowledge on diabetesmellitus

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | List the diverse group of hormones and their specific mechanismof  action in the bodilymetabolism |
| CO2 | Understand the regulatory functions of various hormones and their  interrelationship in the endocrine disorders |
| CO3 | Discuss the pathophysiology, diagnosis, treatment and management of  endocrine disorders |
| CO4 | Differentiate the role of hormones in various biological organs |
| CO5 | Evaluate the biological action of different hormones . |

**UnitI (15**

**Hours)**

**Principles of endocrinology:** Scope of Endocrinology, Nature of Hormones and its types, Receptor Families, Synthesis and Processing, Hormone Secretion, Transport, and Degradation. Hormone Action through Receptors – Membrane, Nuclear and Cytosolic Receptors.Functions of Hormones – Growth, Maintenance of Homeostasis and Reproduction.Hormonal Feedback Regulatory Systems-Paracrineand autocrinecontrol, HormonalRhythms.

## UnitII (15

**Hours)**

**Hypothalamus and pituitary hormones:** Hypothalamic and pituitary axishormones-Chemistry &biochemical functions; Hypothalamic releasing factors. Pituitary gland: hormones of the pituitary gland- Chemistry& biochemical functions

- neurovascular hypothesis; pineal gland- hormones of the pineal gland- Chemistry& biochemical functions.

## UnitIII (15

**Hours)**

**Pancreatic hormones:** Chemistry and biochemical functions. Parathyroid hormone: Calcitonin and its functions. Pancreatic hormone: Insulin, glucagon, somatostatin, pancreatic polypeptide-chemistry and biochemicalfunctions.

## UnitIV (15

**Hours)**

**Adrenal gland:** Hormones of adrenal gland-chemistry and biochemical functions; FSH, TSH, Gastrointestinal hormones-cholecystokinin, Substance P, summary of the neuroendocrine control of GI;Neurohormones- the brain-renin-angiotensin and urotensin.

## UnitV (15

**Hours)**

**Reproductive endocrinology:** Male reproductive system: androgens: Source, synthesis, chemistry,metabolism, Physiological roles, mechanism of action and pathophysiology. Female reproductive system: Synthesis, physiological role andmechanism of action of ovarian steroid hormones.Neuroendocrinecontrol of ovarian function, Pathophysiology. Endocrinology of pregnancy, parturition and lactation, Hormonal contraception, menopause andpathophysiology.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom

**Text Books**

* 1. MacE.Hadley(2009).Endocrinology.4thedition.PrenticeHallInternationalInc
  2. Harrison’s Endocrinology, (2017). 4nd edition, Edited by J. Larry Jameson, The McGraw Hill Companies, Inc.USA.

## Reference Books

1. A. Longstaff. (2002). Instant notes: Neuroscience. 1 stIndian edition, BIOS Scientific Publishers Ltd, UK John E. Hall, Mario Vaz, AnuraKurpad, Tony Raj. (2016).
2. Guyton &Hall (2016). Textbook of Medical Physiology. 2ndSouth Asian edition, Elsevierpublications.
3. ShlomoMelmed*et al*., (2011). William’s Textbook of endocrinology. 12thedition, Philadelphia:Elsevier/Saunders.

## MAPPING

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| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | S | S | M | H |
| **CO2** | M | H | H | S | M |
| **CO3** | S | M | S | H | H |
| **CO4** | S | H | S | M | H |
| **CO5** | S | M | S | H | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub.Code :22PBC413

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| --- | --- | --- | --- | --- |
| **Programme C** | **ode:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper:** Core Paper Methodology13-Biostatistics and Research | | | | |
| Batch  2022-2023 | | Hours / Week  5 | Total Hours  75 | Credits  4 |

**Course Objectives**

1. To learn the different methods of collecting data andprocessing
2. To know about the different statistical methods to interpret the collected statistical data
3. Toknowtheconceptofarticlewriting,reportwritingandthesismakingsoon

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | State an idea on choosing the appropriate method of collecting data |
| CO2 | Employ the statistical method and process the collected data |
| CO3 | Illustrate the device and standardize the statistical methods |
| CO4 | Discriminate the concept in preparing a report, publishing an article and  writing a project thesis |
| CO5 | Contribute the research knowledge in report writing. |

**UnitI (15Hours)**

**Research:** Definition, Introduction, objectives, motivation, types, approaches, significance. Research Methods versus Methodology.**Research process:** formulating the research problem, Extensive literature survey, developing the hypothesis, preparing the research design, determining sample design, collecting the data, execution of the project, analysis of data, hypothesis testing, generalizations and interpretation, and preparation of the report or

presentation of the results. Criteria of a good research. Problems encountered by researchers in India.

## UnitII (15Hours)

**Research problem:** Selection, necessity and techniques (statement of the problem in a general way, understanding the nature of the problem, surveying the available literature, developing the ideas through discussions and rephrasing the research problem into a working proposition).

**Research design:** Introduction, necessity, features, concepts relating to research design, types of research design, basic principles of experimental design (Principle of Replication, Principle of Randomization and Principle of LocalControl).

## UnitIII (15Hours)

**Methods of Data Collection: Collection of Primary Data:** Observation Method, Interview Method, questionnaire method (merits, demerits and main aspects), schedules, difference between questionnaire and schedules. Other methods of primary data collection (Warranty cards, Distributor or store audits, Pantry audits, Consumer panels, Use of mechanical devices, Projective techniques).**Collection of Secondary Data:** characteristics, Selection of appropriate method, Case Study method.

## UnitIV (15Hours)

**Classification and tabulation of data**.Diagrammatic &graphic presentation of data. Problems involving arithmetic mean, median, mode, quartiles, decilesand percentiles. **ANOVA:** Principle, technique, setting ANOVA table, short cut method, coding method (necessary illustrations) for one way ANOVA. Two way ANOVA: Principle, technique, setting ANOVA table (necessary illustrations). ANOVA in Latin-Square design (necessaryillustrations).

## UnitV (15Hours)

**Interpretation and Report Writing:** Introduction, Techniques and precautions in interpretation, Report writing – significance, different steps, layout, types (technical and popular), mechanics (with examples) and precautions. Publication in a scientific journal.Project proposal writing to funding agencies, Career opportunities in research.

## \* denotes Self study

**Teaching Methods**

Power point presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom

**Text Books**

* 1. C.R.Kothari.Research Methodology: Methods and Techniques (2004). New Age International (P) limited. Publishers.
  2. N.Gurumani (2015). Introduction to Biostatistics. MJPPublishers.
  3. S.P.Gupta. (2009). Statistical Methods, 28thedition, Sultan Chand&Sons

## Reference Books

1. SundarRao, JesudianRichard. (2009). AnIntroduction to Bio-Statistics.4th

edition, Prentice-Hall of India Pvt.Ltd.

1. [Naren Kr. Dutta](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor%3A%22Naren%2BKr.%2BDutta%22&source=gbs_metadata_r&cad=2) (2002). Fundamentals Of Biostatistics: Practical Approach. Kanishka Publisher.
2. S.P.Gupta. (2016). Fundamentals of Statistics. 6 thedition, SultanChand.

## MAPPING

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| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | S | S | M | H |
| **CO2** | M | H | H | S | M |
| **CO3** | S | M | S | H | H |
| **CO4** | S | H | S | M | H |
| **CO5** | S | S | M | H | S |

**S**–Strong **H**–High **M**–Medium **L** –Low

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| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Major Elective: Nanobiotechnology | | | |
| Batch  2022-2023 | Hours / Week  5 | Total Hours  75 | Credits  5 |

## Course Objectives

1. Togetanideaabouttheapplicationofnanotechnologyinbiologicalresearch
2. To learn the properties and functions of nanomaterials in biological systems
3. To learn the applications of nanomaterials in drug delivery and treatment

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Insight about the nanotechnologyconcepts |
| CO2 | Explain the methods of nanoparticlesynthesis |
| CO3 | Use properties of nanoparticles |
| CO4 | Apply the knowledge of nanotechnology in biological research |
| CO5 | Employ and apply the knowledge of nanotechnology in wastewater treatment, agriculture and diseases. |

**UnitI (15Hours)**

**Introduction to Nanotechnology:** Introduction to nanoparticles. Nanoscienceand its importance. Definition: Nanotechnology - Nanobiotechnology- Nanomaterial - Nanocomposites- Classification of nanostructures – Top down and Bottom Up approach - Quantum dots -Bio-inspired nanomaterials.

## UnitII (15Hours)

**Herbonanotechnology:** Physical synthesis - Ball Milling - Thermal evaporation - Chemical synthesis – Solgel Process - Hydro thermal Synthesis-BiologicalSynthesis – Plant, Microbial compound based synthesis

## UnitIII (15Hours)

**Properties of Nanomaterials:** Preparation of nanoparticles Physical properties - Optical, Magnetic, Surface Plasmon resonance - Electrochemical Properties of Nanoscale Materials, Intramolecularbonding, Inter-molecularbonding,

**\*Nanocatalysis**, Self-assembly – DNA, Protein.

## UnitIV (15Hours)

**Characterization methods:** UV - Visible Spectrophotometer, X-ray diffraction (XRD), Scanning Electron Microscope (SEM) Transmission, Electron Microscope (TEM), Fourier Transform InfraRed Spectrometer (FTIR), EDAX, Dynamic Light Scattering(DLS).

## UnitV (15Hours)

**Applications of Nanoparticles:** Nanoparticles in waste water treatment, cancer therapy, Biosensors- DNA Microarrays - CellBiochips - Nanoparticles for Bioimaging– Textile and pharma industries. Application in environment, agriculture and pesticide diagnosis.Nanorobotics. Military applications of Nanotechnology - Nanomaterialsfor food Applications.Diagnosis and nanoToxicityof Nanoparticles - Future Perspectives.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text Books**

1. T.Pradeep. (2008). Nano: The Essentials: Understanding Nanoscienceand Nanotechnology. Tata McGraw-Hill Publishing Company Limited, NewDelhi.
2. Robert W. Kelsall, Ian W. Hamleyand Mark Geoghegan. (2005).NanoscaleScienceandTechnology.JohnWiley&Sons,Ltd.,UK.

## Reference Books

1. GuozhongGao. (2004). Nanostructures &Nanomaterials: Synthesis, Properties &Applications, ImperialCollegePress.
2. Mick Wilson, KamaliKannangara, Geoff Smith, Michelle Simmons, BurkhardRaguse. (2005). Nanotechnology: Basic Science and Emerging Technologies. OverseasPress.
3. Vladimir P Torchilin. (2006). Nanoparticles as Drug carriers. Imperial College Press,USA.
4. M.Niemeyer, Chad A.Mirkin. (2004). Nanobiotechnology: Concepts, Applications and Perspectives. Wiley-VCH,Weinheim.

## MAPPING

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| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | L | M | M | M |
| **CO2** | S | M | H | S | H |
| **CO3** | H | S | M | M | S |
| **CO4** | S | M | S | S | M |
| **CO5** | S | M | S | M | H |

**S**–Strong **H**–High **M**–Medium **L** –Low

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| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Major Elective – Microbiology | | | |
| Batch  2022-2023 | Hours / Week  5 | Total Hours  75 | Credits  5 |

## Course Objectives

1. To learn about the microbiological techniques for microbialstudies
2. To learn the energy process taking place inmicrobes
3. To learn about the food poisoning and pathogenicity ofmicrobes

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Commemorate the general bacteriology and microbial techniques. |
| CO2 | Understand the basic microbial structure and function |
| CO3 | Implement the handling techniques and staining procedures inlaboratory |
| CO4 | Resolve the microbial techniques and its applications |
| CO5 | Employ the role of microbes in pathogenesity. |

**UnitI (15Hours)**

**Morphology andUltrastructure:** History of microbiology. Classification of microbes. Ultra structure and characteristics of fungi, algae and protozoa. Bacterial morphology and fine structure; cell wall, cell membrane, intra cytoplasmic structures and external structures-bacterial growth curve, synchronous growth, continuous culture. Factors affecting bacterial growth. Staining techniques-simple Differential Special staining techniques and negative staining.

## UnitII (15Hours)

**Microbiological techniques:** Culture techniques: Isolation of microbes from various sources, serial dilution techniques, pure culture techniques, Anaerobic culture methods-chemical and physical methods. Culture preservation techniques.

Nutritional requirements: different kinds of media, composition of media -carbon sources, nitrogen sources, vitamin and growth factors, mineral, inducers, precursors and inhibitors. Sterilization methods. Anaerobicfermentation- Alcoholic fermentation, propionic acid fermentation, formic acid fermentation.

## UnitIII (15Hours)

**Food Microbiology:** Food poisoning – Food borne diseases- Bacterial and Non- Bacterial. Microbial quality and safety – Determining microorganismsin foodculture, Microscopy and sampling methods-Chemical and immunological methods. Principles of food preservations: Asepsis, Preservation by use of High temperature, Low temperature, Canning, Drying, Radiation and Foodadditives.

## UnitIV (15Hours)

**Medical Microbiology:** Infectious Diseases process-Diagnosis-Process of sample collection, transport and examinations of the specimens. Antibiogram. Bacteriology: Morphology, cultural characteristics, pathogenicity and laboratory diagnosis of Grampositive organisms-*Staphylococcus aureus*, Mycoplasma; Gram negative organisms: *E.coli*.

## UnitV (15Hours)

**Pathogenicity and Laboratory Diagnosis**: **\*Virology-Basic concepts of virology**. General properties of Human viruses, Approaches to viral diagnosis-Serological and Molecular techniques of viral infections-Hepatitis.Mycology: General propertiesand approaches tolaboratory diagnosis. Mycosis-Superficial, Subcutaneous and Systemic infections-*Candida allbicans*. Parasitology: Pathogenicity and laboratory diagnosis of *Plasmodiumvivax*.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text Books**

1. Prescott. (2003). Microbiology. 3rd edition, Magrawhill, Boston
2. Pelczar M.J., Ried, RD and Chan, ECS. (2000). Microbiology. 5 thedition, McGrawHill

## Reference Books

1. Ananthanarayananand JayaramPaniker. (2005). Text Book of Microbiology.6th

edition Orient Longman, Hyderabad.

1. Standby and Wittaker. (2008). Principles of Fermentation Technology. 2ndedition.
2. Davis*etal*.,(2001).Microbiology.4thedition,LippincottWilliamsandWilkins.

## MAPPING

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| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | M | S | S | H |
| **CO2** | S | H | S | H | H |
| **CO3** | M | S | M | H | S |
| **CO4** | H | M | H | S | M |
| **CO5** | S | M | S | H | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

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| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Major Elective: Bioinformatics | | | |
| Batch  2022-2023 | Hours / Week  5 | Total Hours  75 | Credits  5 |

## Course Objectives

1. To learn the role of computer programmes in studying the biological processes
2. To know about the different software’s for data analysis
3. To learn about the methods of data retrieval from various databases

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Learn about the basics and beginning developments in computer usage |
| CO2 | Employ the basics of bioinformatics |
| CO3 | Differentiate various bioinformatics softwares |
| CO4 | Apply the role bioinformatics in biological science research |
| CO5 | Apply bio informatics in proteomics and human genome project. |

**UnitI (15Hours)**

**Bioinformatics:** Introduction, fields related to bioinformatics, objectives, scope, genome mapping as a source of bioinformatics. Applications of bioinformatics in various fields\*.Chronological history of events in bioinformatics.Role of computers in bioinformatics.Major categories of bioinformatics tools.Applications of programmes inbioinformatics.

## UnitII (15Hours)

**Biological databases:** database, database management system and its advantages. Biological databases and information resources. Classification of biological databases: general databases, protein families & sequence motif database, signal sequence databases, protein – protein interaction databases, pathways databases, structural databases, SNPs database, histology database, standards, PUBMED, ENTREZ. Searching and retrieving data from databases- FASTA and BLAST. Linking databases with sequence retrieval systems (SRS).Advantages of SRS.OMIM, ExPASy, EMBL-Bank, ENSEMBL and itsadvantages.

## UnitIII (15Hours)

**Genomics:** gene, genome, genomics: genome mapping & genome projects, methods of gene sequence analysis: Genbank, Genbank assembly, genome annotation, genome similarity. Types of genomics: comparative, structural and functional genomics. Gene functions: analysis of gene expression, DNA microarray or DNA chip, serial analysis of gene expression.

## UnitIV (15Hours)

**Proteomics:** Introduction, methods of studying proteins: determining the post translationally modified proteins, determining the existence of proteins in complex mixtures, establishing protein-protein interactions. Protein structure classification: CATH, SCOP, DALI, FSSP, SSAP, protein structure bioinformatics resource. Protein structure prediction: ROSETTA, protein folding, protein folding disorders. Protein function prediction: automated protein function prediction, diversity in protein function.

## UnitV (15Hours)

**Human Genome Project:** Milestones, types of sequences in Human Genome Project, impact, potential benefits, ethical, legal and social issues. **Gene therapy:** Principles, current status of gene therapy research. Factors affecting gene therapy.Recent developments in gene therapy.**Drug designing:** Objectives, rational drug design, computer assisted drug design, drug development. **Pharmacogenomics:** prospects, uses, barriers toprogress.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text Books**

1. PrakashS.Lohar (2009). Bioinformatics. MJPPublishers.
2. Jean-Michel Claverieand Cedric Notredame. (2012) Bioinformatics-A beginner‟sguide. 1stedition, Wiley- Dream TechIndia Pvt. Ltd.

## Reference Books

1. David. W. Mount. (2001). Bioinformatics. CBS publishers anddistributers.
2. D.R. Westhead, J. H. Parish and R. M. Twyman. (2002). Instant notes in bioinformatics. Oxford,UK.

## MAPPING

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| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | H | S | M | S |
| **CO2** | S | M | S | M | S |
| **CO3** | S | H | M | S | H |
| **CO4** | H | M | H | M | M |
| **CO5** | S | M | M | S | H |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub code: 22PBC2E2

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| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Major Elective - Bioethics, Biosafety and IPR | | | |
| Batch  2022-2023 | Hours / Week  5 | Total Hours  75 | Credits  5 |

**Course Objectives**

1. Tolearnaboutthedemeritsofbiotechnologicalapplicationsinrecentresearch
2. Toknowtheethicalissuestobeconcernedinthecourseofbiologicalresearch
3. To know about the intellectual property rights of individualresearchers

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Remember the ethical issues of scientific research |
| CO2 | Employ the various regulations in biosafety and bioethics |
| CO3 | Decipher the awareness of the intellectual property rights |
| CO4 | Experiment the secured and ethical way of research |
| CO5 | Contribute the knowledge in filing the patents. |

**Unit I (15Hours)**

**Ethics/bioethics:** Introduction, framework for ethical decision making;biotechnology and ethics-benefits and risks of genetic engineering-ethical aspects of genetic testing- ethical aspects relating to useof genetic information-genetic engineering andbiowarfare.

## Unit II (15Hours)

**Ethical implications of cloning:** Reproductive cloning, therapeutic cloning; Ethical, legal and socioeconomic aspects of gene therapy, germ line, somatic, embryonic and adult stem cell research-GM crops and GMO’s – biotechnology and biopiracy– ELSI of human genomeproject.

## UnitIII (15Hours)

**Biosafety:** Introduction, biosafety issues in biotechnology – risk assessment and risk Management – safety protocols: risk groups – biosafety levels – biosafety guidelines and regulations (National and International) – operation of biosafety guidelines and regulations – types of biosafety containment.

## UnitIV (15Hours)

**Introduction to intellectual property and intellectual property rights:** types: patents, copy rights, Trade marks, design rights, geographical indications– importance of IPR - world intellectual Property rights organization(WIPO).

## UnitV (15Hours)

**What can and what cannot be patented?:** Patenting life – legal protection of biotechnological Inventions – Patenting in India: **\*Indian patent act.**

## \* denotes Self study Teaching Methods

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**Text Books**

* 1. Jose Cibelli, Robert P. lanza, Keith H. S. (2002). Principles ofcloning,. Campbell, Michael D.West, AcademicPress.
  2. SassonA. (2000). Biotechnologies in developing countries present and future, UNESCOPublishers

## Reference Books

1. Singh, K. (2000). Intellectual Property Rights on Biotechnology. BCll, New Delhi. BAREACT, Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt.Ltd.,
2. Kankanala C., (2007) Genetic Patent Law & Strategy, 1st Edition, Manupatra Information Solution Pvt.Ltd.,
3. Gurumani, N. Research Methodology (2006). For Biological Sciences . MJP Publishers, Chennai

## MAPPING

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| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | M | M | M | S |
| **CO2** | S | S | H | M | H |
| **CO3** | H | M | S | H | M |
| **CO4** | S | M | S | H | S |
| **CO5** | S | M | H | S | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

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| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Non Major Elective – Environmental Management | | | |
| Batch  2022-2023 | Hours / Week  5 | Total Hours  75 | Credits  5 |

## Course Objectives

1. To learn the various issues pertaining to theenvironment
2. To combat the environmental issues with efficientstrategies
3. To assess the various existing environmental riskissues

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Recognize the subject of environmentalmanagement |
| CO2 | Demonstrate the issues concerned with environmental management |
| CO3 | Analyze the various issues of importance |
| CO4 | Criticize the right decision on combating upcomingenvironmental  Issues |
| CO5 | Employ the role of assessment of risk in the management of  environment. |

**UnitI (15Hours)**

**Concept and scope of Environmental Management:** Environmental Management of Resources - Water, forest, biological, mineral and agricultural; Environmental management of chemical, mining and manufacturing industries –petroleum, coal, cement, paper, fertilizer. Analysis and prediction of Environmental issues: Environmental Planning, Establishment of Health and Environmental standards, measuring Sustainable Development, Life Cycle Assessment, Material Flow Analysis, Environmental Auditing and Environmental Management Systems and Accounting forEco-efficiency.

## UnitII (15Hours)

**Principles of Risk Assessment:** Human Health Risk Assessments, Ecological Risk Assessment, Probabilistic Risk Assessments, Determination of acceptable risk based limits for Environmental chemicals and development of riskbased remediation goals.

## UnitIII (15Hours)

**Theroleof RiskAssessment in Environmental Management decisions** :Evaluation of Human Health Risks Associated with airborne exposures to asbestos, a diagnostic human health risk assessment for a contaminated site problem and a risk based strategy for developing a corrective action, Response plan for petroleum – contaminated sites, Risk Management and RiskCommunication.

## UnitIV (15Hours)

**Basic concepts of Environmental Economics:** International Trade and its Environmental Integrity, Ecolabelling, responsible care, design for the Environment and full-cost accounting for municipal solid waste management, Waste landsand their reclamation, Desertification and itscontrol. Soil erosion, Formation and reclamation of user, alkaline and saline soil, Terra Preta [black carbon] soil in Amazon forests for sustainability in soil; Biocharsfor energy production and as mitigation measures for global warming and **\*soilrejuvenation.**

## UnitV (15Hours)

**Environmental Education and Communication:** Environmental Conflict Management, Sustainable development-concept, and growth of the idea, indicatorsof sustainability, Sustainability of Water Resources, Sustainable Management of Forests, Sustainability in Industry, Ecosystem Management: Coastal Environments, River and Inland Water Environments, Wetlands, Desert margins, Rural and Urban Environments. Current environmental issues in India – Case studies: Narmada Dam, There Dam, AlmettiDam.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text Books**

1. Sally L. Benjamin and David, A. Bullock. (2001). Practical Guide toUnderstanding Management and Reviewing EnvironmentalRiskAssessmentReports. Lewis Publishers, WashingtonD.C
2. Mary K. Theodore, Louis Theodore (2009). Introduction to Environmental Management. 1stEdition.

## Reference Books

1. [M.C. Dash](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=M.C.%2BDash&search-alias=stripbooks) (2019). Concepts of Environmental Management for Sustainable Development.DreamtechPress.
2. KartA, Frantzen. (2001). Risk based analysis for Environmental Managers. Lewis Publishers WashingtonD.C.

## MAPPING

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| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | M | S | M | S |
| **CO2** | S | M | S | M | S |
| **CO3** | H | S | M | S | M |
| **CO4** | S | H | M | M | H |
| **CO5** | S | M | S | S | H |

**S**–Strong **H**–High **M**–Medium **L** –Low

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| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Non Major Elective – Competitive Science | | | |
| Batch  2022-2023 | Hours / Week  5 | Total Hours  75 | Credits  5 |

## Course Objectives

1. To insist the various facts of life sciences in detail
2. To learn the various information regarding the biologicalprocesses
3. To expose the students to the onlineexamination

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Recall all concepts of biochemistry in detail |
| CO2 | Explain the consolidated view of life science subjects |
| CO3 | Develop the analytical capability by learning the objective type questions |
| CO4 | Undertake competitive examinations will necessarypreparation |
| CO5 | Apply the knowledge of various fields of biochemistry. |

**UnitI (15Hours)**

**Molecules andtheir Interaction relevant to Biology:** Structureofatoms, molecules and chemical bonds - Composition, structure and functionof biomolecules

- Stabilizing interactions - Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties) - Bioenergetics,glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers - Principles of catalysis, enzymes and enzyme kinetics,enzyme regulation, mechanism of enzyme catalysis, isozymes- Conformation of proteins - Conformation of nucleic acids – Stability of proteins and nucleic acids - Metabolism of carbohydrates, lipids, amino acids nucleotides and**\*vitamins.**

## UnitII (15Hours)

**Cellular Organization:** Membrane structure and function - Structural organization and function of intracellular organelles - Organization of genes and chromosomes - Cell division and cell cycle - Microbial Physiology. FundamentalProcesses: DNA

replication, repair and recombination - RNA synthesis and processing – Protein synthesis and processing - Control of gene expression at transcription and translation level.

## UnitIII (15Hours)

**System Physiology –Plant:** Photosynthesis -Respiration and photorespiration – Nitrogen metabolism - Plant hormones – Sensory photobiology- Solute transport and photo assimilate translocation – Secondary metabolites - Stressphysiology.

**System Physiology –Animal:** Blood and circulation - Cardiovascular System - Respiratory system - Nervous system - Sense organs - Excretory system - Thermoregulation -Stress and adaptation - Digestive system - Endocrinology and reproduction.

## UnitIV (15Hours)

**Cell Communication and Cell Signalling:** Host parasite interaction - Cell signalling- Cellular communication - Cancer - Innate and adaptive immune system. Methods in Biology: Molecular Biology and Recombinant DNAmethods - Histochemicaland Immunotechniques- Biophysical Methods - Statistical Methods - Radiolabelling techniques - Microscopic techniques - Electrophysiological methods - Methods in fieldbiology.

## UnitV (15Hours)

**Applied Biology**: Microbial fermentation and production of small and macro molecules - Application of immunological principles, vaccines, diagnostics - Tissue and cell culture methods for plants and animals - Transgenic animals and plants, molecular approaches to diagnosis and strain identification - Genomics and its application to health and agriculture, including gene therapy - Bioresourceand uses of biodiversity - Breeding in plants and animals, including marker – assisted selection - Bioremediation andphytoremediation-Biosensors.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Textbooks:**

1. Kumar. (2016). ArihantPublications. 3rdedition.
2. Nithin Sharma [(2020). Ace The Race: CSIR-UGC NET Life Sciences (JRF & LS) 2nd Edition](https://www.amazon.in/Ace-Race-CSIR-UGC-Life-Sciences/dp/8192725839?ref_=ast_slp_dp).

## MAPPING

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| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | M | H | S | M | S |
| **CO2** | S | S | M | H | M |
| **CO3** | M | M | S | S | H |
| **CO4** | S | S | M | S | M |
| **CO5** | S | S | M | M | S |

**S**–Strong **H**–High **M**–Medium **L** –Low

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| **Programme Code:** 07 | | **Programme Title:** M.Sc Biochemistry | | |
| **Course Code:** NA | | **Title of the paper** Non Major Elective – Bioprocess Technology | | |
| Batch  2022-2023 | Semester  NA | Hours / Week  5 | Total Hours  75 | Credits  5 |

## Course Objectives

1. To understand the basics of fermentationtechniques
2. To learn the concepts of screening, optimization and maintenance ofcultures
3. To provide the basics of bioprocesstechnology

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K4 | CO1 | Remember the basics of bioreactors |
| CO2 | Understanding of the various aspects of bioprocess techniques |
| CO3 | Employ in biotechnological industries |
| CO4 | Distinguish the fermentation process and its kinetics |
| CO5 | Appraise the role of bioreactors in various industries. |

**UnitI (15Hours)**

**Introduction: Basic principles\*,** Historical development in fermentation, strain improvement and inoculum development. Types of fermentation: batch, fedbatch and continuous. Isolation, screening, and maintenance of microbes for industrial process. Strain selection and improvementmethods.

## UNITII (15Hours)

**Bioreactor:** Components design, parts and its functions. Types ofbioreactors: CSTR, packed bed, batch, Air lift bioreactor, Bioreactors for immobilized cells, animal cells, waste water and effluent treatment. Specialized bioreactors: pulsed, fluidized and photobioreactors.

## UNITIII (15Hours)

**Upstream processing:** Introduction, principles of microbial nutrition, Media formulation and optimization. Sterilization: Methods of sterilization- Batchand

continuous sterilization. Air sterilization, design and air filters, aseptic operation of fermentor. Inoculadevelopment for Industrial fermentations.Scale up and scale down.

## UNITIV (15Hours)

**Transport phenomena:** Mass and heat transfer mechanism. Mass, heat and oxygen transfer coefficients. Rheological properties of a fermentation broth. Bioprocess monitoring and control: On-line and Off-line analysis. Monitoring variables: pH, temperature, DO2, agitation and foam level. PID control and computer aided control.

## UNITV (15Hours)

**Downstream processing:** Overview.Primary separation - Cells, Solid matter and foam- precipitation, filtration, centrifugation, celldisruptions(Mechanical, enzymatic and chemical).Product isolation - solvent extraction, adsorption, aqueous two-phase system and precipitations. Purification techniques: Chromatography (ion - exchange, gel-permeation and affinity), membrane separation (microfiltration, Ultrafiltration and reverse osmosis). Product recovery; product polishing (drying and crystallization).

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom

**Textbooks:**

* 1. El – Mans, E.M.T., and Bryce, C.F.A. (2002). Fermentation Microbiology and Biotechnology. Taylor &Francisgroup
  2. Stanbury, P. F. &A. Whitaker. (2003). Principles of Fermentation Technology. Pergamann Press,Oxford.

## Reference books:

1. M.L.Shuler andF. Kargi.(2003). Bioprocess engineering: Basic Concepts. Prentice Hall, EngelwoodCliffs.
2. W. Cruger&A. Cruger. (2003). A Textbook of Industrial Microbiology. PanimaPub. Corp., NewDelhi.
3. R.K. Rajput. (2003). Heat and Mass Transfer in SI units. S Chand and Co. Ltd.,NewDelhi.

## MAPPING

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| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | H | M | S | S |
| **CO2** | H | S | S | H | M |
| **CO3** | S | H | S | M | S |
| **CO4** | M | S | H | S | S |
| **CO5** | S | M | S | H | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

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| **Programme C** | **ode:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Non Major Elective – Cancer Biology | | | | |
| Batch  2022-2023 | Semester  NA | Hours / Week  5 | Total Hours  75 | Credits  5 |

## Course Objectives

1. To know the biology of cancerdevelopment
2. To know the features of various cancertypes
3. To know about the mechanism of cancer cellcycle
4. To learn the screening and diagnosis methods forcancers
5. To learn the treatment strategies for variouscancers

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Remember the basic knowledge on cancer development |
| CO2 | Understand the molecular mechanisms of cancer cell cycle |
| CO3 | Apply the techniques for diagnosis of various cancers |
| CO4 | Contribute the role of different treatment strategies and its application |
| CO5 | Employ various strategies in the treatment of cancer |

**UnitI (15Hours)**

**Cancer:** Introduction, Normal cells and tissues, Control of growth in normal Tissues, Tumour growth, the process of carcinogenesis\*, Genes involved in carcinogenesis, Factors influencing the development of cancers. **Risk factors for cancer:** Tobacco, infections, dietary-related factors, reproductive and hormonal factors, radiation, occupational carcinogens, medical carcinogens (non-radiation), environmental pollution, genetic predisposition, mutagens and mutational spectra in relation to cancertypes.

## UnitII (15Hours)

Epidemiology, Etiology, pathology, Clinical Features, Diagnosis and Evaluation, Management of breast, oral, cervical, gastric, lung and skin cancer. Role of tumour

suppressor genes (Rb, p53, NF1, BRCA 1 & 2) in cancer prevention and the mechanism leading to loss of function.

## UnitIII (15Hours)

**Cancer cell cycle:** Introduction, cell cycle events in normal and neoplastic cells, restriction point control and its loss, initiation of DNA replication, completion of DNA replication, checkpoint responses to DNA damage in G1 and S phase, from G2 to mitotic metaphase, checkpoints controlling mitotic entry, centrosome duplication and the maintenance of ploidy, the metaphase–anaphase transition and exit from mitosis, cell cycle proteins as prognostic markers and drug targets.

## UnitIV (15Hours)

**Screening of cancer:** Introduction, Types of screening tests, Safety and acceptability, Evaluation of screening (Evaluating the test, Potential biases, Randomized trials, Screening programmes), Types of screening test (Visual inspection, Palpation, Analysis of exfoliated cells, Imaging, Serum and urine markers, screening for and treatment of infections), Screening for specific cancers (Cervix cancer, Breast cancer, Colorectal cancer, Prostate cancer).

## UnitV (15Hours)

**Local treatment of cancer:** Introduction, Skin cancers, Breast cancer, Lung cancer, Prostate cancer, Colo rectal cancer. **Chemotherapy:** Mechanisms of action and resistance to traditional cytotoxic drugs, Therapeutic principles of traditional cytotoxic chemotherapy. **Radiotherapy. Immunotherapy of cancer:** Introduction, Specific Immunotherapy (Human tumour antigens & genetically enhanced T cells), Non-specific immunotherapy (Immunotherapy withcytokines).

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/GoogleClassroom

**Textbook:**

* 1. Introduction to the Cellular and Molecular Biology of Cancer. Margaret A.Knowles Peter

J. Selby. Oxford University Press 2005, Fourth Edition

## Reference books:

1. Franco Cavalli, Stan B. Kaye, Heine, H.Hansen, James O. Armitage, Martine J. Piccart- Gebhart (2009). Textbook of Medical Oncology. Fourth Edition. InformaHealthcare.
2. Raymond W. Ruddon (2007). Cancer Biology Fourth Edition, Oxford UniversityPress.
3. Arthur B. Pardee. Gary S. Stein (2009). The Biology and Treatment of Cancer. Understanding Cancer by John Wiley & Sons, Inc.
4. Harvey Lodish, Arnold Berk*et al*., (2007). Molecular Cell Biology. 6thedition, W HFreeman and Company, NewYork.

## MAPPING

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| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | S | S | M | S |
| **CO2** | M | H | M | H | M |
| **CO3** | S | M | S | M | H |
| **CO4** | S | H | M | H | M |
| **CO5** | S | M | S | M | H |

**S**–Strong **H**–High **M**–Medium **L** –Low

## KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

Re-accredited by NAAC with ‘A’ Grade Status – 3.64CGPA out of 4 (3rdCycle) College of Excellence (UGC)

## COIMBATORE – 641029, TAMIL NADU, INDIA.

**QUESTION PAPER PATTERN FOR CIA & END OF SEMSTER EXAMINATION**

**M. Sc., BIOCHEMISTRY**

1. **THEORY** Max Marks =75

Time = 3.00hrs

**SECTION-A** (10 x 1=10marks)

Choose the correct answer type.

*Q.No. 1 to 10: Multiple choice type* ***alone****.*

Questions with four alternative (distracter) answers each (Two questions from eachunit).

*Q.No. 11 to 15: Fill in the blanks* ***alone****.* (5 x 1=5marks)

*Q.No. 16 to 20: one word answer* ***alone****.* (5 x 1=5marks)

**SECTION-B** (5 x 5=25marks)

Short answer questions

*Q.No. 21-28: Answer any 5 out of 8*

**SECTION-C** (3x 10=30marks)

Essay type of questions:

*Q.No. 29-33: Answer any 3 out of 5*

## BREAK UP OF INTERNAL MARKS (25marks)

**Internal marks (50) = CIA (**out of 30**) + problem based Assignment (**out of 10**) + Attendance (**out of 5**) + others(**out of5**)**

## \*CIA marks (out of 30 marks) = I CIA marks + II CIA marks / 150 X 15 PBC 79

1. **PRACTICALS–QuestionPattern&Break-upofmarks**

### END OF SEMESTER PRACTICAL EXAMINATION

Max. Marks: 50 Duration: 3hrs

* 1. **Major** (Onequestion) (1 x 15= 15)
  2. **Minor** (Onequestion) (1 x 10 = 10)
  3. **Spotters** (3 x 5=15)

Examine, identify and critically comment on the spotters A, B, C, D and E.

* 1. **Viva** (05)

## Record/Observation\* (05)

*\*Record for ESE; Observation for CIA exam.*

### INTERNAL - PRACTICAL MARKS

|  |  |  |
| --- | --- | --- |
| From Model Practical Examination | - | 30 |
| Observation | - | 15 |
| Attendance | - | 5 |
| **Total** | **-** | **50** |

**PRACTICALS – Question Pattern & Break-up of marks**

***END OF SEMESTER PRACTICAL EXAMINATION***

Max. Marks: 50 Duration: 3hrs

|  |  |  |
| --- | --- | --- |
| **I. Major** | (One question) | (1 x 15 =15) |
| 1. **Minor** 2. **Spotters** | (One question) | (1 x 10 = 10)  (3 x 5 = 15) |

Examine,identifyandcriticallycommentonthespottersA,B,C,DandE.

1. **Viva** (05)

## Record/Observation\* (05)

*\*Record for ESE; Observation for CIA exam.*

|  |  |  |
| --- | --- | --- |
| ***INTERNAL - PRACTICAL MARKS*** |  | |
| From Model Practical Examination | - | 30 |
| Observation | - | 15 |
| Attendance | - | 5 |
| **Total** | **-** | **50** |

## PBC 81

**PROJECT VIVA-VOCE EXAMINATION**

**Maximum marks: 100**

**Continuous Internal Assessment (CIA)**

Project review I&II – 45 marks Regularity – 5marks

Total –50marks

## End of Semester Examination (ESE)

Projectreport – 35marks

Viva-voce – 15marks

Total – 80marks

==============================================

CIA – 50marks

ESE – 50marks

Total – 100marks

## Sub code: 22PBCOD1

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** ALC – Forensic Science | | | |
| Batch  2022-2023 | Hours / Week  NA | Total Hours  NA | Credits  4 |

**Course Objectives**

1. Todealswiththeforensicaspectslikelegalproceduresandtypesoftrauma.
2. To prop up and develops regulation in forensicscience
3. To give students with a sound basis in forensicscience

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Define the basic concepts of forensicscience |
| CO2 | Understand theidentification procedures employed underforensics  Science |
| CO3 | Apply the fingerprint analysis and interpretations in research fields |
| CO4 | Examine and analyze the results involved in fingerprinting technique |
| CO5 | Evaluate the physical analysis andinjuries. |

**Unit I**

**Crime scene management and investigation:** Collection, preservation, packing and forwarding of physical and trace evidences for analysis. Legal and court procedure related to expert testimony. Consumer Protection Act: rights and liabilitiesof doctors, medical indemnity insurance; human rights and violation; duties of medical practitioners to victims of torture; Human organ transplantationAct.

## Unit II

**Identification of the living and the dead:** Forensic thanatology; death; causes of death; mechanism and manner of death; changes after death; artifacts; medico legal

Death in vestigation; exhumation. Examination and identification of hair, semen, saliva, urine, faecal matter and milk. DNA fingerprinting and HLA typing.

## Unit III

**Physical analysis:** Soil, glass, paints, lacquers, cement, inks, paper, tool and tyremarks

shoeprints. Forensic examination of vehicles in cases of accident.Identification of individualization from foot prints andteeth.

## Unit IV

**Injuries:** Mechanical injuries; injuries due to electricity, lightning andradiation; train and road traffic accidents; firearm and explosion injuries; medico legal aspects of wounds. General aspects; patho-physiology and classification; mechanical asphyxia; hanging; strangulation; drowning; smothering,choking,garroting,burking,yoking.

## Unit V

**Medico legal aspects:** Medico legal aspects ofwounds. Post mortem examinationand changes, asphyxia death, sexual offences, infanticide, forensic psychiatry and lye detection. History, classification, search, lifting and examination of fingerprints.Various methods for the development of latent fingerprints, **\*Crime records and computerization.**

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text Books**

* 1. NarayanareddyK. S. (2007). The Essentials of Forensic Medicine &Toxicology. 26th edition, K. SuganaDevi publishers,Hyderabad.
  2. Basu, R. (2009). Fundamentals of forensic medicine and toxicology. 2ndEdition, Books and Allied (P) Ltd.Kolkata.

## Reference Books

* + 1. PillayV.V. (2009). Text book of Forensic Medicine, ParasPublication. Hyderabad.
    2. JB Mukherjee’s. (2007). Forensic Medicine and Toxicology-Volume I and II (combined)-edited by Karmakar, 3rdedition.
    3. R.Saferstein.(2004).Criminalistics.8thedition,PrenticeHall,NewJersey.

## MAPPING

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | S | M | M | S |
| **CO2** | S | H | M | S | H |
| **CO3** | H | S | S | M | H |
| **CO4** | M | S | H | M | M |
| **CO5** | S | M | S | H | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub code: 22PBCOD2

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** ALC – Nutraceuticals and Functional Foods | | | |
| Batch  2022-2023 | Hours / Week  NA | Total Hours  NA | Credits  4 |

**Course Objectives**

1. To learn the concept of nutraceuticalsand functionalfoods
2. To know the available biochemical compounds in oursystem
3. To prepare functional foods from nutraceuticalcompounds

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Remember the complete history ofnutraceuticals |
| CO2 | Classity the different nutraceuticals |
| CO3 | Illustrate the formulation methods of functional foods |
| CO4 | Distinguish the role of functional foods in disease prevention and management |
| CO5 | Employ the role of nutraceuticals in various disorders. |

**Unit I**

**Introduction to Nutraceuticals as Science:** Nutraceutical- Definition, Classification - Dietary supplements, Functional foods, Historical perspective, scope &future prospects. Applied aspects of the Nutraceutical Science.Sources of Nutraceuticals. Relation of NutraceuticalScience with other Sciences: Medicine, Human physiology, genetics, food technology, **\*chemistry and nutrition (brief description).**

## Unit II

**Classification, Properties and structure of various Nutraceuticals:** Alkaloids, Terpenoids,Glycosides, Natural phenols, Isoprenoidderivaties, Glucosamine, Octacosanol, flavonoids, carotenoids, polyunsaturated fatty acids, lecithin, choline and spingolipids, Lycopene, Carnitine, Melatonin and Ornithine alphaketoglutarate

asneutraceuticals. Use of proanthocyanidins, grape products, flaxseed oil as Nutraceuticals.

## Unit III

**Nutraceuticals of plant and animal origin:** Plant metabolites - Functions, sources - Alkaloids, phenols, Terpenoids. Applications with specific examples with reference to skin, hair, eye, bone, muscle, heart, brain, liver, kidney, general health and stimulants. Concept of cosmoceuticalsand aquaceuticals.Animal metabolites – Functions, Sources - chitin, chitosan, glucosamine, chondroitin sulphateand other polysaccharides of animal origin.Uses and applications in preventive medicine and treatment.

## Unit IV

**Functional Foods:** Definition. Applications of herbs to functional foods.Concept of free radicals and antioxidants; Nutritive and Non-nutritive food components with potential health effects.Soy proteins and soy isoflavonesin human health; Role of nutsin cardiovascular disease prevention. Functional foods from wheat and rice and their health effects. Role of Dietary fibers in disease prevention.Vegetables, Cereals, milk and dairy products as Functional foods. Health effects of common beans, Capsicumannum,mustards,Ginseng,garlic,citrusfruits,fishoils,andseafoods.

## Unit V

**Foodas remedies:** Nutraceuticals bridging thegapbetween foodand drug, Nutraceuticalsin treatment forcognitive decline, Nutraceuticalremediesfor common disorders like Arthritis, Bronchitis, circulatory problems, hypoglycemia, Nephrological disorders, Liver disorders, Osteoporosis, Psoriasis and Ulcers etc. Brief idea about some Nutraceuticalrich supplements e.g. Bee pollen, Caffeine, Greentea,Lecithin,Mushroomextract,Chlorophyll,KelpandSpirulinaetc.

## \* denotes Self study

**Teaching Methods**

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text Books:**

1. SwaminathanM.(2014).EssentialsofFoodandNutrition.2ndedition.Bappco.
2. C. Gopalan, B. V. Rama Sastri& S.C. Balasubramanian, (Reprinted 2007, 2011) Nutritive Value Of Indian Foods(NVIF),

## Reference Books:

1. Todd and others. Clinical Diagnosis and Management. 17th edition, W.B.Saunders, Philadelphia.
2. Clinicaldieteticsandnutrition20014thEdition,OxfordUnivPress.
3. Sizer, F. &Whitney, E. (2000). Nutrition-Concepts &Controversies. 8thedition, Wadsworth ThomsonLearning**.**

## MAPPING

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | M | H | S | S |
| **CO2** | M | S | S | M | M |
| **CO3** | S | H | M | S | H |
| **CO4** | M | S | H | H | S |
| **CO5** | M | S | M | H | S |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub Code: 22PBCOD3

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** ALC –Stem CellBiology | | | |
| Batch  2022-2023 | Hours / Week  NA | Total Hours  NA | Credits  4 |

**Course Objectives**

1. To learn about the technology of stem cellspreparation
2. To learn the properties of stemcells
3. To prepare stem cells for genetherapy

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Recall the different types of stem cells and its applications |
| CO2 | Explain the importance of gene therapy in various diseases |
| CO3 | Interpret implement the stem cell in therapies |
| CO4 | Examine the molecular concepts of stem cell |
| CO5 | Appraise the role of stem cells in various disorders. |

**Unit I**

**Introduction and Scopeof stem cells:** Definitions, Concepts of stem cells, differentiation, maturation, proliferation, pluripotency, self maintenanceand selfrenewal, significations in measuring stemcells, preservation and storage protocols

## Unit II

**Types of stem cells:** Intestinal stem cells, Mammary stem cells, Skeletal muscle stem cell,keratinocytestem cells of cornea, skin and hair follicles, tumor stem cells. Factors influencing proliferation and differentiation of stem cells. Role of hormoneindifferentiation.

## Unit III

**Embryonic stem cells:** Blastocyst, inner cell mass, Culturing of ES cells in lab, laboratory tests to identify ES cells, stimulation ES cells for differentiation, properties of ES cells, human ES cells, Monkey and Mouse ES cells.

## Unit IV

**Application of stem cell:** Identification, Manipulating differentiation pathways, stem cell therapy vs cell protection, stem cell in cellular assays for screening, stem cellbased drugdiscovery platforms, drug screening and toxicology, stemcell banking.

## Unit V

**Gene therapy:** Genetically engineered stem cells, stem cells and animal cloning, transgenic animals and stem cells, Therapeutic applications, Parkinson’s disease, Neurological disorder, limb amputation, heart disease, spinal cord injuries, diabetes, burns. Matching the stem cell with transplant recipient, HLA typing Alzheimer’s disease, spinal cord injuries tissue engineering application, production of complete organ, kidney, eyes, heart, and brain. \***Stem cell case study.**

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text Books**

* 1. KursadandTurksen.(2002).EmbryonicStemcells,HumanaPress.

## Reference Books

1. Stem cell and future of regenerative medicine. By committeeon the Biologicaland Biomedical applications of Stem cell Research. (2002). NationalAcademic press.

## MAPPING

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | H | M | S | H | S |
| **CO2** | S | S | M | H | S |
| **CO3** | M | H | S | M | H |
| **CO4** | H | S | S | M | M |
| **CO5** | H | S | H | M | S |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub Code:22PBCOJ1

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** JOC –Bio-Entrepreneurship | | | |
| Batch  2022-2023 | Hours / Week  2 | Total Hours  30 | Credits  4 |

**Course Objectives**

1. To learn about the concepts ofentrepreneurship
2. To study the various opportunities in launching and running abusiness
3. To know the various strategies of effectiveentrepreneurship

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | List the concepts ofentrepreneurship |
| CO2 | Report the different strategies adopted for a better entrepreneurship |
| CO3 | Discriminate the various biological entrepreneurshipprogrammes |
| CO4 | Apply the quipped enough to become an entrepreneur |
| CO5 | Employ in understanding about the marketing of products. |

**UnitI (6Hours)**

Basics of Bioentrepreneurship Introduction to bioentrepreneurship– Biotechnologyin a global scale, Scope in Bioentrepreneurship, Importance of entrepreneurship. Meaning of entrepreneur, function of an entrepreneur, types of entrepreneur, advantagesof being entrepreneur. Innovation – types, out ofbox thinking, opportunities for Bioentrepreneurship. Entreprenuership development programs of public and private agencies (MSME, DBT, BIRAC, Startup and Makein India). Patent landscape, IP protection and commercializationstrategies.

## UnitII (6Hours)

Management, Accounting andFinance Management principles of Henry Fayol. Business plan preparation: business feasibility analysis by SWOT, socio-economic costs benefit analysis, Sources of financial assistance – making a business proposal, approaching loan from bank and other financial institutions, budget planning and cash flow management, basics in accounting practices - balance sheet, P&Laccount,

double entry book keeping, estimation of income, expenditure and Income tax. Collaborations and partnerships, information technology for business administration and expansion.

## UnitIII (6Hours)

Knowledge Centre and R&D Knowledge centers - Universities, innovation centre, research institutions and business incubators. R&D - technology development and upgradation, assessment of technology development, managing technology transfer, industry visits to successful bio-enterprises, regulations for transfer of foreign technologies, quality control, technology transfer agencies, Understanding of regulatory compliances and procedures (CDSCO, NBA, GLP, GCP & GMP)

## UnitIV (6Hours)

Medium &Small Scale Industry Definition, characteristics, need and rationale, objectives, scope and advantages of small scale industries.Types of bioindustries– Pharma, AgriandIndustry.Biofertilizers production - \*Azospirillium, Azolla, Cyanobacteria and its applications.Biopecticides production- Bacterial, fungal, viraland plant insecticides. Sericulture.Apiculture.Dairy farming.Single Cell ProteinProductionand applications.Vermicomposting anditsapplications.Mushroom cultivation and its application.Ancillary and tiny industries

## UnitV (6Hours)

Marketing and Human Resource Development Assessment of market demand for potential product(s) of interest, Market conditions, segments, prediction of market changes, identifying needs of customers including gaps in the market. Branding issues, developing distribution channels – franchising policies, promotion,advertising, branding and market linkages. Marketing of agro products. Recruitment and selection process, leadership skills, managerial skills, organization structure, training, team building andteamwork.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom

**Text Books**

* 1. “Entrepreneurship and Business of Biotechnology”, S. N. Jogdand, Himalaya Publishing Home,2007.

## Reference Books

1. Stephon, Robbins. (2003). Management.17th edition, Pearson Education.

## MAPPING

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | M | S | M | M |
| **CO2** | H | S | M | S | H |
| **CO3** | S | M | S | H | S |
| **CO4** | H | M | M | M | S |
| **CO5** | H | M | S | H | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub Code:22PBC0J2

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** JOC - Food Safety and Quality Control | | | |
| Batch  2022-2023 | Hours / Week  2 | Total Hours  30 | Credits  4 |

**Course Objectives**

1. To learn the principles of food qualitycontrol
2. To learn the methodologies to standardize and ensuring foodsafety
3. To gain knowledge on the framed food safetyregulations

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Repeat the various steps in the quality control of food items |
| CO2 | Classify the various foodstandards |
| CO3 | Illustrate the various methods to determine the quality of foods |
| CO4 | Examine the various regulations concerned with the food quality issues |
| CO5 | Evaluate the methods in standardization of quality control of foods. |

**UnitI (6Hours)**

**Principles of Quality control of food:** Raw material control, processed control and finished product inspection. Leavening agents, classification, uses and optimum levels. Food additives - Preservatives, colouring, flavouring, sequestering agents, emulsifiers,antioxidants.

## UnitII (6Hours)

**Standardisation systems for quality control of foods:** National and International standardization system, Food grades, Food laws-compulsory andvoluntarystandards. Food adulteration - Common adulterants in foods and tests to detect commonadulterants.

## UnitIII (6Hours)

**Standards for foods:** Cereals and pulses, sago and starch, milk and milk products, Coffee, tea, sugar and sugar products.

## UnitIV (6Hours)

**Methods for determining quality:** Subjective and objective methods. Sensory assessment of food quality-appearance, color, flavour, texture and taste, different methods of sensory analysis, preparation of score card, panel criteria, sensory evaluation room.

## UnitV (6Hours)

**Food safety, Risks and hazards:** Food related hazards, Microbial consideration in food safety, HACCP-principles and structured approach. Chemicalhazardsassociated with foods**.\*FSSAI.**

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text Books**

1. Food Science-Srilakshmi (2001). 2nd edition, New age international publishers- (2001)

## Reference Books

1. Swaminathan M. (2014). Essentials of Food and Nutrition.2 nd edition.Bappco.

## MAPPING

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | M | S | S | M | M |
| **CO2** | H | S | S | M | S |
| **CO3** | M | M | M | S | H |
| **CO4** | S | S | M | M | M |
| **CO5** | S | M | S | M | H |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub Code:22PBCOJ3

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** JOC –Clinical and TherapeuticNutrition | | | |
| Batch  2022-2023 | Hours / Week  2 | Total Hours  30 | Credits  4 |

**Course Objectives**

1. To enable the basic principles of clinicalnutrition
2. To understand the clinical significance of biochemicalfindings
3. Todevelop skills in planning and prep arationof therapeutic diets for various diseases

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Commemorate the basics of nutritionalcare |
| CO2 | Explain the relation between nutrition and health |
| CO3 | Interpret the lifestyle and nutritional assessment techniques |
| CO4 | Analyze the main nutrients and its functions in the body |
| CO5 | Appraise the role of probiotics in diet. |

**UnitI (6Hours)**

Guidelines for dietary planning: **\*Weights and Measures.** Nutritional Assessment.Nutritional care process. Nutritional intervention: Objectives of diet therapy,Therapeuticmodificationofthenormaldiet:dietprescription.RoutineHospitaldiet

- regular diets, clear fluid diet, full fluid diet, soft diet, modifications of food and nutrient intake, Enteral nutrition, parenteral nutrition, Refeeding syndrome, Transitional feeding. Medical and nutritional care record types and uses, Format for medical and nutrition charting and documentation record.

## UnitII (6Hours)

Dietician and Nutrition counselling: Role of dietician on hospitalized and outdoor patients and development of nutritional careplan. Specific functionsof atherapeutic, administrative and consultant dietician. Team approachinpatientcare.

Psychological considerations in feeding the patients.Inter personal relationship withpatients. Nutrition counseling- concept, components, activities forbehaviourchanges,interventioncounselingmodels,typesofcounsellingsessioninpatients.

## UnitIII (6Hours)

Weight imbalances, anorexia nervosa andBulimia nervosa, cardiovasculardisorders, Diabetes mellitus-Type I, II, GI Tract Disorders, Liver and gall bladder, Pancreatic disorders, renal disorder, gout, cancer, Musculo-skeletal disorders (Rheumatoid Arthritis, Osteoarthritis, Osteoporosis), Respiratory problems, hyper metabolic conditions- Burns, Sepsis,Surgery.

## UnitIV (6Hours)

**Pro and prebiotics:** Probiotics: Taxonomy and important features of probiotic microorganisms. Health effects of probiotics with mechanism of action. Probiotics in various foods: fermented milk products, non-milk products etc. **Prebiotics**: Definition, chemistry, sources, metabolism and bioavailability, effect of processing, physiological effects, effects on human health and potential applications in risk reduction of diseases. perspective for food applications for the-Non-digestible carbohydrates/oligosaccharides, Dietary fibre, Resistant starch, Gums. Palliative diet and nutritional care.

## UnitV (6Hours)

Food- Drug Interaction: Effect of Food on Drug Therapy. Effect ofDrug on Foodand Nutrition. Modification of Drug Action by Food and Nutrition.Effect of Drug on Nutritional Status.Excipients and Food-Drug Interaction.**\*Medical nutritional therapy**.

## \* denotes Self study Teaching Methods

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text Books**

* 1. Mahan, L.K. and Escott-Stump, S. (2008). Krause’s Food Nutrition and Diet- Therapy. 12thedition, W-13 Saunders Ltd.,Canada.
  2. Garrrow J.S, James W. P.T, Ralph A. (2000). Human Nutrition and Dietetics. 10th

edition, Churchill Livingston, London.

## Reference Books

1. AntiaF.P. And Philip Abraham. (2001). Clinical Nutrition and Dietetics. Oxford Publishing Company, NewDelhi.
2. Williams, S.R. (2003). Nutrition and Diet Therapy. 7th edition, Times Mirror/Mosby CollegePublishing
3. Esther A. Winter feldt, Margret L. Bogle, Lea L. Ebro. (2011). Dietetics: Practice &FutureTrends.3rdedition,JonesandBarletPublishers.

## MAPPING

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | M | H | S | S |
| **CO2** | M | S | S | M | M |
| **CO3** | S | H | M | S | H |
| **CO4** | M | S | H | H | S |
| **CO5** | S | M | H | S | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

# CERTIFICATE COURSE IN MEDICAL LABORATORYTECHNOLOGY

## KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

Re-accredited by NAAC with ‘A’ Grade Status – 3.64 CGPA out of 4 (3rd Cycle) College of Excellence (UGC)

## COIMBATORE – 641029, TAMIL NADU, INDIA.

**Course Name: M.Sc. Biochemistry Curriculum and Scheme of Examination under CBCS**

**(Applicable for the Students Admitted during the Academic Year 2022-2023 onwards)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject code/ Question**  **paper code** | **Title of the paper** | **Instructions**  **hours/cycle** | **Exam Marks** | | | **Duration of**  **Exam (Hrs)** | **Credits** |
| **CIA** | **ESE** | **Total** |
| 22PBC0F1 | Paper I: Biochemistry | 2 | - | 100 | 100 | 3 | 4 |
| 22PBC0F2 | Paper II: Clinical Pathology and  Microbiology-I | 2 | - | 100 | 100 | 3 | 4 |
| 22PBC0F3 | Practical I | 2 | - | 100 | 100 | 3 | 4 |
| 22PBC0F4 | On the Job training and Viva voce | 2 | - | 100 | 100 | 3 | 8 |

**Sub Code:22PBC0F1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Paper I-Biochemistry | | | |
| Batch  2022-2023 | Hours / Week  2 | Total Hours  60 | Credits  4 |

**Course Objectives**

1. To acquire the knowledge on laboratory safety andmeasures
2. To know the techniques of biochemistry and clinicalchemistry
3. To obtain information about various enzymes analysis and analyticaltechniques

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Commemorate the basics of laboratorypractices |
| CO2 | Explain the relation between colorimetric and titrimetric techniques |
| CO3 | Interpret various clinical laboratorytechniques |
| CO4 | Analyze the basic concepts inautomation. |
| CO5 | Appraise the mechanism of management of laboratory. |

**UnitI (12Hours)**

**Laboratory safety and Specimen processing:** General approach to medical laboratory sciences. Safety in laboratory.General laboratory instruments and equipments.Basic chemistry and laboratory chemicals. Specimen processing for biochemical analysis: blood, urine,CSF.

## UnitII (12Hours)

**Biochemical techniques:** Principles of analytical techniques. Basic concepts in analytical chemistry, colorimetry, spectrophotometry, titrimetry, flame photometry, chromatography, electrophoresis, PCR, Real time PRR. Immunochemistry: ELISA, RIA, CLIA, flow cytometry and biochips.

## UnitIII (12Hours)

**Clinical chemistry:** Biochemical tests: glucose, protein, albumin, urea, creatinine, uric acid, bilirubin and cholesterol. Enzymes: **\*SGOT**, SGPT, ALP, ACP, LDH, creatinine kinase, lipase, amylase, choline esterase. Hormones: Insulin, T3, T4, TSH,cortisol, FSH, progesterone and estrogen. Electrolytes and blood gases.Biochemical profiletest:

liver function test, renal function test, gastric function test, pancreatic function testand endocrine functiontest.

## UnitIV (12Hours)

**Automation in clinical laboratory:** Basic concepts, automation of the analytical processes, steps of automation in biochemical analysis, computers in the clinical laboratory, types of automated analysers, commonly used analysersofbiochemical

laboratories. Statistical procedures: Arithmetic mean, median, standard deviation, coefficient of correlation, t test and ANOVA

## UnitV (12Hours)

**Laboratory management:** Clinical laboratory informatics, computer systems, laboratory information systems. Laboratory management: Basic concepts, financial management, quality management-fundamentals, total quality managementof clinicallaboratory.

## Reference Books

1. OcheiJandKlohatkarA. (2000). Medical Laboratory Science-Theory and Practice. Tata McGraw Hill Publishing CompanyLimited.
2. ChatterjeeMNandShindeR. (2002). Text book of Medical Biochemistry.5 th

edition. Jaypee Brothers Medical Publishers.

## MAPPING

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | M | H | S | S |
| **CO2** | M | S | S | M | M |
| **CO3** | S | H | M | S | H |
| **CO4** | M | S | H | H | S |
| **CO5** | S | M | H | S | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub Code:22PBC0F2

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Paper II-Clinical Pathology and Microbiology | | | |
| Batch  2022-2023 | Hours / Week  2 | Total Hours  60 | Credits  4 |

**Course Objectives**

1. To acquire the knowledge on microbialtechniques
2. To know the techniques of serologicalprocedures
3. To obtain information on hematologicalprocessing

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Recall the basics ofmicrobiology. |
| CO2 | Explain the relation between various infectious agents |
| CO3 | Interpret sero diagnostic techniques |
| CO4 | Analyze the basic concepts in clinical pathaology |
| CO5 | Evaluate the mechanisms in hematology |

**UnitI (12Hours)**

**Microbiology:** Introduction to diagnostic microbiology and microbiological techniques. Role of microbiology in laboratory, specimen handling, laboratoryrecords maintenance, safety regulations, basic procedures of diagnostic microbiology, culture environment of microbes and quality control in microbiology. **UnitII (12Hours)**

**Diagnostic Bacteriology:** Systemic grouping of pathogenic bacteria, laboratory identification of infectious agents, diagnosis of anaerobic infection, identifying characteristics of common pathogenic bacteria. Anti microbial susceptibility test.

Diagnostic of mycotic infection: Introduction to fungi, parasitic fungi, specimen collection, laboratory diagnosis of mycotic infection, diagnostic mycology.

## UnitIII (12Hours)

**Serology:** Serology and serodiagnostic procedures: Principles of immunological reactions, serodiagnosis. Laboratory procedures in serology: Collection and preparation of specimen. CRP test, RA test, ASO test, HIV, immunologic test for pregnancy.

## UnitIV (12Hours)

**Clinical Pathology:** Clinical pathology and urine analysis: Urine analysis, routing examination of urine, rapid chemical test of urine. Laboratory examination of miscellaneous body fluids: CSF, serous fluids, synovial fluids and gastric juices. Semen analysis: Clinical examination, specimen collection, laboratory investigation. Stool examination: Clinical significance, collection of faecal specimen and laboratoryinvestigations.

## UnitV (12Hours)

**Hematology:** Components of blood and their function, specimen collection. Routine haematological test: RBC, WBC, DC, TC, platelet, **\*Hb**, EST, PCV. Bleeding disorders: Bleeding time, clotting time, routine coagulation test. Blood banking: Human blood grouping system, transfusion reactions, collection and processing of blood for transfusion.

## Reference Books

1. OcheiJ and KlohatkarA. (2000). Medical Laboratory Science-Theory and Practice. Tata McGraw Hill Publishing CompanyLimited.
2. ChatterjeeMN and ShindeR. (2002). Text book of Medical Biochemistry. 5th

edition. Jaypee Brothers Medical Publishers.

1. VarleyS. (1988). Practical Clinical Biochemistry. 6th edition, CBS Publishers and Distributors.

## MAPPING

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| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | M | S | S | H |
| **CO2** | M | H | S | S | M |
| **CO3** | S | S | M | M | H |
| **CO4** | M | S | S | H | S |
| **CO5** | S | M | M | S | H |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub Code:22PBC0F3

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper :**Practical I | | | |
| Batch  2022-2023 | Hours / Week  2 | Total Hours  60 | Credits  4 |

**Course Objectives**

1. To attain the knowledge on serum and urineanalysis
2. To know the principles and techniques ofmicrobiology
3. To acquire knowledge on pathologicaltechniques

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Recall the basics of biological samples |
| CO2 | Explain the experiments inBiochemistry |
| CO3 | Interpret various clinical laboratorytechniques |
| CO4 | Analyze the pathogens used in microbiology.. |
| CO5 | Be competent enough to handle various clinical pathology experiments. |

**Biochemistry:**

1. Analysis inserum:

Glucose, creatinine, uric acid, cholesterol, urea, bilirubin, total protein, albumin, total lipids, triglycerides, HDL

1. Analysis inurine:

Glucose, creatinine, uric acid, urea

1. Analysis in CSF: Sugar andprotein
2. Enzymes:SGOT,ALP,LDH,CK,lipase,amylaseandcholineesterase
3. Hormones: Insulin, TSH,estrogen
4. Electrolytesinserumandurine:Sodium,potassium,chlorides,calcium
5. Routine complete urineanalysis

**Microbiology:**

1. Sterilization and mediapreparation
2. Stainingprocedures:Simple,differential,negativeandacidfaststaining
3. Identification of pathologicalorganism
4. Biochemical analysis of microbialstrains
5. Processingofclinicalspecimens:Urine,pus,bloodandotherbodyfluids

**Clinical Pathology:**

1. CRP
2. ASO
3. RA
4. HIV
5. VDRL
6. WIDAL
7. Blood banking: Sample collection andstorage

## Reference Books

* 1. Mukherjee KL. (1988). Medical Laboratory Technology-A procedure manual for routine diagnostic tests, VolI, II, III. Tata McGraw HillPublishingCompany Limited.
  2. BurtisCA,AshwoodER.(1999).TeitzTextbookofClinicalChemistry.3rd

edition, WB Saunders Company.

* 1. VarleyS. (1988). Practical Clinical Biochemistry. 6 thedition, CBSPublishers andDistributors.

## MAPPING

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| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | M | H | S | S |
| **CO2** | M | S | S | M | M |
| **CO3** | S | H | M | S | H |
| **CO4** | M | S | H | H | S |
| **CO5** | S | M | H | S | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Question paper pattern (External only)

* + 1. **THEORY** Max Marks =100

Time = 3.00hrs

**SECTION-A** (5 x 5=25marks)

Short answer questions

*Q.No. 1-5: Either (a) or (b) short note type (One question ‘a’ or ‘b’ from eachunit)*

**SECTION-B** (5 x 15=75marks)

Essay type of questions:

*Q.No. 6-10: Either (a) or (b) essay type (One question ‘a’ or ‘b’ from each unit)*

## PRACTICALS–QuestionPattern&Break-upofmarks

### END OF SEMESTER PRACTICAL EXAMINATION

Max. Marks: 100 Duration: 3hrs

1. **Major** (Onequestion) (1 x 20 = 20)
2. **Minor** (Onequestion) (1 x 10 = 10)
3. **Spotters** (3 x 5 =15)

Examine, identify and critically comment on the spotters A, B, C, D and E.

1. **Viva** (05)

## Record/Observation\* (10)

*\*Record for ESE; Observation for CIA exam.*

# DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

## KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

Re-accredited by NAAC with ‘A’ Grade Status – 3.64 CGPA out of 4 (3rd Cycle) College of Excellence (UGC)

## COIMBATORE – 641029, TAMIL NADU, INDIA.

**Course Name: M.Sc. Biochemistry Curriculum and Scheme of Examination under CBCS**

**(Applicable for the Students Admitted during the Academic Year 2022-2023)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject code/ Question**  **paper code** | **Title of the paper** | **Instructions**  **hours/cycle** | **Exam Marks** | | | **Durationof**  **Exam (Hrs)** | **Credits** |
| **CIA** | **ESE** | **Total** |
| 22PBC0F5 | Paper I: Anatomy, Physiology and  Laboratory safety | 2 | - | 100 | 100 | 3 | 4 |
| 22PBC0F6 | Paper II: Clinical Pathology and Medical  Microbiology II | 2 | - | 100 | 100 | 3 | 4 |
| 22PBC0F7 | Practical II | 2 | - | 100 | 100 | 3 | 4 |
| 22PBC0F8 | On the job training and Viva voce | 2 | - | 100 | 100 | 3 | 8 |

**Sub Code:22PBC0F5**

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Paper I-Anatomy, Physiology and Laboratory safety | | | |
| Batch  2022-2023 | Hours / Week  2 | Total Hours  60 | Credits  4 |

**Course Objectives**

1. To learn the anatomy of different organs in humanbody
2. To know the structure and functions oforgans
3. To acquire the knowledge on laboratory safety andmeasures

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Commemorate the basics of anatomy of the body |
| CO2 | Understand the relation between various organs and its functions. |
| CO3 | Distinguish different organs and its functions. |
| CO4 | Analyze the functions of respiratory system |
| CO5 | Evaluate the methods of management of laboratory. |

**UnitI (12Hours)**

**Gross Anatomy:** Introduction to Anatomy andits Nomenclature-Different systems of Human body, Cell- Structure and function; Body Tissue – their functions, Common anatomical terms(Anterior/Ventral, lateral, medial,median, posterior/dorsal etc.), Anatomical Position &Planes (Supine, prone, recumbent, lithotomy) planes- coronal,sagittal.

## UnitII (12Hours)

**Cardiovascular and Respiratory system:** Structure of Heart &its coverings, Major Blood vessels- arteries and veins, Pulmonarycirculation-portal and systemic circulation. Cardiovascular diseases-hypertension, Cardiac Failure, Ischemic heart disease.Respiratory system: Respiratory tract structure, Lungs structure, Mechanism of respiration. Introduction to Respiratory Diseases like Tuberculosis, Pneumonia, Asthma, ARDS, Respiratory failure,**\*carcinoma**.

## UnitIII (12Hours)

**Digestive and Central Nervous system:** Structure of Digestive system- physiologyof digestion. Introduction to bowl diseases like -Gastric ulcer, Carcinoma, Inflammatory Bowel disease, Liver – Cirrhosis, CholelithiasisandPancreatitis.

Brain – Central and

peripheral nervous system. Introduction to central nervous system diseases - Stroke, Alzheimer’s disease, Epilepsy, Myasthenia Gravis, Parkinson’s disease.

## UnitIV: (12Hours)

**Urinary, Reproductive and Endocrine system:** Structure and functions of kidney- Mechanism of urine formation, Introduction to common kidney diseases like Urolithiasisand Renal failure. Reproductive system: Structure of male and female reproductive system. Testis- Vasdeferens, prostate, Seminal vesicles; Ovaries,uterus,

vagina Diseases- Menopause, carcinoma. Hormones: Classification – Mechanism of action – Hypothalamic hormones – Pitutary – Anterior, posterior – Thyroid, Adrenal cortex, Adrenal medulla – Gonadal hormones-GI hormones.

## UnitV: (12Hours)

**Laboratory safety:** General principles of safety programmes: First aid and safety measures for Mechanical, Electrical, Chemical, Radioactive and Biological hazards; Universal safety precautions. General Principles: Care and Cleaning of Glassware, Care of equipment and apparatus, Laboratory chemicals-Proper use, care, storageand labeling, Specimen handling, Appropriate container, Method of collection, Method of transportation, Method of preservation and disposal of laboratorywaste.

## \*Designing of laboratory sections.

**\* denotes Self study**

**Teaching Methods**

Power point presentation/Seminar/Quiz/Discussion/Assignment/Google Classroom

## Text Books

1. StandringS. (2016). Gray’s Anatomy: The Anatomical Basis of Clinical Practice. Elsevier, pp.1584.
2. RanganathanTS. (2000). A Textbook of Human Anatomy. 5 thedition, S Chand &amp; CoLtd.

**Reference Books**Guyton AC and Hall JE.(2000). Text Book of Medical Physiology, 10th edition, Saunders Publishers.

1. GreishcimerEM. Physiology andAnatomy withpractical considerations. JP Lippincott,Philadelphia.
2. ChaursiaBD and GargK. (2012) Human Anatomy Regional and Applied. CBS Publications: NewDelhi.
3. Fattana. (1991). Human anatomy (Description and applied). Saunders & C P Prism Publishers,Bangalore.
4. Solomon EA.(2008). Introduction to Human Anatomy andPhysiology. 3rd

edition, Saunders: St Louis.

## MAPPING

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| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | M | H | S | S |
| **CO2** | M | S | S | M | M |
| **CO3** | S | H | M | S | H |
| **CO4** | M | S | H | H | S |
| **CO5** | S | M | H | S | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub Code: 22PBC0F6

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Programme C** | **ode:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper** Paper II-Clinical Pathology and Medical Microbiology | | | | |
| Batch  2022-2023 | | Hours / Week  2 | Total Hours  30 | Credits  4 |

**Course Objectives**

1. To learn the principles and applications of hematologicaltechniques
2. To acquire a knowledge on antigen-antibodyreactions
3. To know the microbial techniques and how to establish thelaboratory

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Recall the basics of clinicalpathology |
| CO2 | Understand the various tests in hematology. |
| CO3 | Able to distinguish different bloodgroups. |
| CO4 | Analyze the mechanism of antigen antibody reaction |
| CO5 | Evaluate the methods of management of laboratory. |

**Unit I**

**Clinical Pathology:** Routine analysis and examination of urine, body fluids, semen and stool. Mantoux test: Blood coagulation test-BT, CT, PT, PTT. Histopathology: Reception of specimen-cytology, fluid cytology, FNAC, PAP smear and histopathological examination preparation and processing, fixing, dehydration, impregnation withparaffin wax,embedding, block making, section cutting,mountingandstaining,documentation,slidefilling,waxblockpreservation.

## Unit II

**Haematology:** Introduction, haemotopoietic system of body, specimen collection, routine haematolotical test: special tests, estimation of foetalHb, screening forsickle cell anemia, Heinz body preparation, lupus erythematous preparation, preparation of bone marrow smear, cytochemicaltest.Bloodbanking: Preparation for blood collection, laboratory preparation in blood bank, ABO blood grouping, Rh typing, anti-human globulin (AHG) or coomb’s test, compatibility test/cross matching, blood transfusion process and transfusionreactions.

## Unit III

**Immunology:** Immunity-Definition, classification, mechanismofinnateand acquired immunity vaccines. Antigen: Definition, properties and types. Antibodies: Definition, structure, classification and functions. Complement system. Antigen- antibody reaction, different types of reaction, principle and application of antigen - antibodyreactions.

## Unit IV:

**Medical Microbiology:** Introduction to Medical Microbiology-Common methods of sterilization anddisinfection-Common media and culturing methods usedfor bacterial growth. Antimicrobial susceptibility test.Virology: Morphology, pathogenicity and laboratory diagnosis of Hepatitis, AIDS and oncogenic viruses. Mycology: Morphology and laboratory diagnosis of superficial mycosis and deep Mycosis. Parasitology: Morphology, Life-cycle, Pathogenicity and Laboratory diagnosis of E. histolytica, Giardia, Trichomonas, Toxoplasma, Plasmodia and Leishmania.

## Unit V:

**Laboratory establishment andmanagement:** Space, ventilation, light, water, working benches, arrangement of rooms, laboratory safety, maintenance of records, students code, personal care. Computer laboratory information systems. Laboratory management: Balance sheet, profit loss statement, equity and cashflow,costaccounting. Total quality management of clinical laboratory. Laboratory statistics.

## \* denotes Self study

**Teaching Methods**

Power point presentation/Seminar/Quiz/Discussion/ Assignment/Google Classroom

**Text Books**

1. SoodRamnik. (2009). Textbook of Medical Laboratory Technology, 6thEd, JaypeeBrothers Medical Publishers (P) Ltd., NewDelhi.
2. **2.**OrchardG andNation B. (2018). Histopathology. 2 ndedition.Oxford University Press, Oxford, UnitedKingdom.

## Reference Books

1. Shirley Mitchell Lewis, Barbara J. Bain, Imelda Bates ( 2006) DacieAnd Lewis Practical Haematology, 10th Ed, ChurchillLivingstone/Elsevier.
2. Carson FL and CappellanoCH. (2015). Histotechnology: A SelfInstructional Text. 4thedition. American Society of Clinical Pathologists Press,Chicago, United States
3. Saunders WB. (2014). Cytology :Diagnostic Principles and Clinical Correlates. 4thedition. Elsevier Health Sciences, W B Saunders Co Ltd, London, United Kingdom
4. Teitz, Clinical Chemistry. W.B. Saunders Company Harcourt (India) Private Limited NewDelhi.
5. Ananthanarayananand JayaramPaniker. (2005). Text Book of Microbiology.6 th

edition Orient Longman, Hyderabad.

## MAPPING

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| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | M | S | H | S |
| **CO2** | S | M | S | H | M |
| **CO3** | S | M | H | S | H |
| **CO4** | M | S | M | M | S |
| **CO5** | S | M | H | S | S |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Sub Code: 22PBC0F7

|  |  |  |  |
| --- | --- | --- | --- |
| **Programme Code:** 07 | **Programme Title:** M.Sc Biochemistry | | |
| **Title of the paper:** Practical II | | | |
| Batch  2022-2023 | Hours / Week  2 | Total Hours  60 | Credits  4 |

**Course Objectives**

1. To accomplish the information on routine analysis of blood andurine
2. To know the techniques of microbiology andimmunology
3. To acquire knowledge on pathologicaltechniques

## Course Outcomes (CO)

|  |  |  |
| --- | --- | --- |
| K1  K5 | CO1 | Commemorate the basics of blood and urine. |
| CO2 | Understand the techniques of clinical pathology and microbiology |
| CO3 | Demostrate various estimation procedures. |
| CO4 | Analyze the immunological techniques |
| CO5 | Be competent to handle the biological samples and pathgesns. |

**Clinical pathology, Immunology and Microbiology:**

1. Haemoglobin Estimation – Sahli’sand Drabkin’smethod
2. Total RBC and WBCCount
3. DifferentialCount
4. E.S.R. determination by Westergrener’smethod
5. PlateletCount
6. Prothrombintime / Partial Thromboplastintime
7. Lupus Erythematosus(L.E) CellPreparation
8. ABO Grouping: Slidetechnique
9. Crossmatching
10. Rh typing – Slide/tubetest
11. Coombs test: Direct and Indirect coombstest
12. Routine examination ofurine
13. Routine examination ofstool
14. Routine examination ofsputum
15. Fixation,Processing,Embedding,Sectioncuttingandpreparationofslides
16. Sharpening ofKnives

Preparation of fixative and decalcifyingfluid

1. Principles and working of laboratory instruments(Demonstration)
2. PreparationofbuffersolutionsandmeasurementoftheirpH
3. Estimation of Blood glucose – GOD-PODmethod
4. Estimation of Urea- DAMmethod
5. Estimation of Plasma protein – Biuretmethod
6. Estimation of serum Bilirubin- Diazomethod, Uric acid, Creatinine, Cholesterol, HDLCholesterol
7. Estimation of serumChloride
8. EstimationofserumSodiumandPotassium(byflamephotometer)
9. Estimation ofSGOT
10. Estimation of serumAmylase
11. Estimation of serumALP
12. Hanging drop technique formotility
13. Biochemical tests for identification ofpathogens
14. Demonstration of malarialparasites

## MAPPING

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PSO**  **CO** | **PSO1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** |
| **CO1** | S | S | H | M | S |
| **CO2** | S | M | S | H | M |
| **CO3** | M | H | S | M | H |
| **CO4** | S | M | H | M | S |
| **CO5** | M | S | H | H | M |

**S**–Strong **H**–High **M**–Medium **L** –Low

## Question paper pattern (External only)

* 1. **THEORY** Max Marks =100

Time = 3.00hrs

**SECTION-A** (5 x 5=25marks)

Short answer questions

*Q.No. 1-5: Either (a) or (b) short note type (One question ‘a’ or ‘b’ from eachunit)*

**SECTION-B** (5 x 15=75marks)

Essay type of questions:

*Q.No. 6-10: Either (a) or (b) essay type (One question ‘a’ or ‘b’ from each unit)*

## PRACTICALS–QuestionPattern&Break-upofmarks

### END OF SEMESTER PRACTICAL EXAMINATION

Max. Marks: 100 Duration: 3hrs

1. **Major** (Onequestion) (1 x 20 = 20)
2. **Minor** (Onequestion) (1 x 10 = 10)
3. **Spotters** (3 x 5 =15)

Examine, identify and critically comment on the spotters A, B, C, D and E.

1. **Viva** (05)

## Record/Observation\* (10)

*\*Record for ESE; Observation for CIA exam.*