

Telangana Mahila Viswavidyalayam
Women's University Koti, Hyderabad 500 095.
Formerly University college for women, O.U.
Accredited by NAAC with 'A' Grade

DEPARTMENT OF ZOOLOGY

M.Sc. SYLLABUS – CBCS

SEMESTER – I

Paper – I, II, III & IV
With effect from 2022 – 2023

MINUTES OF THE MEETING

Board of Studies meeting was convened in the Department of Zoology, Telangana Mahila Viswavidyalayam (Women's University), Koti, Hyderabad, on 09-11-2022 at 1:30 PM under the Chairmanship of Dr. Y. Sunila Kumari, Head Department of Zoology, TMV, Koti, Hyderabad, to discuss the following agenda.

Agenda 1 : Review of M.Sc. I Year curriculum as per O.U. CBCS Syllabus.

Agenda 2 : Approval of panel of Examiner for the academic year 2022-23.

Agenda 3 : Any other Matter with the permission of the chair.

MEMBER OF BOS COMMITTEE:

Sl. No.	Member of BOS and Address	Designation	Signature
1	Dr. Y. Sunila Kumari, Assistant Professor, Head & Chairperson of Board of Studies Dept. of Zoology, TMV, Koti, Hyd.	Head & CBOS, TMV	
2	Prof. M. Madhavi, Chairperson Board of Studies, Department of Zoology, UCS, OU.	Subject Expert CBOS (O.U)	
3	Prof. B. Neeraja, Dept. of Zoology, TMV, Koti, Hyd.	Senior Faculty Member	
4	Dr. G. Shamita, Associate Professor, Department of Zoology, Kakitaya University	Subject Expert	
5	Dr. M. Radha Krishna, Assistant Professor, Department of Zoology, Nizam College	Subject Expert	
6	Dr. K. Ashok Reddy, Managing Director, Synteny Life Science PVT, LTD. Nallakunta Hyderabad.	Industry Expert	
7	Dr. D. Priya Kumari, Assit. Prof. [C] Department of Zoology, TMV, Koti, Hyderabad	Faculty Member	
8	Dr. G. Shailaja, Assistant Professor, [C] Department of Zoology, TMV, Koti, Hyderabad	Faculty Member	
9	Dr. C. Sanat Kumar, Assit. Prof. [C] Department of Zoology, TMV, Koti, Hyderabad	Faculty Member	
10	Ms. Mazia Jabeen, Lecturer, Gautam Junior & Degree College, Nalgonda	Alumini Member	
11	Ms. Roselin, Student UCW, Koti	Student Member	

Keeping in view of the CBCS system, Osmania University, M.Sc. Zoology I Year Semester – I Syllabus was discussed with the members of BOS and it is resolved to follow the same syllabus of Department of Zoology, Osmania University, for Paper – I, II, III & IV.

Approval of the Panel of Examiners were discussed for Semester – I ; Paper – I, II, III & IV for both Theory and Practical for 2022-23.

Semester – wise Proposed Credit Distribution Pattern

Semester - I	Credits	Semester - II	Credits	Semester - III	Credits	Semester - IV	Credits	Grand Total
Core Paper - I	5	Core Paper - I	5	Core Paper - I	5	Core Paper - I	5	80 Credits
Core Paper - II	5	Core Paper - II	5	Core Paper - II	5	Core Paper - II	5	
Core Paper - III	5	Core Paper - III	5	Elective - I	4	Elective - I	4	
Core Paper - IV	5	Core Paper - IV	5	Elective - II	4	Project Work	6	
-	-	Seminar	-	Seminar	2	-	-	
Total	20		20		20		20	

➤ All the Non-professional PG Courses shall contain 12 core papers @ 5 Credits each and 3 Elective @ 4 Credits each, Seminar III Semester of 2 Credits worth the Project work of 6 credit worth in IV Semester.

➤ **Scheme of evaluation**

○ 30 : 70 – (30 Internal assessment & 70 semester end examination)

▪ **Internal Assessment**

- 30 Internal Marks are divisible into 2 parts
 - ❖ 20 Marks that consists for 5 short question each carries 2 marks and 2 long question each carries 5 marks
 - ❖ 10 marks for theory Assignments

• **Semester End Examination for 70 Marks divisible as Part ‘A’ & ‘B’**

- Part – A – 20 Marks (5 Question each carries 4 marks)without choice
- Part – B – 50 Marks (5 Questions each carries 10 marks) with internal choice

▪ **Semester End Practical Examination for 100 Marks**

- ❖ Marks distribution for semester end practical examination shall be as follows:
 - ❖ Experiment based assessment - 60 marks
 - ❖ Practical assignment - 15 marks
 - ❖ Record - 10 marks
 - ❖ Viva Voce - 15 marks

▪ **IV Semester Project Assessment for 150 Marks**

❖ Marks distribution for project assessment shall be as follows:

Internal Assessment		
❖ Research Design Seminar	1 Credit	25 Marks
❖ Progress Seminar	1 Credit	25 Marks
Semester end Assessment		
❖ Dissertation	1 credit	25 Marks
❖ Final presentation	2 credits	50 Marks
❖ Viva Voce during final presentation	1 credit	25 Marks

➤ Where practical classes are involved, each paper shall consist of 3 units of theory & 2 units of practical, totaling 5 credit for the paper. Each unit of practical is worth 1 Credit.

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Semester – I Proposed Credit Distribution Pattern

Semester – I	Paper Title and Code	Credits
Core Paper – I	Advances in Taxonomy & Invertebrate Biology (ATIB) Zoo-101T	3T + 2P = 5
Core Paper – II	Environmental & Conservation Biology (ECB) Zoo-102T	3T + 2P = 5
Core Paper – III	Structural Biology (SB) Zoo-103T	3T + 2P = 5
Core Paper – IV	Biological Instrumentation & Techniques (BIT) Zoo-104T	3T + 2P = 5
	Total Credits :	20

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Code Zoo_101

M.Sc. Semester – I

CORE PAPER

Paper I: Advances in Taxonomy & Invertebrate Biology [ATIB]

UNIT 1- Advances in Taxonomy

15 Hrs

- 1.1 Basic concepts of systematics, taxonomy and classification; Branches of taxonomy - Cytotaxonomy and Chemotaxonomy; Numerical Taxonomy and Cladistics
- 1.2 Recent trends in biosystematics - Molecular taxonomy and Integrative approaches
- 1.3 Taxonomic hierarchy of ranks; Species concepts - Biological, Evolutionary, Phylogenetic, and Ecological
- 1.4 International Code for Zoological Nomenclature (ICZN)-Operative principles, interpretation and application of important rules
- 1.5 Zoological Types-Holotype, Paratype, Syntype, Allotype; Scientific names and their basis-Eponym, Toponym, Taxonym, Bionym, Morphonym

UNIT II - Invertebrate Biology - I

15 Hrs

- 2.1 Concepts of Prokarya & Eukarya and Radiata & Bilateria; Concept of Ecdysozoa & Lophothrochozoa; Biological and medical importance of sponges.
- 2.2 Feeding and digestion in invertebrates-Protozoa, Porifera, Helminthes, Mollusca, and Echinodermata
- 2.3 Filter feeding in invertebrates - Polychaeta; Origin of nerves and cnidarian nerve nets; Open and closed type of circulatory mechanisms in Annelids and Arthropods
- 2.4 Respiration and excretory system in Annelida, Arthropoda, and Mollusca
- 2.5 Reproduction and development in Cnidaria; Metagenesis and its significance

UNIT III - Invertebrate Biology-II

15 Hrs

- 3.1 Types of helminthic parasites; Parasitic adaptations in helminthes
- 3.2 Crustacean larval forms - Evolutionary and phylogenetic significance
- 3.3 Echinoderm larval forms Evolutionary and phylogenetic significance
- 3.4 Systematic position, general organization and affinities of a) Rotifera; b) Rhynchocoela; c) Ectoprocta & Entoprocta
- 3.5 Eusociality in insects; Autotomy and regeneration in Echinoderms; Concept and significance of connecting links in invertebrates

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M.Sc. SYLLABUS – CBCS
(with effect from 2022-23 academic year onwards)

Code : Z00 – 101 P

PRACTICALS (Each practical is for 2 hours duration)

30 Hrs

01. Identification, classification, and salient feature of selected Protozoans (3 to 5 examples) of medical importance
02. Identification, classification, and salient feature of selected Helminthes (2 to 4 examples) of medical importance
03. Study of section of certain representatives of Cnidaria, Platyhelminthes, Annelida to understand coelom evolution and their types.
04. Study of larval forms of Platyhelminthes
05. Study of larval forms of Crustaceans
06. Study of larval forms of Echinodermata
07. Mounting and study of different types mouth parts in house fly (piercing & sponging) butterfly (siphoning), and mosquito (piercing & sucking)
08. Study of Peripatus and Balanoglossus for their evolutionary significance
09. Study of respiratory organs in arthropods - book lungs, trachea, spiracles (models/virtual).
10. Excretory organs in platyhelminthes, annelids, and arthropods-flame cells, malphigian tubules, and nephridia (models/virtual).
11. Preparation of permanent slides of zooplanktons (minimum three different types of species).
12. Culture of paramecium/vorticella/drosophila to study their morphological features.
13. Collection and identification of parasites from the cockroach
14. Demonstration and practice of virtual dissection of digestive, circulatory, respiratory, nervous, and reproductive system in cockroach/prawn/crab.
15. Visit to Freshwater Biology Research Station or Zoological Survey of India, Hyderabad.

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Assignments

1. Theory Assignment will be three detailed essays on any one topic each from Units I, II & III. The theory assignment shall be submitted before the II Internal Assessment.
2. Continuous assessment register to be submitted to Head by Incharge Teacher before semester end Practical Examination.

Suggested Books

- 01 Principles of Systematic Zoology (2nd Edition) by E. Mayr and P.D. Ashlock
- 02 Five Kingdoms - An Illustrated Guide to the Phyla of Life on Earth by Lynn Margulis & M.J. Chapman
- 03 A Textbook of Zoology Vol. by Parker and Haswell (Revised)
- 04 The Invertebrates Vol. I to Vol. VI by L. H. Hyman
- 05 Invertebrate structure and function by E. J. W. Barrington
- 06 Invertebrate Zoology by P. A. Meglitsch
- 07 Life of Invertebrates by Russel Hunter
- 08 Invertebrate Zoology by Rupport and Barnes
- 09 Life of Invertebrates by S. N. Prasad
- 10 Evolutionary Biology by Eric C. Mitkoff
- 11 Worms and Man by D. W. T. Crompton
- 12 Parasitology by Noble and Noble
- 13 Regeneration by S. M. Rose-Appleton
- 14 Animal Taxonomy by Principles & Practices by D.N. Pandit

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Code Zoo_102 T

M.Sc. Semester I

CORE PAPER

Paper II: Environmental and Conservation Biology [ECB]

UNIT I - Basic Concepts of Ecology	15 Hrs
1.1	Concepts of ecosystems; Types of ecosystems-Aquatic (freshwater and marine) and Terrestrial
1.2	Concepts of laws of limiting factor, minimum, tolerance and tragedy of commons; Ecosystem dynamics and management; Stability and complexity of the ecosystem
1.3	Micronutrients and macronutrients; Role of nutrients in aquatic and terrestrial ecosystems
1.4	Population characteristics and dynamics; Growth curves and pyramids; sigmoid curve, J curve and hyperbola; Logistic equation and concepts relating to growth
1.5	Concept of climate change; Impacts of climate change on ecosystems; Avenues of mitigation of climate change
UNIT II - Community Organization and Structure	15 Hrs
2.1	Community analysis, structure, species diversity: Diversity indices - Simpson Diversity, Shannon Diversity, Evenness Index; Interaction between abiotic and biotic factors
2.2	Concepts of biota, habitat and biome; Ecotone concept and edge effect, ecological niche and niche overlap; Concepts of productivity; Trophodynamics and Eutrophication of lakes
2.3	Solid waste management, Concepts of Reduce, Reuse & Recycle; Biological indicators of water quality: Water quality assessment and management
2.4	Biological waste management; Impact of plastic pollution and ocean acidification: Sustainable Development Goals (Goals 13, 14 & 15)
2.5	Environmental Impact Assessment - principle, scope and purpose; Concept of carbon footprint and zero carbon economy
UNIT III-Natural Resource Management and Conservation	15 Hrs
3.1	Concepts of natural resources-renewable and non-renewable resources
3.2	Overexploitation of resources- deforestation, water table depletion and land degradation
3.3	Role of ecological restoration in conservation; displacement and settlement of local communities
3.4	Major conservation movements in India; NGOs in conservation efforts; Conservation in India -Project Tiger
3.5	National legislation for protecting biological resources - Biodiversity Act, 2002 and Biodiversity Rules, 2004; Historical perspective on conservation in India

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Paper – II Environmental & Conservation Biology

Code Zoo-102 P

PRACTICALS (Each practical is for 2 hours duration)

30 Hrs

01. Enumeration and identification of benthic forms and pelagic zooplanktons.
02. Identification of the freshwater faunal diversity (snails, fishes, amphibians, and water birds) of the local habitats.
03. Identification of the terrestrial faunal diversity (butterflies, reptiles, birds, and mammals) of the local habitats.
04. Estimation of particulate matter in the air.
05. Estimation of nitrates and nitrites in the water sample.
06. Estimation of total alkalinity in the water sample.
07. Estimation of phosphates in the water sample.
08. Estimation of magnesium in the water sample.
09. Estimation of calcium in the water sample.
10. Estimation of dissolved oxygen in the water sample.
11. Determination of Water Quality Index
12. Calculation of species diversity indices-Simpsons Index, Shannon Index & Evenness Index.
13. Estimation of land use change using Google Earth imagery.
14. Visit to Solid Waste Management / Treatment Plant.
15. Visit to Nehru Zoological Park, Hyderabad/Other biodiversity rich area in and around Hyderabad.

Assignments

1. Theory Assignment will be three detailed essays on any one topic each from Units I, II & III
The theory assignment shall be submitted before the II Internal Assessment.

Suggested Books

- 01 Caughley, G., and A. Gunn. 1996. Conservation Biology in Theory and Practice. Blackwell Science, Cambridge, Massachusetts, U.S.A
- 02 Cox, G. W. 2005. Conservation Biology: Concepts and Applications. McGraw-Hill, Dubuque, Iowa, U.S.A
- 03 Dasmann, R., 1981. Wildlife Biology, 2nd ed. John Wiley and Sons, NY
- 04 Dobson, A. P. 1996. Conservation and Biodiversity. Scientific American Library, New York, New York, U.S.A
- 05 Jeffries, M. J. 1997. Biodiversity and Conservation. Routledge, New York, New York, USA
- 06 Mills, L. Scott 2006. Conservation of Wildlife Populations. Blackwell Science, Oxford, U. K
- 07 Milner-Gulland, E. J., and R. Mace. 1998. Conservation of Biological Resources. Blackwell Science, Oxford
- 08 Morris, W. F., and D. F. Doak 2002. Quantitative Conservation Biology: Theory and Practice of Population Viability Analysis. Sinauer Associates, Sunderland, Massachusetts, U.S.A
- 09 Sinclair, A. R. E., I. M. Fryxell, and G. Caughley 2006. Wildlife Ecology, Conservation and Management, Blackwell Publishing
- 10 Soulé ME (ed) 1986. Conservation biology: the science of scarcity and diversity- Sinauer, Sunderland
- 11 Bram F. Noble 2005. Introduction to Environmental Impact Assessment: A Guide to Principles and Practice. Oxford University Press, London
- 12 John A. Wiens and Michael R. Moss 2005. Issues and Perspectives in Landscape Ecology Cambridge University Press, London
- 13 Aparna Sawhney 2004. The New Face of Environmental Management in India. Ashgate Publishing Ltd., Sheffield

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Code Zoo_103 T

M.Sc. Semester I

CORE PAPER

Paper III: **Structural Biology [SB]**

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|--|---|--------|
| UNIT I-Biomolecules, Enzymes and Metabolism | | 15 Hrs |
| 1.1.1 | Composition, structure and functions of biomolecules (Carbohydrates, lipids, proteins, and nucleic acids) | |
| 1.2 | Bioenergetics principles; ATP Cycle; Biosynthesis of carbohydrates - Gluconeogenesis & Glycogenesis | |
| 1.3 | Biosynthesis of fatty acids; Biosynthesis of amino acids; Biochemical aspects of hormone action | |
| 1.4 | Classification, nomenclature, and properties of enzymes; Michaelis-Menten Constant, Km values, Mechanism of enzyme action and regulation of enzyme activity | |
| 1.5 | Catabolism of amino acids - Transamination, deamination & decarboxylation; HSPs and Molecular chaperons and protein binding | |
| UNIT II-Cellular Organization | | 15 Hrs |
| 2.1 | Macromolecules and origin of cells; Molecular organization and functions of cell membranes | |
| 2.2 | Cell permeability-transport across the cell membrane; transport of small molecules; Carrier proteins, Ion pumps, membrane-bound enzymes | |
| 2.3 | Cell communications - Intercellular communication and gap junctions; chemical signaling between the cells; strategies of chemical signaling | |
| 2.4 | Signaling mediated by intracellular receptors; signaling mediated cell surface receptors – second and third messengers; C-AMP, G-proteins, Ca ⁺⁺ , Inositol Triphosphate (IP ₃) and prostaglandins | |
| 2.5 | Cell cycle; molecular events in the cell cycle; mitotic spindle | |
| UNIT III-Molecular Biology | | 15 Hrs |
| 3.1 | DNA replication: Semi conservative, enzymology of DNA replication, replication of circular DNA, initiation, elongation and termination of replication process; Proofreading function of DNA polymerases | |
| 3.2 | Protein synthesis: Regulation of genetic code - Wobble's concept, Events of protein synthesis, transcription in prokaryotes and eukaryotes | |
| 3.3 | Post-transcriptional processing Enzymatic synthesis of RNA; Translation in prokaryotes and eukaryotes | |
| 3.4 | DNA repair mechanism: High fidelity of DNA sequence and alteration of DNA molecules, Biological indicators of repair; Eukaryotes repair systems (Nucleotide Excision Repair, Base Excision Repair, Mismatch Repair) | |
| 3.5 | Cancer: Molecular genesis of cancer: Molecular interactions of cancer and healthy cells; Therapeutic interventions to cancer | |

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Paper – III Structural Biology [SB]
PRACTICALS (Each practical is for 2 hours duration)

Code Zoo_103 P
30 Hrs

01. Introduction to Good Laboratory Practices.
02. Preparation of standard graph using carbohydrate/protein.
03. Quantitation of DNA by UV-visible Spectrophotometer and/or Colorimetry.
04. Quantitation of protein by UV-visible Spectrophotometer and/or Colorimetry.
05. Quantitation of total carbohydrates by UV-visible and/or Colorimetry.
06. Quantitation of lipids by UV-visible and/or Colorimetry.
07. Determination of enzyme activity of SDH in cultured fish.
08. Determination of enzyme activities of LDH in cultured fish.
09. Effect of substrate concentration on SDH activity in cultured fish.
10. Effect of pH on SDH activity in cultured fish.
11. Protein fractionation using sodium sulphate.
12. Virtual demonstration of cell permeability.
13. Virtual demonstration of cell communication.
14. Virtual demonstration of cell signaling
15. Virtual demonstration of cell cycle.

Assignments

1. Theory Assignment will be three detailed essays on any one topic each from Units I, II & III. The theory assignment shall be submitted before the II Internal Assessment.

Suggested Books

01. Textbook of Biochemistry by Harper
02. Textbook of Biochemistry by Lehninger
03. Textbook of Biochemistry by Stryer and Stryer
04. Textbook of Biochemistry by Conn and Stumpf
05. Textbook of Biochemistry by A.B.V. Rama Rao
06. Cell and Molecular Biology by De Robertis and De Robertis, 8th ed.
07. Molecular Biology by Friefielder
08. Molecular Cell Biology by Darnell, Lodish and Baltimore (Scientific American Books)
09. Molecular Biology by H. D. Kumar
10. Biochemistry and Molecular Biology by W. H. Elliot and D.C. Elliot (OU Press)
11. Molecular Biology of Cell by Bruce Alberts et al
12. Cell by Karp
13. Textbook of Biochemistry by Harper

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Code Zoo_104 T

M.Sc. Semester I

CORE PAPER

Paper IV: Biological Instrumentation and Techniques (BIT)

UNIT 1- Applications of Tools and Separation Techniques

15 Hrs

- 1.1 Principles and Applications of Microscopic Techniques: Bright and Dark Field Microscopy; Fluorescent Microscopy; Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM)
- 1.2 Microtomy and Staining Procedures: Types of microtomes; Tissue Fixation & Embedding; Types of stains. staining and mounting procedures of biological materials
- 1.3 Basic Principles of Centrifugation: Types of centrifugations & their principles, Refrigerative; Principles of Sedimentation, Svedberg Co-efficient; Cell separation by density gradient centrifugation; Cell separation Affinity adsorption; Cell separation by anchorage-based techniques
- 1.4 Separation Techniques: Basic principles of chromatography concept and applications; Concept and application of Ion Exchange Chromatography and Gel Chromatography, Concept and application of HPLC and Affinity Chromatography
- 1.5 Electrophoretic Techniques: Principles and applications of Agarose and SDS-polyacrylamide gelelectrophoresis; Principles and applications of Zone and Moving Boundary electrophoresis, Principles and applications of Isotachopheresis and Isoelectrophoresis

UNIT II-Molecular Identification & Imaging Techniques

15 Hrs

- 2.1. Spectroscopic Techniques-I: Principles and applications of UV. Visible, IR and Fluorescence spectroscopy; Principles and applications of Atomic Absorption spectroscopy: Principles and applications of NMR and ESR spectroscopy
- 2.2 Spectroscopic Techniques-II: Principles and applications of Mass spectrometry (LC-MS, GC-MS), Principles and applications of X-ray diffraction; Principles and applications of MALDI-TOF
- 2.3 Electrophysiological Techniques: Principles and applications of single neuron recording; Principles and applications of patch-clamp recording, Principles and applications of ECG Recording
- 2.4 PCR Techniques: Hybridization techniques A) Southern B) Northern C) Western - Principles and applications, RT-PCR Techniques for Qualitative and Quantitative Analysis of DNA, RNA and Proteins: Applications of PCR and RT-PCR techniques
- 2.5 Imaging Techniques: PET, MRI, fMRI and CAT: Ultra sonography: Radiography. Mammography
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UNIT III-Diagnostic Techniques

15 Hrs:

- 3.1 Radioisotope Techniques: Principles and applications of tracer techniques in biology and autoradiography: Radioactive isotopes and half-life periods of isotopes; Principles and application of Geiger-Muller and Scintillation Counter
- 3.2 Micro Array Technology: Principles and Applications of Micro Array Technology
- 3.3 Molecular diagnostics for communicable disease detection
- 3.4 Molecular diagnostics in non-communicable disease detection
- 3.5 Point of care diagnostic techniques; Zoonotic diagnostics techniques for animals and humans

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Biological Instrumentation & Techniques

Code Zoo – 104 P

PRACTICALS (Each practical is for 2 hours duration)

30 Hrs

01. To fix a tissue with Bouin's fixative and stain using hematoxylin-eosin stain for histochemical studies
02. Separation of biological compounds by paper chromatography
03. Separation of biological compounds of by TLC
04. To prepare a paraffin block of tissue for microtomy for making sections of tissue for histochemical studies
05. Quantitative detection of total carbohydrates using Anthrone method
06. Quantitative detection of total lipids using Sulpho-phosovanillin technique
07. Quantitative detection of total proteins using Lowry et al./Bluret method
08. Demonstration of the gel electrophoresis for separation of DNA
09. Virtual demonstration of SEM & TEM
10. Virtual demonstrations of FISH and GISH techniques
11. Virtual/Live demonstration of GCMS
12. Virtual/Live demonstration of FTIR
13. Virtual demonstrations of ELISA/EIA for detecting microbial diseases
14. Virtual demonstrations of RT PCR for detecting viral disease
15. Visit to Central Facilities for Research and Development (CFRD), Osmania University

Assignments

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Suggested Books

01. Principles and techniques of Practical Biochemistry Ed B.L Williams &K Wilson Arnold Publishers
02. Practical Biochemistry by Plummer
03. Immunology-Roit
04. Cell and Molecular Biology - DeRoberties
05. Cell and Molecular Biology - Ladish et al.
06. Techniques in life sciences - by Tembhare