Animal Diversity

I - M.Sc(Zoology) / I - Semester

Choice Based Credit System(CBCS)

- By

Prof. P. Neeraja
Prof. K.S. Reddy
Department of Zoology
Sri Venkateswara University

Tirupati-517502, Andhra Pradesh, India.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

Centre for Distance and Online Education

Sri Venkateswara University

Tirupathi, AP -517 502

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Year : 2024

Edtion : First

Printed

by

StudentsHelpline
Expect more from us ...

(An ISO 9001 : 2015 Certified Publishers)

326/C, Surneni Nilayam
Near B K Guda Park, S R Nagar
Hyderabad - 500 038 TS
PNo:+91 40 23710657, 238000657, 23810657
Cell:+91 94405 75657, 93925 75657, 93935 75657
Reg. Off.: 5-68, Pedda Gorpadu, Pakala, Tirupathi - 517 112 AP
mail: studentshelpline.in@gmail.com

for

Director

Centre for Distance and Online Education
Sri Venkateswara University
Tirupathi, AP -517 502
mail : directorddesvu@gmail.com
Cell: +91 877-2289380
www.svudde.in

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

CONTENTS

INTRODUCTION

BLOCK I: CLASSIFICATION OF ANIMALS

UNIT 1 INTRODUCTION TO ANIMAL DIVERSITY **1-17**

1.0 Introduction
1.1 Objectives
1.2 Diversity of Animals: An Introduction
1.3 Principles of Classification
1.4 Types of Classification
1.5 Linnaeus's Classification System
1.6 Answers to Check Your Progress Questions
1.7 Summary
1.8 Key Words
1.9 Self Assessment Questions and Exercises
1.10 Further Readings

UNIT 2 SPECIES CONCEPT **18-31**

2.0 Introduction
2.1 Objectives
2.2 Species: Fundamental Theory
2.3 Answers to Check Your Progress Questions
2.4 Summary
2.5 Key Words
2.6 Self Assessment Questions and Exercises
2.7 Further Readings

UNIT 3 TAXONOMIC CHARACTERS AND THEORIES OF TAXONOMY **32-56**

3.0 Introduction
3.1 Objectives
3.2 Taxonomic Characters and Theories
3.3 Numerical Taxonomy
3.4 Cladistics

3.5 Molecular Taxonomy
3.6 Answers to Check Your Progress Questions
3.7 Summary
3.8 Key Words
3.9 Self Assessment Questions and Exercises
3.10 Further Readings

UNIT 4 MAJOR DIVISION AND SUBDIVISION OF ANIMAL KINGDOM **57-82**

4.0 Introduction
4.1 Objectives
4.2 Divisions of Animal Kingdom
4.3 Animal Architecture
4.4 Symmetry
4.5 Coelom in Animals
4.6 Answers to Check Your Progress Questions
4.7 Summary
4.8 Key Words
4.9 Self Assessment Questions and Exercises
4.10 Further Readings

BLOCK II: PROTOZOA, PORIFERA, COELENTERATA AND HELMINTHES

UNIT 5 PROTOZOA **83-101**

5.0 Introduction
5.1 Objectives
5.2 General Characteristics of Protozoa
5.3 Classification of Protozoa
5.4 Protozoa N Parasitic Diseases
5.5 Feeding and Nutrition of Protozoa
5.6 Answers to Check Your Progress Questions
5.7 Summary
5.8 Key Words
5.9 Self Assessment Questions and Exercises
5.10 Further Readings

UNIT 6 PORIFERA **102-112**

6.0 Introduction
6.1 Objectives
6.2 Porifera: General Features and Classification

6.3 Types of Canal System of Porifera
6.4 Spicules: Meaning, Classification and Development
6.5 Answers to Check Your Progress Questions
6.6 Summary
6.7 Key Words
6.8 Self Assessment Questions and Exercises
6.9 Further Readings

UNIT 7 COELENTERATA **113-128**

7.0 Introduction
7.1 Objectives
7.2 Coelenterata: An Introduction
7.3 Polymorphism in Cnidaria (Coelenterate)
7.4 Coral Reefs
7.5 Answers to Check Your Progress Questions
7.6 Summary
7.7 Key Words
7.8 Self Assessment Questions and Exercises
7.9 Further Readings

UNIT 8 HELMINTH PARASITES **129-142**

8.0 Introduction
8.1 Objectives
8.2 Phylum Platyhelminthes: Helminth
8.3 Classification of Phylum Platyhelminthes
8.4 Parasitic Adaptation in Platyhelminthes
8.5 Phylum Nematoda
8.6 Answers to Check Your Progress Questions
8.7 Summary
8.8 Key Words
8.9 Self Assessment Questions and Exercises
8.10 Further Readings

BLOCK III: ANNELIDA, ARTHROPODA, MOLLUSCA AND ECHINODERMATA

UNIT 9 ANNELIDA **143-151**

9.0 Introduction
9.1 Objectives
9.2 Annelida

9.3 Classification of Phylum Annelida
9.3.1 Class 1 Polychaeta
9.3.2 Class 2 Oligochaeta
9.3.3 Class 3 Hirudinea
9.3.4 Class 4 Archiannelida
9.4 Metamerism in Annelids
9.5 Answers to Check Your Progress Questions
9.6 Summary
9.7 Key Words
9.8 Self Assessment Questions and Exercises
9.9 Further Readings

UNIT 10 ARTHROPODA **152-164**

10.0 Introduction
10.1 Objectives
10.2 Arthropoda
10.3 Classification of Arthropoda
10.4 Respiration in Arthropoda
10.5 Answers to Check Your Progress Questions
10.6 Summary
10.7 Key Words
10.8 Self Assessment Questions and Exercises
10.9 Further Readings

UNIT 11 MOLLUSCA **165-177**

11.0 Introduction
11.1 Objectives
11.2 Mollusca
11.2.1 Classification of Mollusca
11.2.2 Economic Importance of Mollusks
11.2.3 Shells in Mollusca
11.3 Echinodermata
11.3.1 Classification of Echinodermata
11.3.2 Water Vascular System of Starfish
11.3.3 Echinodermata Larval Forms
11.4 Answers to Check Your Progress Questions
11.5 Summary
11.6 Key Words
11.7 Self Assessment Questions and Exercises
11.8 Further Readings

BLOCK IV: VERTEBRATES

UNIT 12 PROCHORDATES AND VERTEBRATES **178-194**

12.0 Introduction
12.1 Objectives
12.2 Phylum Chordata
  12.2.1 Classification of Phylum Chordata
12.3 Prochordates
  12.3.1 General Characteristics of Protochordata
  12.3.2 Subphylum Urochordata
  12.3.3 Cephalochordata
  12.3.4 Hemichordata
12.4 Craniata (Vertebrata)
12.5 Answers to Check Your Progress Questions
12.6 Summary
12.7 Key Words
12.8 Self Assessment Questions and Exercises
12.9 Further Readings

UNIT 13 AMPHIBIANS AND REPTILES **195-210**

13.0 Introduction
13.1 Objectives
13.2 Amphibians
13.3 Reptiles
13.4 Answers to Check Your Progress Questions
13.5 Summary
13.6 Key Words
13.7 Self Assessment Questions and Exercises
13.8 Further Readings

UNIT 14 AVES AND MAMMALS **211-232**

14.0 Introduction
14.1 Objectives
14.2 Aves
  14.2.1 Classification of Aves
  14.2.2 How Birds Fly-Flight -Adaptations in Birds
  14.2.3 Bird Migration

14.3 Class Mammalia
14.3.1 Main Characteristics of Mammals
14.3.2 Classification of Mammals
14.3.3 General Classification of Mammals
14.3.4 Aquatic Adaptations
14.4 Answers to Check Your Progress Questions
14.5 Summary
14.6 Key Words
14.7 Self Assessment Questions and Exercises
14.8 Further Readings

ZOO-101: Animal Diversity

BLOCK - I: CLASSIFICATION OF ANIMALS

UNIT 1: Introduction to the Diversity of Animals, Principles of Classification, Types of Classification and Binomial Nomenclature; Linnaeus

UNIT 2: Species Concept - Typological, Biological and Evolutionary Species Concept.

UNIT 3: Taxonomic Characters and Theories of Taxonomy – Numerical Taxonomy, Cladistics and Molecular Taxonomy.

UNIT 4: Major Divisions and Subdivisions of the Animal Kingdom; Animal Architecture - Cephalization Symmetry - Bilateral and Radial Symmetry; Coelom in Animals: Coelomata, Acoelomata and Psudocoelomata.

BLOCK - II: PROTOZOA, PORIFERA, COELENTERATA AND HELMINTHES

UNIT 5: Protozoa: General Characteristics, Classification up to Class Level, Protozoan parasites: Entamoeba and Plasmodium.

UNIT 6: Porifera: General Characters and Classification, Structure of Leucosolenia, Canal System in Sponges, Spicules in Sponges

UNIT 7: Coelenterata: Structure of Obelia Colony, Polymorphism in Coelenterates, Corals and Coral Reefs.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

UNIT 8: Helminth Parasites - Taenia Solium, Nematode Parasites – Ascaris and Parasitic Adaptations.

BLOCK - III: ANNELIDA, ARTHROPODA, MOLLUSCA AND ECHINODERMATA

UNIT 9: Annelida: General Characters, Classification up to Class – Metamerism in Annelids.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

UNIT 10: Arthropoda: General Characters, Classification up to Class – Larval forms of Crustaceans - Adaptive Radiations in Arthropoda, Harmful and Beneficial Insects.

UNIT 11: Mollusca and Echinodermata: General Characters, Classification up to Class - Cephalopod as an Advanced Mollusc; Larval forms of Echinodermata - Water Vascular System in Echinoderms.

BLOCK - IV: VERTEBRATES

UNIT 12: General Characters and Classification of Prochordates and Vertebrates; Pisces - Classification up to Orders, Structural and Functional Adaptation of Fishes.

UNIT 13: Amphibians and Reptiles: Definition, General Characters, Classification, Structural and Functional Adaptations of Amphibians and Reptiles - Mesozoic Reptiles - Dinosaurs.

UNIT 14: Aves: Phylogeny, Flight Adaptation, Flightless Birds and Migration of Birds. Mammals: General Characteristics of Prototheria, Metatheria and Eutheria; Aquatic Mammals; Adaptive Radiation in Mammals.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Biochemistry

I - M.Sc(Zoology) / I - Semester

Choice Based Credit System(CBCS)

- By

Prof. P. Neeraja
Prof. K.S. Reddy
Department of Zoology
Sri Venkateswara University
Tirupati-517502, Andhra Pradesh, India.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

Centre for Distance and Online Education

Sri Venkateswara University

Tirupathi, AP -517 502

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Year : 2024

Edtion : First

Printed

by

StudentsHelpline
Expect more from us ...

(An ISO 9001 : 2015 Certified Publishers)

326/C, Surneni Nilayam
Near B K Guda Park, S R Nagar
Hyderabad - 500 038 TS
PNo:+91 40 23710657, 238000657, 23810657
Cell:+91 94405 75657, 93925 75657, 93935 75657
Reg. Off.: 5-68, Pedda Gorpadu, Pakala, Tirupathi - 517 112 AP
mail: studentshelpline.in@gmail.com

for

Director

Centre for Distance and Online Education
Sri Venkateswara University
Tirupathi, AP -517 502
mail : directorddesvu@gmail.com
Cell: +91 877-2289380
www.svudde.in

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

CONTENTS

INTRODUCTION

BLOCK I: INTRODUCTION TO BIOMOLECULES

UNIT 1 CARBOHYDRATES **1-25**

1.0 Introduction
1.1 Objectives
1.2 Carbohydrates and their Functions
1.3 Classification of Carbohydrate
  1.3.1 Monosaccharides
  1.3.2 Oligosaccharides
  1.3.3 Polysaccharides
  1.3.4 Glycoconjugates
1.4 Answers to Check Your Progress Questions
1.5 Summary
1.6 Key Words
1.7 Self Assessment Questions and Exercises
1.8 Further Readings

UNIT 2 LIPIDS: STRUCTURE, CLASSIFICATION & PROPERTIES **26-62**

2.0 Introduction
2.1 Unit Objectives
2.2 Structure and Nomenclature of Lipids
  2.2.1 Nomenclature of Lipids
2.3 Classification of Lipids
  2.3.1 Simple lipids
  2.3.2 Conjugated Lipids
  2.3.3 Derived Lipids
2.4 Physical Properties of Fatty Acids
2.5 Chemical Reactions of Fatty Acids
2.6 Answers to Check Your Progress Questions
2.7 Summary
2.8 Key Terms
2.9 Self Assessment Questions and Exercises
2.10 Further Readings

UNIT 3 PROTEINS AND AMINO ACIDS **63-104**

3.0 Introduction
3.1 Objectives
3.2 Amino Acids
  3.2.1 Physical Properties of Amino Acids

3.2.2 Chemical Properties of Amino Acids
3.3 Classification of Amino Acids
3.4 Proteins and their Structure
3.4.1 Distribution of Amino Acids in Proteins
3.4.2 Peptides and Polypeptides
3.4.3 Proteins Containing other Chemical Groups
3.4.4 Structural Organization of Protein
3.5 Classification of Proteins
3.6 Properties of Proteins
3.7 Answers to Check Your Progress Question
3.8 Summary
3.9 Key Words
3.10 Self Assessemnt Questions and Exercises
3.11 Further Readings

UNIT 4 NUCLEIC ACIDS **105-129**

4.0 Introduction
4.1 Objectives
4.2 Nucleic Acids
4.3 Components of Nucleic Acid
4.4 Functions of Nucleic Acids
4.5 Nucleosides
4.6 Structure and Properties of DNA
4.6.1 Different forms of DNA Structures
4.6.2 Structure and Properties of RNA
4.6.3 Organization of DNA in Cell
4.7 Answers to Check Your Progress Question
4.8 Summary
4.9 Key Words
4.10 Self Assessemnt Questions and Exercises
4.11 Further Readings

BLOCK II: ENZYMES, VITAMINS AND HORMONES

UNIT 5 ENZYMES **130-150**

5.0 Introduction
5.1 Objectives
5.2 Enzymes
5.2.1 Nomenclature and Classification of Enzyme
5.3 Mechanism of Enzyme Action
5.4 Factors Affecting the Rate of Enzyme Activity
5.5 Active Site
5.6 Enzyme Inhibition

5.7 Allosteric Enzymes
5.8 Characteristics of Enzymes
5.9 Uses of Enzymes
5.10 Answers to Check Your Progress Questions
5.11 Summary
5.12 Key Words
5.13 Self Assessemnt Questions and Exercises
5.14 Further Readings

UNIT 6 ISOENZYMES **151-164**

6.0 Introduction
6.1 Objectives
6.2 Isoenzymes
6.3 Regulation of Enzyme Activity in Living Systems
6.4 Enzyme Kinetics
6.4.1 Michaelis-Menten Hypothesis
6.4.2 Lineweaver–Burk Methods
6.5 Answers to Check Your Progress Questions
6.6 Summary
6.7 Key Words
6.8 Self Assessemnt Questions and Exercises
6.9 Further Readings

UNIT 7 VITAMINS **165-188**

7.0 Introduction
7.1 Objectives
7.2 Overview of Vitamins
7.2.1 Fat-Soluble Vitaminss
7.2.2 Water-Soluble Vitamins
7.3 Answers to Check Your Progress Questions
7.4 Summary
7.5 Key Words
7.6 Self Assessemnt Questions and Exercises
7.7 Further Readings

UNIT 8 HORMONES **189-218**

8.0 Introduction
8.1 Objectives
8.2 Introduction of Hormones
8.2.1 Structure and Function of Hormones
8.3 General Classification of Hormones
8.3.1 Chemical Classification of Hormones
8.3.2 Mode of Action Role of C-AMP and Hormone Action

8.3.3 Role of Calcium in Hormone Action
8.3.4 Regulation of Hormone Secretion
8.4 Steroid Hormone Receptors
8.5 Peptide Hormones Receptor
8.6 Hormone Receptors and Intracellular Messengers
8.6.1 Hormones Transduce Signals to Affect Homeostatic Mechanisms
8.6.2 Hormones have Membrane Receptors and Use Intracellular Messengers Group II (Peptide and Catecholamine)
8.6.3 G Protein-Coupled Receptors
8.7 Adenylyl Cyclase
8.8 Protein Kinase
8.9 Phosphodiesterases
8.10 Insulin
8.10.1 Insulin Secretion
8.10.2 Actions of Insulin
8.10.3 Degradation of Insulin
8.11 Role of Glucagon
8.11.1 Physiologic Effects of Glucagon
8.11.2 Control of Glucagon Secretion
8.12 Epinephrine and their Mechanism Various Endocrine
8.12.1 Glucocorticoids
8.12.2 Adrenal Medullary Hormones
8.12.3 Metabolic Functions of Catecholamines
8.13 Regulatory Systems Mediated by Cyclic AMP
8.13.1 A Metabolic Regulator and Second Messenger
8.13.2 Functional Control of Various Biological Process
8.13.3 Molecular Structure
8.13.4 Biosynthesis and Degradation
8.13.5 Hunger Signal
8.13.6 Glycogen Metabolism
8.13.7 Control of Transcription
8.14 Answers to Check Your Progress Questions
8.15 Summary
8.16 Key Words
8.17 Self Assessemnt Questions and Exercises
8.18 Further Readings

BLOCK III: METABOLISM

UNIT 9 CARBOHYDRATES METABOLISM **219-247**

9.0 Introduction
9.1 Objectives
9.2 Carbohydrates Metabolism
9.2.1 Glycogenesis

9.2.2 Glycogenolysis
9.2.3 Gluconeogenesis—The Gluconeogenic Pathway (The Cori Cycle)
9.2.4 Glycolysis
9.2.5 TriCarboxylic Acid (TCA) Cycle
9.2.6 The Pentose Phosphate Pathway (Hexose Mophosphate Pathway)
9.2.7 Uronic Acid Pathway
9.3 Answers to Check Your Progress Questions
9.4 Summary
9.5 Key Words
9.6 Self Assessemnt Questions and Exercises
9.7 Further Readings

UNIT 10 LIPID METABOLISM **248-275**

10.0 Introduction
10.1 Objectives
10.2 Lipids
10.3 Formation of Ketone Bodies
10.4 Cholesterol Metabolism
10.5 Biosysnthesis of Fatty Acids
10.5.1 Fatty Acid Synthesis in Animals
10.5.2 Fatty Acid Synthesis in Bacteria and Plants
10.6 Answers to Check Your Progress Questions
10.7 Summary
10.8 Key Words
10.9 Self Assessemnt Questions and Exercises
10.10 Further Readings

UNIT 11 AMINOACID METABOLISM **276-294**

11.0 Introduction
11.1 Objectives
11.2 Amino Acid Metabolism
11.3 Urea Cycle and Ammonia Excretion
11.4 Fate of Carbon Skeleton of Amino Acids
11.5 Answers to Check Your Progress Questions
11.6 Summary
11.7 Key Words
11.8 Self Assessemnt Questions and Exercises
11.9 Further Readings

UNIT 12 NUCLEOTIDE METABOLISM **295-312**

12.0 Introduction
12.1 Objectives
12.2 Nucleotide Metabolism

12.3 Purine Nucleotide Synthesis
12.3.1 De Novo Synthesis of Purine
12.3.2 Salvage Pathway of Purine Synthesis
12.3.3 Regulation of Purine Nucleotide Biosynthesis
12.4 Pyrimidine Synthesis
12.4.1 De Novo Synthesis of Uridine Monophosphate (UMP)
12.4.2 Salvage Pathway of Pyrimidine Nucleotide Synthesis
12.4.3 Regulation of Pyrimidine Synthesis
12.5 Degradation of Purines and Pyrimidines
12.5.1 Inhibitors of Nucleotide Synthesis
12.6 Answers to Check Your Rprogress Questions
12.7 Summary
12.8 Key Words
12.9 Self Assessment Questions and Exercises
12.10 Further Readings

BLOCK IV: METABOLIC DISORDERS

UNIT 13 DIABETES **313-332**

13.0 Introduction
13.1 Objectives
13.2 Diabetes Mellitus
13.3 Diabetes Insipidus
13.4 Glycogen Storage Disease (GSD)
13.5 Ketoacidosis
13.6 Hyerlipoprotienemia
13.7 Fatty Liver
13.8 Atherosclerosis
13.9 Phenylketonuria
13.10 Maple Syrup Urine Disease
13.11 Glutaric Acidemia Type I
13.12 Carbamoyl Phosphate Synthetase I (CSP 1) Deficiency
13.13 Answers to Check Your Progress Questions
13.14 Summary
13.15 Key Words
13.16 Self Assessemnt Questions and Exercises
13.17 Further Readings

UNIT 14 ALCAPTONURIA AND OTHER DISEASES **333-345**

14.0 Introduction
14.1 Objectives
14.2 Alkaptonuria
14.3 Lesh Nyhan Syndrome (Lns)

14.4 Gout
14.4.1 Types of Gout
14.4.2 Treatment of Gout
14.5 Congenital Adrenal Hyperplasia (CAH)
14.5.1 Classification of CAH
14.6 Kearns Sayre Syndrome (KSS)
14.7 Zellwegar Syndrome (ZS)
14.8 Gaucher's Disease
14.9 Niemann Pick Disease
14.10 Answers to Check Your Progress Questions
14.11 Summary
14.12 Key Words
14.13 Self Assessemnt Questions and Exercises
14.14 Further Readings

ZOO-102: Biochemistry

BLOCK I: INTRODUCTION TO BIOMOLECULES

UNIT-1: Carbohydrates: Functions, Classification (Mono, Di and Polysaccharides), Structural Aspects of Monosaccharide, Disaccharides and Polysaccharides.

UNIT-2: Lipids: Classification and Functions of Lipids, Fatty Acids, Essential Fatty Acids, Triacylglycerols, Phospholipids, Glycolipids, Lipoproteins and Steroids, Properties of Fats and Waxes.

UNIT-3: Proteins and Aminoacids: Functions, Structure (Primary, Secondary, Tertiary and Quaternary Structure), Classification and Properties of Proteins. General Structure, Classification and Chemical Properties of Aminoacids.

UNIT-4: Nucleic Acids: Functions and Components of Nucleic Acids. Structure and Nomenclature of Nucleotides. Structure of DNA (Watson and Crick Model), Different Forms of DNA Double Helix and Organization of DNA in the Cell.

BLOCK II: ENZYMES, VITAMINS AND HORMONES

UNIT-5: Enzymes: Nomenclature and Classification of Enzymes, Active Site, Factors Affecting Enzyme Activity. Mechanism of Enzyme Action (Lock and Key Model, Induced Fit Model, Substrate Strain Model).

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

UNIT-6: Isoenzymes, Regulation of Enzyme Activity in Living System, Enzyme Kinetics (MM Equation, Line-Weaver and Burk Plot).

UNIT-7: Vitamins: Classification of Vitamins, Chemistry, Sources, Biochemical Functions, Recommended Dietary Allowances (RDA), Deficiency, Symptoms and Hypervitaminosis.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

UNIT-8: Hormones: General Classification, Mechanism of Action, Origin and Major Functions of Hormones - Pituitary and Gonadal.

BLOCK III: METABOLISM

UNIT-9: Carbohydarte Metabolism: Glycolysis, Citric acid Cycle, Glyconeogenesis, Glycogenesis, Glycogenolysis, Hexose Monophosphate Shunt, Uronic Acid Pathway.

UNIT-10: Lipid Metabolism: Fatty Acid Oxidation, Ketogenesis, Biosynthesis of Fatty Acids, Metabolism of Cholesterol.

UNIT-11: Aminoacid Metabolism: Amino Acid Pool, Transamination, Deamination, Metabolism of Ammonia, Urea Cycle, Fate of Carbon Skeleton of Aminoacids.

UNIT-12: Nucleotide Metabolism: Biosynthesis and Degradation of Purine and Pyrimidine Ribonucleotides.

BLOCK IV: METABOLIC DISORDERS

UNIT-13: Diabetes Mellitus, Diabetes Insipidus, Glycogen Storage Diseases, Ketoacidosis, Hyperlipoproteinemia, Fatty Liver-Antherosclerosis; Phenylketonuria, Maple Syrup Urine Disease, Glutaric Acidemia Type I,Carbamoyl Phosphate Synthetase I Deficiency.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

UNIT-14: Alcaptonuria, Lesch-Nyhan Syndrome; Gout; Lipoid Congenital Adrenal Hyperplasia; Kearns-Sayre Syndrome; Zellweger Syndrome; Gaucher's Disease, Niemann Pick Disease.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Cell and Molecular Biology

I - M.Sc(Zoology) / I - Semester

Choice Based Credit System(CBCS)

- By

Prof. P. Neeraja
Prof. K.S. Reddy

Prof. M. Bhaskar

Department of Zoology
Sri Venkateswara University

Tirupati-517502, Andhra Pradesh, India.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

Centre for Distance and Online Education

Sri Venkateswara University

Tirupathi, AP -517 502

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Year : 2024

Edtion : First

Printed

by

StudentsHelpline
Expect more from us ...

(An ISO 9001 : 2015 Certified Publishers)

326/C, Surneni Nilayam
Near B K Guda Park, S R Nagar
Hyderabad - 500 038 TS
PNo:+91 40 23710657, 238000657, 23810657
Cell:+91 94405 75657, 93925 75657, 93935 75657
Reg. Off.: 5-68, Pedda Gorpadu, Pakala, Tirupathi - 517 112 AP
mail: studentshelpline.in@gmail.com

for

Director

Centre for Distance and Online Education
Sri Venkateswara University
Tirupathi, AP -517 502
mail : directorddesvu@gmail.com
Cell: +91 877-2289380
www.svudde.in

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

CONTENTS

INTRODUCTION

BLOCK I: CELL STRUCTURE

UNIT 1 CELL THEORY – STRUCTURAL ORGANIZATION 1-19

1.0 Introduction
1.1 Objectives
1.2 Fundamentals of Cell Theory
  1.2.1 Fundamentals of Cell
1.3 Prokaryotic and Eukaryotic Cells
  1.3.1 Structure of Prokaryotic Cells
  1.3.2 Structure of Eukaryotic Cell
1.4 Answers to Check Your Progress Questions
1.5 Summary
1.6 Key Words
1.7 Self Assessment Questions and Exercises
1.8 Further Readings

UNIT 2 CELL COMPONENTS 20-33

2.0 Introduction
2.1 Objectives
2.2 Components of the Cell
  2.2.1 Ultra Structure of Cell Membrane (Plasma Membrane)
  2.2.2 Mitochondria - The Energy Transformers (Singular = Mitochondrion)
  2.2.3 Nucleus: The Hereditary Organelle
2.3 Answers to Check Your Progress Questions
2.4 Summary
2.5 Key Words
2.6 Self Assessment Questions and Exercises
2.7 Further Readings

UNIT 3 ENDOPLASMIC RETICULUM 34-57

3.0 Introduction
3.1 Objectives
3.2 Endoplasmic Reticulum (ER)
3.3 Golgi Apparatus
3.4 Lysosomes
3.5 Ribosomes
3.6 Peroxisomes
3.7 Answers to Check Your Progress Questions
3.8 Summary
3.9 Key Words
3.10 Self Assessment Questions and Exercises
3.11 Further Readings

UNIT 4 CYTOSKELETON **58-73**

4.0 Introduction
4.1 Objectives
4.2 The Cytoskeleton
  4.2.1 Microfilaments
  4.2.2 Microtubules
4.3 Cell Cycle
  4.3.1 Mitosis
  4.3.2 Meiosis
4.4 Answers to Check Your Progress Questions
4.5 Summary
4.6 Key Words
4.7 Self Assessment Questions and Exercises
4.8 Further Readings

BLOCK II: NUCLEIC ACIDS

UNIT 5 STRUCTURE AND FUNCTION: DNA AND RNA **74-100**

5.0 Introduction
5.1 Objectives
5.2 Dna: Structure and Function
  5.2.1 Structure of DNA; 5.2.2 Functions of DNA
5.3 RNA: Structure, Function and Types
5.4 Answers to Check Your Progress Questions
5.5 Summary
5.6 Key Words
5.7 Self Assessment Questions and Exercises
5.8 Further Readings

UNIT 6 ENZYMES INVOLVED IN MOLECULAR BIOLOGY **101-121**

6.0 Introdcution
6.1 Objectives
6.2 Molecular Biology
  6.2.1 DNA Polymerases
  6.2.2 RNA Polymerase
  6.2.3 DNA Helicases
  6.2.4 Primase
  6.2.6 Restriction Enzyme Restriction Endonuclease
  6.2.7 DNA Ligase
6.3 Answers to Check Your Progress Questions
6.4 Summary
6.5 Key Words
6.6 Self Assessment Questions and Exercises
6.7 Further Readings

UNIT 7 MECHANISM OF PROKARYOTIC AND EUKARYOTIC DNA REPLICATION **122-141**

7.0 Introduction
7.1 Objectives
7.2 Mechanism of Prokaryotic and Eukaryotic DNA Replication
  7.2.1 DNA Replication in Prokaryotes
  7.2.2 DNA Replication in Eukaryotes
  7.2.3 Okazaki Fragments
7.3 Difference between Prokaryotic DNA Replication and Eukaryotic DNA Replication
7.4 Answers to Check Your Progress Questions
7.5 Summary
7.6 Key Words
7.7 Self Assessment Questions and Exercises
7.8 Further Readings

BLOCK III: TRANSCRIPTION AND TRANSLATION

UNIT 8 PROKARYOTIC TRANSCRIPTION **142-153**

8.0 Introduction
8.1 Objectives
8.2 Prokaryotic Transcription
  8.2.1 Promoters
  8.2.2 Steps in Prokaryotic Transcription
8.3 Properties of Bacterial RNA Polymerase
8.4 Answers to Check Your Progress Questions
8.5 Summary
8.6 Key Words
8.7 Self Assessment Questions and Exercises
8.8 Further Readings

UNIT 9 EUKARYOTIC TRANSCRIPTION **154-167**

9.0 Introduction
9.1 Objectives
9.2 Eukaryotic Transcription
  9.2.1 Properties of RNA Polymerases I, II and III
  9.2.2 Introduction to Transcription in Eukaryotes
9.3 Post Trancriptional Modification
9.4 Reverse Transcription in Eukaryotes
9.5 Answers to Check Your Progress Questions
9.6 Summary
9.7 Key Words
9.8 Self Assessement Questions and Exercises
9.9 Further Readings

UNIT 10 PROTEIN SYNTHESIS **168-183**

10.0 Introduction
10.1 Objectives

10.2 Protein Synthesis
10.2.1 Components of Protein Synthesis
10.2.2 Composition of Genetic Code
10.3 Mechanisms of Protein Synthesis
10.3.1 Role of Ribosomes in Protein Synthesis
10.4 Formation of Initiation Complex
10.4.1 Polypeptide Chain Elongation
10.4.2 Translocation; 10.4.3 Chain Termination
10.4.4 Modification of Folding of Released Polypeptides
10.5 Answers to Check Your Progress Questions
10.6 Summary
10.7 Key Words
10.8 Self Assessment Questions and Exercises
10.9 Further Readings

UNIT 11 CELL FREE PROTEIN SYNTHESIS **184-196**

11.0 Introduction
11.1 Objectives
11.2 Cell Free Protein Synthesis
11.2.1 Application of Cell Free Proteins
11.3 Comparison of Protein Synthesis in Prokaryotes and Eukaryotes
11.4 Answers to Check Your Progress Questions
11.5 Summary
11.6 Key Words
11.7 Self Assessment Questions and Exercises
11.8 Further Readings

BLOCK IV: REGULATIONS OF GENE EXPRESSION

UNIT 12 CONCEPT OF OPERON **197-210**

12.0 Introduction
12.1 Objectives
12.2 Operon: Basic Concepts
12.2.1 Repressible Versus Inducible Enzymes:
12.3 Concept of Operon
12.3.1 Lac Operon
12.3.2 Tryptophan Operon
12.4 Answers to Check Your Progress Questions
12.5 Summary
12.6 Key Words
12.7 Self Assessment Questions and Exercises
12.8 Further Readings

UNIT 13 HARMONAL REGULATION OF GENE EXPRESSION **211-223**

13.0 Introduction
13.1 Objectives
13.2 Hormonal Regulation of Gene Expression
13.2.1 Hormonal Control of Gene Expression
13.3 Steroid Receptors

13.4 Transcription Factors
13.4.1 Function of Transcription Factors
13.5 DNA Binding Motifs in Prokaryotes and Eukaryotes
13.6 Answers to Check Your Progress Questions
13.7 Summary
13.8 Key Words
13.9 Self Assessment Questions and Exercises
13.10 Further Readings

UNIT 14 ANALYSIS OF GENE EXPRESSION USING MOLECULAR BIOLOGY **224-262**

14.0 Introduction
14.1 Objectives
14.2 Analysis of Gene Expression Using Molecular Methodology
14.3 Polymerase Chain Reaction (PCR)
14.3.1 Factors Affecting PCR
14.3.2 Types of PCR
14.3.3 Applications
14.4 Southern Blotting
14.4.1 Applications
14.5 Western Blotting
14.5.1 Applications
14.6 Real Time PCR
14.6.1 Non-specific Detection using DNA Binding Dyes
14.6.2 Specific Detection using Target Specific Probes
14.6.3 Applications
14.6.4 Real Time PCR VS Traditional PCR
14.6.5 Limitations of End-point PCR
14.7 Microarray
14.7.1 Microarray Technique
14.7.2 Types of Microarrays
14.7.3 Applications
14.8 Recombinant DNA Technology
14.8.1 Preparation of Recombinant DNA Technology
14.9 Sanger Sequencing
14.9.1 Method of Sanger Sequencing
14.9.2 Uses and Limitations
14.10 Next-Generation Sequencing
14.11 Cell Culture Methods
14.11.1 Significance of Cell Culture
14.12 Answers to Check Your Progress Questions
14.13 Summary
14.14 Key Words
14.15 Self Assessment Questions and Exercises
14.16 Further Peadings

ZOO-103: Cell and Molecular Biology

BLOCK - I: CELL STRUCTURE

Unit 1: Cell theory - Structural organization of Prokaryotic and Eukaryotic cells.

Unit 2: Ultrastructure of Cell membrane, Nucleus, Chromosomes, Mitochondria.

Unit 3: Endoplasmic reticulum, Golgi apparatus, Lysosomes, Ribosomes, Peroxisomes and their functions.

Unit 4: The cytoskeleton - Microtubules and Microfilaments - Cell cycle -Mitosis and Meiosis.

BLOCK - II: NUCLEIC ACIDS

Unit 5: Structure and functions of DNA,Types of RNA and its function

Unit 6: Enzymes involved in Molecular Biology-DNA polymerases, RNA polymerase, Helicase, Primase, Ligase, Exonuclease and endonuclease.

Unit 7: Mechanism of prokaryotic and eukaryotic replication; machinery for replication; Synthesis of leading and lagging strands, Okazaki fragments, Difference between Prokaryotic and Eukaryotic replication.

BLOCK - III: TRANSCRIPTION AND TRANSLATION

Unit 8: Prokaryotic transcription: Promoters, Properties of bacterial RNA polymerase, Steps: Initiation, Elongation and Termination.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

Unit 9: Eukaryotic transcription: Promoters, Enhancers, Factors, properties of RNA polymerase I, II and III. Post transcriptional modification, Reverse transcription.

Unit 10: Protein synthesis: Machinery, Formation of initiation complex, Translocation, Chain elongation and Termination. Post-translational modifications.

Unit 11: Cell free protein synthesis, Comparison of protein biosynthesis in prokaryotes and eukaryotes.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

BLOCK - IV: REGULATIONS OF GENE EXPRESSION

Unit 12 Concept of operon - Lac and trp operons, Positive and negative control, Repressor and Inducer.

Unit 13: Hormonal regulation of gene expression, Transcription factors, Steroid receptors; DNA binding motifs in pro- and eukaryotes.

Unit 14: Analysis of Gene expression using Molecular Methodolgy.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Immunology

I - M.Sc(Zoology) / I - Semester

Choice Based Credit System(CBCS)

- By

Prof. P. Neeraja
Prof. K.S. Reddy
Department of Zoology
Sri Venkateswara University
Tirupati-517502, Andhra Pradesh, India.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

Centre for Distance and Online Education

Sri Venkateswara University

Tirupathi, AP -517 502

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Year : 2024

Edtion : First

Printed

by

StudentsHelpline
Expect more from us ...

(An ISO 9001 : 2015 Certified Publishers)

326/C, Surneni Nilayam
Near B K Guda Park, S R Nagar
Hyderabad - 500 038 TS
PNo:+91 40 23710657, 238000657, 23810657
Cell:+91 94405 75657, 93925 75657, 93935 75657
Reg. Off.: 5-68, Pedda Gorpadu, Pakala, Tirupathi - 517 112 AP
mail: studentshelpline.in@gmail.com

for

Director

Centre for Distance and Online Education
Sri Venkateswara University
Tirupathi, AP -517 502
mail : directorddesvu@gmail.com
Cell: +91 877-2289380
www.svudde.in

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

CONTENTS

BLOCK 1: INTRODUCTION TO IMMUNOLOGY **1-71**

UNIT I HISTORICAL PERSPECTIVES AND SCOPE OF IMMUNOLOGY **1-17**

Structure

1.1 INTRODUCTION
1.2 Objectives
    1.2.1 Immune Cells Made In the Bone Marrow
1.3 Types of Immune Cells
1.4 Immune Cells Made In the Bone Marrow
    1.4.1 Neutrophils
    1.4.2 Eosinophils
    1.4.3 Basophils
    1.4.4 Mast Cells
    1.4.5 Monocytes and Macrophages
    1.4.6 B Lymphocytes or B Cells
    1.4.7 T Lymphocytes or T Cells
1.5 Dendritic Cells
1.6 Natural Killer (Nk) Cells
1.7 Lymphoid Organs
    1.7.1 Types Of Lymphoid Organs
    1.7.2 Primary Lymphoid Organs
    1.7.3 Secondary Lymphoid Organs
1.8 Tertiary Lymphoid Organs
1.9 Lymph
1.10 Lymph Nodes
1.11 Spleen
1.12 Tonsils
1.13 Peyer's Patches
1.14 Mucosal-Associated Lymphoid Tissues (Malt)
1.15 Unit End Exercises
1.16 Let us Sum up
1.17 Answers to Check Your Progress
1.18 Suggested Readings

UNIT II LYMPHOID ORGANS STRUCTURE AND FUNCTIONS OF PRIMARY AND SECONDARY LYMPHOID ORGANS **18-26**

Structure

2.1 Introduction
2.2 Objectives
2.3 Primary Lymphoid Organs
    2.3.1 Bone Marrow
2.4 Mucosa Associated Lymphoid Tissue (MALT)
    2.5 Lymphocytes
2.6 Naive Lymphocytes
    2.6.1 Distribution
    2.6.2 Functions of B-Cells
2.7 T Lymphocyte
    2.7.1 Distribution
2.8 Large Granular Lymphocytes
    2.8.1 Distribution:
2.9 Let us Sum up
2.7 Unit End Exercises
2.8 Answers to Check Your Progress
2.9 Suggested Readings

UNIT III MOLECULES OF IMMUNE SYSTEM-ANTIBODIES, COMPLEMENTS, CYTOKONES, INTERFERONSE, GENERATION OF SOURCES AND FUNCTIONS. ANTIGEN: CLASSIFICATION AND EPISODE **27-45**

Structure

3.1 Introduction
3.2 Objectives
3.3 Molecules of Immune System
- 3.3.1 Acute phase reactants
- 3.3.2 Antibody structure
- 3.3.3 B-cell receptor
- 3.3.4 Antibody classes

3.4 Cytokines
3.5 Chemokines
3.6 Colony-Stimulating Factors (CSF)
- 3.6.1 Granulocyte-colony stimulating factor (G-CSF)
- 3.6.2 Granulocyte-macrophage colony stimulating factor (GM-CSF)
- 3.6.3 Macrophage colony stimulating factor (M-CSF)
- 3.6.4 Stem cell factor (SCF)

3.7 Interferons
- 3.7.1 IFN-alpha
- 3.7.2 IFN-beta
- 3.7.3 IFN-gamma

3.8 Interleukins
- 3.8.1 IL-1 (alpha and beta)
- 3.8.2 Transforming growth factors (TGF)
- 3.8.3 Tumor necrosis factors (TNFs)

3.9 Antigens
3.10 Epitope
- 3.10.1 Classification of antigens on the basis of its role
- 3.10.2 Antigen presenting cells

3.11 An Epitope
3.12 Let us Sum up
3.13 Unit End Exercises
3.14 Answers To Check Your Progress
3.15 Suggestion Readings

UNIT IV ELEMENTS OF IMMUNE SYSTEM **46-58**

Structure

4.1 Introduction
4.2 Objectives
4.3 Hematopoiesis
- 4.3.1 Hematopoiesis in the embryo
- 4.3.2 The process of Haematopoiesis

4.4 B lymphocytes (B CELLS) and T lymphocytes (T CELLS).
4.5 Specificity And Diversity of the Immune System
- 4.5.1 Kappa light chain rearrangement
- 4.5.2 Generation of B-cell / antibody diversity

4.6 Let us Sum up
4.7 Unit End Exercises
4.8answers to Check Your Progress
4.9 Suggestion Readings

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

UNIT-V ANTIGEN PROCESSING AND PRESENTATION, SUBSECTS OF T CELLS, MEMERY CELL, HELPER AND SUPPRESSOR CELLS MYELOIDE CELLS, MAJOR HISTOCOMPATIABILITYCOMPLEX **59-71**

Structure

5.1 Introduction
5.2 Objectives
5.3 Antigen Processing and Presentation
5.3.1 Antigen presentation
5.4 MCH class I presentation
5.4.1 MCH class I polymorphism
5.4.2 MCH CLASS II Presentation
5.4.3 MCH class II polymorphism
5.5 Subsets of T Cells
5.6 Memory Cells
5.7 Suppressor Cell
5.8 T Regulatory/Suppressor Cells
5.9 Myeloid Cells
5.10 The Major Histocompatibility Complex (Mhc)
5.11 Let us Sum up
5.12 Unit End Exercises
5.13 Answers to Check Your Progress
5.14 Suggested Readings.

UNIT VI IMMUNITY, TYPES OF IMMUNITY, INNATE, ADAPTIVE IMMUNITY **72-87**

Structure

6.1 Introduction
6.2 Objectives
6.3 Definition
6.4 Types of Immunity
6.4.1 Innate or Natural or Nonspecific Immunity
6.4.2 Macrophages
6.4.3 Natural Killer Cells (NK Cells)
6.5 Types of Innate Immunity
6.5.1 Species immunity
6.5.2Racial immunity
6.5.3 Individual immunity
6.6 Acquired or Developed Immunity or Adaptive Immunity
6.6.1 Types of acquired immunity:
(i) Active immunity (ii) Passive immunity
6.7 Components of Acquired Immunity
6.7.1 Antibody Mediated Immune System (AMIS) or Humoral Immunity
6.7.2 Formation of Plasma B Cells and Memory B cells
6.7.3 Cell-Mediated Immune System (CMIS) or T-Cell Immunity
6.8 Types of T-Cells and their Functions
6.8.1 Helper T cells (T_H)
6.8.2 Cytotoxic T cells (Tc) or Killer cells
6.8.3 Memory T Cells (Primed Cells)
6.8.4 Suppressor Cells (Regulatory T cells (T_R)
6.8.5 Natural Killer (NK) Cells:
6.9 Determinants of Acquired Specific Immunity.
6.9.1 Form
6.9.2 Route
6.9.3 Dose
6.10 Let us Sum up
6.11 Unit End Exercises
6.12 Answers To Check Your Progress

UNIT VII IMMUNE RESPONSE: TYPES OF IMMUNE RESPONSE EFFECTOR MECHANISM OF HUMORAL AND CELL MEDIATED IMMUNE RESPONSES **88-92**

Structure

7.1 Introduction

7.2 Objectives

7.3 Types of Immune Response

7.3.1 Two types of immune response

7.4 Humoral Immunity: B Cell Response

7.4.1 The primary immune response

7.4.2 The secondary immune response:

7.5 Let us Sum up

7.6 Unit End Exercises

7.4 Answers To Check Your Progress

UNIT –VIII ANTIBODY-DEPENDENT CELL-MEDIATED CYTOTOXICITY (ADCC) **93-109**

Structure

8.1 Introduction

8.2 Objectives

8.3 ADCC steps

8.3.1 Activation of ADCC

8.4 Natural Killer Cells, or NK Cells

8.5 Mechanisms of Cytotoxicity

8.6 Mechanism of Cell Destruction

8.6.1Calcium-dependent processes

8.6.2 Engagement of Fas

8.6.3 Release of reactive oxygen species

8.6.4 Perspectives

8.6.5 Natural killer cells

8.7 Immunity to Infectious Diseases

8.7.1 Infection

8.7.2 Vaccination

8.7.3 Future Exposure

8.8 Non-Specific (INNATE) Immunity

8.9 Specific Immunity

8.10 Vaccines and Immunization Schedule

8.10.1 Passive Immunization

8.10.2 Active Immunization (Vaccination)

8.11 Vaccine

8.11.1 Live vaccines

8.11.2 Attenuation

8.11.3 Inactivated vaccines

8.11.4 Subunit vaccines

8.12 Immunization Schedule

8.13 Let us Sum up

8.14 Unit End Exercises

8.15 Answers to Check Your Progress

8.16 Suggestion Readings

UNIT IX INFECTIOUS DISEASES; HYPERSENSITIVITY – TYPE I, II, III AND IV **110-126**

Structure

9.1 Introduction

9.2 Objectives

9.3 Type Hypersensitivity

9.3.1 Immediate Hypersensitivity (Anaphylactic Reaction)
9.3.2 Immunoglobulin E–Mediated Immediate Hypersensitivity
9.3.3 Mechanisms of Immune-Mediated Tissue Injury
9.3.4 Inflammation, Inflammatory Mediators, and Immune-Mediated Disease
9.4 TYPE II HYPERSENSITIVITY
9.4.1 Cytotoxic Reaction (Antibody-dependent)
9.4.2 Adaptive Immune Response and Hypersensitivity Type II
9.4.3 Mechanisms of Immune-Mediated Tissue Injury
9.4.4 Molecular Basis of Diseases of Immunity
9.6 TYPE III HYPERSENSITIVITY
9.6.1 Immune Complex Reaction
9.6.2 Immunocomplex-Mediated Hypersensitivity
9.6.3 Mechanisms of Immune-Mediated Tissue Injury
9.7 TYPE IV HYPERSENSITIVITY
9.7.1 Cell-Mediated (Delayed Hypersensitivity)
9.7.2 Type IV or Delayed-Type Hypersensitivity
9.7.3 Mechanisms of Immune-Mediated Tissue Injury
9.8 Let Us Sum Up
9.9 Unit - End Exercises
9.10 Answers to Check Your Progress
9.11 Suggested Reading

UNIT X AUTOIMMUNE DISORDER AND IMMUNODEFICIENCY DISESES. ORAN TRANSPLANTATION ANTIBODY ENGINEERING **127-155**

Structure

10.1 Introduction
10.2 Objectives
10.3 Definition
10.4 Autoimmune Diseases
10.4.1 Rheumatoid arthritis
10.4.2 Systemic lupus erythematosus (lupus)
10.4.3 Inflammatory bowel disease (IBD)
10.4.5 Guillain-Barre syndrome
10.4.6 Chronic inflammatory demyelinating polyneuropathy
10.4.7 Psoriasis
10.4.8 Graves' disease
10.4.9 Hashimoto's thyroiditis
10.4.10 Myasthenia gravis
10.4.11Vasculitis
10.5 Autoimmune Disorder and Immunodeficiency
10.5.1 Definition of Autoimmunity in Primary Immunodeficiency
10.5.2 Autoimmune Cytopenias
10.5.3 Red Blood Cells
10.5.4 Platelets
10.5.5 White blood Cell
10.6 Diagnosis of Autoimmune Cytopenias
10.7 Treatment of Autoimmune Cytopenias
10.8 Autoimmune Lung Disease
10.8.1 Symptoms
10.8.2 Diagnosis of Pulmonary Complications
10.8.3 Treatment
10.9 AUTOIMMUNE SKIN DISEASE
10.9.1 Hair and Skin Pigmentation Changes
10.9.2 Diagnosis of Skin Diseases
10.9.3 Treatment
10.10 Eczema
10.11 Psoriasis

10.12 Autoimmune Gastrointestinal Disease
10.13 Mucosal Changes
10.13.1 Autoimmune Musculoskeletal Disease.
10.13.2 Symptoms.
10.13.3 Treatment
10.14 Liver Inflammation
10.14.1 Autoimmune Kidney Disease
10.14.2 Symptoms
10.14.3 Diagnosis of Kidney Complications
10.14.4 Treatment
10.15 Diabetes
10.15.1 Treatment
10.16 There Are Two Types of Immunodeficiency Disorders
10.16.1 Primary immunodeficiency
10.16.2 Secondary immunodeficiency
10.16.3 Corticosteroids
10.17 Immunodeficiency in Older People
10.17.1 Symptoms
10.17.2 Diagnosis
10.17.3 Physical examination
10.17.4 Tests
10.18 HIV Infection
10.19 Cancer
10.20 Preventing Infections
10.21 Treating Infections
10.22 Antiviral Drugs
10.23 Organ Transplantation
10.23.1 Transplantation
10.23.2 Replacing missing parts of the immune system
10.23.3 Stem cell transplantation
10.24 There Are Several Types Of Transplantation Involving Tissues and Organs
10.24.1Clinical Stages Of Rejection
10.24.2 Hyper Acute Rejection
10.25 Serology Screening
10.26 Immuno Suppressive Drugs
10.27 Future Transplant Therapies
10.28 Let us Sum up
10.29 Unit End Exercises
10.30 Answers to Check Your Progress
10.31 Suggested Readings

10.24.2 Hyper Acute Rejection
10.25 Serology Screening
10.26 Immuno Suppressive Drugs
10.27 Future Transplant Therapies
10.28 Let us Sum up
10.29 Unit End Exercises
10.30 Answers To Check Your Progress
10.31 Suggested Readings

UNIT XI CANCER, TYPES AND NATURE, IMMUNOTHERAPY, IMMUNE RESPONSES AGAINST TUMORS AND TRANSPLANTS **156-178**

Structure

11.1 Introduction
11.2 Objectives
11.3 Types of Cancer
11.4 Cancer Growth and Metastasis
11.5 Risk Factors and Treatment

11.6 Visit The Cancer Prevention Section for more Information
11.7 Surgery
11.8 Chemotherapy
11.9 Radiation Therapy
11.10 Stem Cell (Bone Marrow) Transplant
11.11 Immunotherapy (Biological Therapy)
11.12 Hormone Therapy
11.13 Targeted Drug Therapy
11.14 The Main Types of Cancer
11.14.1 Squamous cell carcinoma
11.14.2 Adenocarcinoma
11.14.3 Transitional cell carcinoma
11.14.4 Basal cell carcinoma
11.14.5 Sarcomas
11.14.6 Bone sarcomas
11.14.7 Soft tissue sarcomas
11.14.8 Cartilage
11.14.10 Muscle
11.14.11 Lymphomas
11.14.12 Myeloma
11.15 Brain and Spinal Cord Cancers
11.16 Glial-Cell.
11.16.1 The Purpose of Cancer Treatments
11.17 Patients' Rights
11.18 Cancer Treatment In Practice
11.19 Different Types of Cancer Treatment
11.19.1 Combination therapy
11.19.2 Adjuvant therapy
11.19.3 Supportive therapy
11.20 Treatment Fatigue
11.21 Treatment Studies and Drug Trials
11.22. Growth
11.22.1 Ability to invade nearby tissues
11.23 Immuno Therapy
11.24 Types of Immunotherapy
11.25 Let us Sum up
11.24 Unit End Exercises
11.25 Answers to Check Your Progress
11.26 Suggested Readings **179-196**

UNIT XII IMMUNOCYTOCHEMISTRY, ANTIBODY GENERATION AND RADIOIMMUNOASSAY

Structure

12.1 Introduction
12.2 Objectives
12.3 Immunocytochemistry
12.3.1 Uses of Immunocytochemistry
12.3.2 Technique for Immunocytochemistry
12.4 Generation of Antibodies
12.4.1Polyclonal and Monoclonal Antibodies
12.4.2 Production of monoclonal vs. polyclonal antibodies
12.4.3 Some Useful Properties of Polyclonal Antibodies
12.4.4 Advantages of Polyclonal Antibodies
12.4.5 Disadvantage of Polyclonal Antibodies
12.4.6 Antiserum is commonly purified by one of two methods.
12.4.7 Biological Effects of Antibodies
12.5 Neutralization of Viruses

12.6 Immobilization
12.7 Cytolysis
12.8 Opsonization
12.9 Neutralization of Exotoxins
12.10 Preventing Bacterial Adhesion to Host Cells
12.11 Radioimmunoassay
12.11.1 Radioimmunoassay
12.12 Let us Sum up
12.13 Unit End Exercise
12.14 Answers to Check Your Progress
12.15 Suggested Readings

UNIT XIII DETECTION OF MOLECULES USING IMMUNOBLOT TECHNIQUES **197-214**

Structure

13.1 Introduction
13.2 Objectives
13.3 Blotting Techniques
13.3.1 Procedure
13.3.2 Principle
13.3.3 Normalization of target protein abundance
13.3.4 Conclusions
13.4 Capillary and Microchip Electrophoresis
13.4.1 Automated micro fluidic protein immunoblotting and single cell-resolution western blotting
13.4.2 Single cell-resolution western blotting
13.4.3 Thin-film direct coating with suction-western blotting (TDCS)
13.5 Enzyme-Linked Immunosorbent Assay (ELISA)
13.5.1 The principle
13.5.2 Direct ELISA
13.5.3 Indirect ELISA
13.5.4 Sandwich ELISA
13.5.5 Competitive ELISA
13.6 Immobilization of Antibody/Antigen on Micro Plate Wells
13.7 Let us Sum up
13.8 Unit End Exercise
13.9 Answers to Check Your Progress
13.10 Suggested Readings

UNIT XIV IMMUNOPRECIPITATION AND IMMUNOFLUORESCENCE **214-228**

Structure

14.1 Introduction
14.2 Objectives
14.3 Immunoprecipitation (IP)
14.4 Immunofluorescence Microscopy
14.5 Acquired Immuno Deficiency Syntrome
14.5.1 Symptoms
14.5.2 Primary infection (Acute HIV)
14.5.3 Clinical latent infection (Chronic HIV)
14.5.4 Symptomatic HIV infection
14.5.5 Progression to AIDS
14.5.6 Complications
14.5.7 Cancers common to HIV/AIDS
14.5.8 Prevention
14.6 Hybridoma Technology
14.7 Monoclonal Antibodies
14.7.1 Hybridoma technology for production of monoclonal antibodies
14.7.2 Application of monoclonal antibodies

14.7.3 Disease treatment
14.7.4 Passive immunization or disease prevention
14.7.5 Detection and purification of biomolecules
14.8 FACS
14.9 Immunofluorescent Assay
14.9.1 Types of Immunofluorescence
14.10 Let us Sum up
14.11 Unit End Exercise
14.12 Answers to Check Your Progress
14.13 Suggested Readings

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

ZOO-104: Immunology

BLOCK 1: INTRODUCTION TO IMMUNOLOGY

UNIT I Historical Perspectives and Scope of Immunology

UNIT II Lymphoid Organs Structure and Functions of Primary and Secondary Lymphoid Organs

UNIT III Molecules of Immune System–Antibodies, Complements, Cytokines, Interferons, Types, Sources and Functions. Antigen: Classification and Epitopes.

Unit IV Elements of Immune System: Hematopoiesis, T- Lymphocytes, B-Lymphocytes, Generation of Lymphocyte specificity and diversity.

UNIT V Antigen Processing and Presentation, Subsets of T Cells, Memory, Helper and Suppressor Cells, Myeloid Cells, Major histocompatiability complex (MCH)

BLOCK II : IMMUNITY AND IMMUNE RESPONSE

UNIT VI Immunity: Types of Immunity – Innate, Adaptive Immunity.

UNIT VII Immune Response: Types of Immune Response, Effector Mechanism of humoral and Cell Mediated Immune Responses.

UNIT VIII Antibody-Dependent Cell-Mediated Cytotoxicity, Natural killer cells. Immunity to infections-Immunoprophylaxis, Vaccines and immunization schedule.

BLOCK III : IMMUNE DISORDRS

UNIT IX Infectious Diseases; Hypersensitivity – Types I, II, III and IV.

UNIT X Autoimmune disorders and Immunodeficiency diseases. Organ Transplantation, Antibody Engineering.

UNIT XI : Cancer, Types and Nature, Immunotherapy; Immune Responses against Tumors and Transplants.

BLOCK IV IMMUNOLOGICAL TECHNIQUES

UNIT XII: Immunocytochemistry, Antibody generation and Radioimmunoassay.

UNIT XIII: Detection of Molecules Using Immunoblot Techniques, ELISA and Vaccine development.

UNIT XIV: Immunoprecipitation and Immunofluorescence microscopy, Acquired Immuno deficiency Syndrome (AIDS) detection and Hybridoma technology, FACS, Immunofluorescent assay.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Genetics

I - M.Sc(Zoology) / II - Semester

Choice Based Credit System(CBCS)

- By

Prof. P. Neeraja
Prof. K.S. Reddy
Department of Zoology
Sri Venkateswara University
Tirupati-517502, Andhra Pradesh, India.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

Centre for Distance and Online Education

Sri Venkateswara University

Tirupathi, AP -517 502

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Year : 2024

Edtion : First

Printed

by

StudentsHelpline
Expect more from us ...

(An ISO 9001 : 2015 Certified Publishers)

326/C, Surneni Nilayam
Near B K Guda Park, S R Nagar
Hyderabad - 500 038 TS
PNo:+91 40 23710657, 238000657, 23810657
Cell:+91 94405 75657, 93925 75657, 93935 75657
Reg. Off.: 5-68, Pedda Gorpadu, Pakala, Tirupathi - 517 112 AP
mail: studentshelpline.in@gmail.com

for

Director

Centre for Distance and Online Education
Sri Venkateswara University
Tirupathi, AP -517 502
mail : directorddesvu@gmail.com
Cell: +91 877-2289380
www.svudde.in

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

CONTENTS

INTRODUCTION

BLOCK I: CLASSICAL GENETICS

UNIT 1 INTRODUCTION TO GENETICS **1-12**

1.0 Introduction
1.1 Objectives
1.2 Genetics: Terminology and Scope
  1.2.1 Terminology
1.3 Answers to Check Your Progress Questions
1.4 Summary
1.5 Key Words
1.6 Self Assessment Questions and Exercises
1.7 Further Readings

UNIT 2 MENDELIAN GENETICS **13-32**

2.0 Introduction
2.1 Objectives
2.2 Mendelian Principles: Monohybrid and Dihybrid Crosses
  2.2.1 Mendel's Four Postulates of Hereditary
  2.2.2 Punnett Square and Forked Line Method for Representation of Hybridization Crosses
  2.2.3 Test Cross between One and Two Characters
2.3 Mendelian Traits in Man
  2.3.1 Chi Square to Test the Hypothesis of Mendelian Characters
2.4 Answers to Check Your Progress Questions
2.5 Summary
2.6 Key Words
2.7 Self Assessment Questions and Exercises
2.8 Further Readings

UNIT 3 POLYGENIC INHERITANCE AND MULTIPLE ALLELES **33-48**

3.0 Introduction
3.1 Objectives
3.2 Polygenic Inheritance
3.3 Multiple Alleles and Polygenic Inheritance
  3.3.1 Blood Group Inheritance in Man
3.4 Answers to Check Your Progress Questions
3.5 Summary
3.6 Key Words
3.7 Self Assessment Questions and Exercises
3.8 Further Readings

UNIT 4 GENE INTERACTIONS **49-70**

4.0 Introduction
4.1 Objectives

4.2 Gene Interactions
4.2.1 Allelic Gene Interactions
4.2.2 Non-Allelic Gene Interactions
4.3 Answers to Check Your Progress Questions
4.4 Summary
4.5 Key Words
4.6 Self Assessment Questions and Exercises
4.7 Further Readings

BLOCK II: LINKAGE, CROSSING OVER AND CHROMOSOME MAPPING

UNIT 5 MECHANISM AND THEORIES OF LINKAGE AND CROSSING OVER **71-92**

5.0 Introduction
5.1 Objectives
5.2 Mechanism and Theories of Linkage and Crossing Over
5.2.1 Crossing Over
5.3 Answers to Check Your Progress Quetsions
5.4 Summary
5.5 Key Words
5.6 Self Assessment Questions and Exercises
5.7 Further Readings

UNIT 6 CHROMOSOME AND GENE MAPPING **93-118**

6.0 Introduction
6.1 Objectives
6.2 Chromosomal Mapping: Two Point and Three Point Mapping
6.3 Mapping in Haploid Organisms
6.4 Mapping with Molecular Markers and Qtl Mapping
6.4.1 Quantitative Trait Locus (QTL) Mapping
6.5 Answers to Check Your Progress Quetsions
6.6 Summary
6.7 Key Words
6.8 Self Assessment Questions and Exercises
6.9 Further Readings

UNIT 7 CHROMOSOMES: THEIR STRUCTURE AND ROLES **119-140**

7.0 Introduction
7.1 Objectives
7.2 Structure and Classification of Chromosomes
7.3 Sex Determination in Humans, Honey Bee and *Drosophila*
7.3.1 Sex Determination in Honey Bees
7.3.2 Sex Determination in *Drosophila*
7.4 Heterochromatization and Barr Bodies
7.5 Answers to Check Your Progress Questions
7.6 Summary
7.7 Key Words
7.8 Self Assesment Questions and Exercises
7.9 Further Readings

UNIT 8 CHROMOSOMAL INHERITANCE AND ABNORMALITIES 141-164

8.0 Introduction
8.1 Objectives
8.2 Non-Disjunction Syndromes
8.3 Pedigree Analysis
8.4 Sex Linked and Autosomal Inheritance
8.5 Answers to Check Your Progress Questions
8.6 Summary
8.7 Key Words
8.8 Self Assessment Questions and Exercises
8.9 Further Readings

BLOCK III: MOLECULAR GENETICS

UNIT 9 MUTATIONS AND CHROMOSOMAL ABERRATIONS 165-180

9.0 Introduction
9.1 Objectives
9.2 Mutations: Types and Applications
9.3 Chromosomal Aberrations: Types and Examples
9.4 In-Breeding and Out Breeding: Sources of Genetic Superiority or Variations
9.5 Answers to Check Your Progress Questions
9.6 Summary
9.7 Key Words
9.8 Self Assessment Questions and Exercises
9.9 Further Readings

UNIT 10 POPULATION GENETICS 181-194

10.0 Introduction
10.1 Objectives
10.2 Population Genetics
10.2.1 Factors Affecting Hardy-Weinberg Equilibrium
10.3 Answers to Check Your Progress Questions
10.4 Summary
10.5 Key Words
10.6 Self Assessment Question and Exercises
10.7 Further Readings

UNIT 11 TWIN STUDY, EUGENICS, EUTHENICS AND EUPHENICS 195-208

11.0 Introduction
11.1 Objectives
11.2 Twin Study
11.2.1 Euthenics: For Betterment of Life
11.2.2 Euphenics: For Restoring a Normal Phenotype
11.3 Answers to Check Your Progress Questions
11.4 Summary
11.5 Key Words
11.6 Self Assessment Questions and Exercises
11.7 Further Readings

BLOCK IV: GENETIC CONCEPT

UNIT 12 GENE AND CONTROL OF GENE EXPRESSION 209-224

12.0 Introduction
12.1 Objectives
12.2 Gene Concept and Gene Expression Control
12.3 Gene Expression in Eukaryotes
12.4 Answers to Check Your Progress Questions
12.5 Summary
12.6 Key Words
12.7 Self Assessment Questions and Exercises
12.8 Further Readings

UNIT 13 CELL CYCLE REGULATION AND ROLE OF CELL DEATH 225-240

13.0 Introduction
13.1 Objectives
13.2 Gene Regulation
13.3 Apoptosis and Necrosis: Cell Death
13.4 Answers to Check Your Progress Questions
13.5 Summary
13.6 Key Words
13.7 Self Assessment Questions and Exercises
13.8 Further Readings

UNIT 14 DIFFERENTIAL AND SEQUENTIAL EXPRESSION OF GENES 241-254

14.0 Introduction
14.1 Objectives
14.2 Differential and Sequential Expression of Genes with Reference to *Drosophila*
14.3 Answers to Check Your Progress Questions
14.4 Summary
14.5 Key Words
14.6 Self Assessment Questions and Exercises
14.7 Further Readings

ZOO-201: Genetics

BLOCK-I: CLASSICAL GENETICS

Unit I

Definition, Terminology and Scope of Genetics – Mendel and his Contribution – Hybridization Techniques of Mendel.

Unit II

Mendelian Principles – Monohybrid and Dihybrid Crosses, Simple Mendelian Traits in Man.

Unit III

Polygenetic Inheritance, Multiple Alleles – Blood Group Inheritance in Man.

Unit IV

Interaction of Genes – Allelic and Non-Allelic Interaction – Complementary, Supplementary, Duplicate and Epistatic interaction.

BLOCK-II: LINKAGE, CROSSING OVER AND CHROMOSOME MAPPING

Unit V

Mechanism and Theories of Linkage and Crossing Over.

Unit VI

Chromosomal and Gene Mapping Methods. Linkage Maps, Tetrad Analysis, Mapping with Molecular Markers and QTL Mapping.

Unit VII

Structure and Types of Chromosome. Sex Chromosomes, Sex Determination in Animals – Human and Honey Bee. Heterochromatization and Barr Bodies.

Unit VIII

Sex Linked Inheritance, Non Disjunction – Syndromes and Pedigree Analysis.

DIRECTOR
Centre for Distance and Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

BLOCK-III: MOLECULAR GENETICS

Unit IX

Mutation – Types and its Applications, Chromosomal Abnormalities, Inbreeding and Out Breeding.

Unit X

Population Genetics: Hardly – Weinberg Equilibrium – Gene Pool, Gene Frequency, Genotypic Frequency and Factors Affecting Hardy – Weinberg Equilibrium.

Unit XI

Twin Study, Eugenics, Euthenics and Euphenics.

BLOCK-IV: GENETIC CONCEPT

Unit XII

Concept of Gene – Gene Expression Control in Prokaryotes, Eukaryotes, and Phages.

Unit XIII

Genetic Regulation in Development and Role of Cell Death.

Unit XIV

Differential and Sequential Expression of Genes with Reference to Drosophila.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Microbiology

I - M.Sc(Zoology) / II - Semester

Choice Based Credit System(CBCS)

- By

Prof. P. Neeraja
Prof. K.S. Reddy
Department of Zoology
Sri Venkateswara University
Tirupati-517502, Andhra Pradesh, India.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

Centre for Distance and Online Education

Sri Venkateswara University

Tirupathi, AP -517 502

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Year : 2024

Edtion : First

Printed

by

StudentsHelpline
Expect more from us ...

(An ISO 9001 : 2015 Certified Publishers)

326/C, Surneni Nilayam
Near B K Guda Park, S R Nagar
Hyderabad - 500 038 TS
PNo:+91 40 23710657, 238000657, 23810657
Cell:+91 94405 75657, 93925 75657, 93935 75657
Reg. Off.: 5-68, Pedda Gorpadu, Pakala, Tirupathi - 517 112 AP
mail: studentshelpline.in@gmail.com

for

Director

Centre for Distance and Online Education
Sri Venkateswara University
Tirupathi, AP -517 502
mail : directorddesvu@gmail.com
Cell: +91 877-2289380
www.svudde.in

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

CONTENTS

INTRODUCTION

BLOCK I: INRODUCTION TO MICROBIOLOGY

UNIT 1 MICROBIOLOGY: AN INTRODUCTION **1-28**

1.0 Introduction
1.1 Objectives
1.2 Microbiology: An Introduction
1.3 Haeckel's Three Kingdom Concept
1.4 Whittaker's Five Kingdom System
1.5 Three Domain Concept of Carl Woese
1.6 Answers to Check Your Progress Questions
1.7 Summary
1.8 Key Words
1.9 Self Assessment Questions and Exercises
1.10 Further Readings

UNIT 2 MICROBIAL DIVERSITY **29-60**

2.0 Introduction
2.1 Objectives
2.2 Classification of Bacteria According to Bergey's Manual
2.3 Fungi: General Characteristics
2.4 Industrial Uses of Yeasts and Moulds
2.5 Lichens: Structral Organisation and Their Properties
2.6 Answers to Check Your Progress Questions
2.7 Summary
2.8 Key Words
2.9 Self Assessment Questions and Exercises
2.10 Further Readings

UNIT 3 VIRUSES: CHARACTERISTICS AND CLASSIFICATION **61-88**

3.0 Introduction
3.1 Objectives
3.2 Virus: An Introduction
3.3 Morphology and Ultra-Structure of Viruses
3.4 Classification of the Viruses
3.4.1 Classification Systems
3.4.2 Multiplication of Viruses
3.5 Answers to Check Your Progress Questions
3.6 Summary
3.7 Key Words
3.8 Self Assessment Questions and Exercises
3.9 Further Readings

BLOCK II: MICROSCOPY, METHODS, NUTRITION AND MICROBIAL GROWTH

UNIT 4 MICROSCOPY **89-132**

4.0 Introduction
4.1 Objectives
4.2 Microscope
  4.2.1 Components of a Microscope
  4.2.2 Microscope: Setting Up and Cleaning
  4.2.3 Simple Microscope
4.3 Compound Microscope
  4.3.1 Optical System of a Compound Microscope
  4.3.2 Types of Objectives and Eyepieces
  4.3.3 Using a Light Microscope
  4.3.4 Common Problems in Microscopy
  4.3.5 Care and Maintenance
4.4 Dark Field
4.5 Phase Contrast
4.6 Fluorescent Microscope
4.7 Electron Microscopes
4.8 Confocal Microscopy: Principles and their Application
  4.8.1 Historical Perspective
  4.8.2 Principles of Confocal Microscopy
  4.8.3 Laser Scanning Confocal Microscope Configuration
  4.8.4 Advantages and Disadvantages of Confocal Microscopy
4.9 Answers to Check Your Progress Questions
4.10 Summary
4.11 Key Words
4.12 Self Assessment Questions and Exercises
4.13 Further Readings

UNIT 5 STAINS AND STAINING TECHNIQUES **133-150**

5.0 Introduction
5.1 Objectives
5.2 Introduction to Staining Techniques
5.3 Staining and Staining Methods
  5.3.1 Staining Methods
  5.3.2 Differential Staining
5.4 Imaging Techniques
5.5 Answers to Check Your Progress Questions
5.6 Summary
5.7 Key Words
5.8 Self Assessment Questions and Exercises
5.9 Further Readings

UNIT 6 CULTURE PRESERVATION TECHNIQUES **151-172**

6.0 Introduction
6.1 Objectives
6.2 Preservation Methods of Microbes for Storage and Microscopic Studies
  6.2.1 Microbial Culture Collection

6.3 Sterilization and Disinfection
6.3.1 Classification of Sterilization Methods
6.4 Answers to Check Your Progress Questions
6.5 Summary
6.6 Key Words
6.7 Self Assessment Questions and Exercises
6.8 Further Readings

UNIT 7 MICROBIAL CULTURE METHODS 173-210

7.0 Introduction
7.1 Objectives
7.2 Axenic and Synchronous Culture
7.2.1 Axenic Culture
7.2.2 Synchronous Culture
7.3 Aerobic and Anaerobic Culture
7.3.1 Culture Methods and Nutritional Types
7.4 Process of Growth of Bacteria
7.4.1 Measurement of Growth
7.4.2 Microbial Culture Collection
7.3.3 Factors Affecting Growth
7.4.4 Culture of Bacteria in Laboratory
7.5 Answers to Check Your Progress Questions
7.6 Summary
7.7 Key Words
7.8 Self Assessment Questions and Exercises
7.9 Further Readings

BLOCK III: GENERAL CHARACTERISTICS OF BACTERIA, ALGAE AND PROTOZOA

UNIT 8 STRUCTURAL ORGANISATION OF PROKARYOTIC CELLS 211-238

8.0 Introduction
8.1 Objectives
8.2 Prokaryotic Cell Structure and Functions
8.3 Answers to Check Your Progress Questions
8.4 Summary
8.5 Key Words
8.6 Self Assessment Questions and Exercises
8.7 Further Readings

UNIT 9 MICROBIAL DIVERSITY 239-268

9.0 Introduction
9.1 Objectives
9.2 Algae: General Introduction
9.2.1 Microalgae and Microalgae
9.3 Characters of Different Classes of Algae Given By F.E.Fritsch

9.4 Answers to Check Your Progress Questions
9.5 Summary
9.6 Key Words
9.7 Self Assessment Questions and Exercises
9.8 Further Readings

UNIT 10 THE WORLD OF PROTOZOA **269-288**

10.0 Introduction
10.1 Objectives
10.2 Protozoa: An Introduction
10.2.1 Cytoskeleton
10.3 Importance of *Entamoeba histolytica* and *Plasmodium* Species
10.3.1 Life Cycle of *Plasmodium*
10.4 Answers to Check Your Progress Questions
10.5 Summary
10.6 Key Words
10.7 Self Assessment Questions and Exercises
10.8 Further Readings

BLOCK IV: MOLECULAR TECHNIQUES FOR IDENTIFICATION, INFECTIOUS DISEASES

UNIT 11 MOLECULAR TAXONOMY: CLASSIFICATION AND IDENTIFICATION **289-302**

11.0 Introduction
11.1 Objectives
11.2 Molecular Taxonomy
11.3 Bacterial Identification Using 16S rRNA Sequencing
11.4 Answers to Check Your Progress Questions
11.5 Summary
11.6 Key Words
11.7 Self Assessment Questions and Exercises
11.8 Further Readings

UNIT 12 PHYLOGENETIC TREES **303-325**

12.0 Introduction
12.1 Objectives
12.2 Phylogenetic Tree: Types and Construction
12.3 Molecular Tools for Microbial Diversuty
12.4 Answers to Check Your Progress Questions
12.5 Summary
12.6 Key Words
12.7 Self Assessment Questions and Exercises
12.8 Further Readings

UNIT 13 METAGENOMICS: SEQUENCING METHODS, DATA ANALYSIS AND ITS APPLICATIONS **326-351**

13.0 Introduction
13.1 Objectives
13.2 Metagenomics
13.2.1 Sequencing Methods and Strategies
13.2.2 Data Analysis and its Applications
13.3 Answers to Check Your Progress Questions
13.4 Summary
13.5 Key Words
13.6 Self Assessemnt Questions and Exercises
13.7 Further Readings

UNIT 14 BACTERIAL AND VIRAL DISEASES **352-394**

14.0 Introduction
14.1 Objectives
14.2 Bacterial Diseases
14.2.1 Typhoid Fever
14.2.2 Tuberculosis
14.2.3 Leprosy
14.3 Viral Diseases
14.3.1 Ebola Virus
14.3.2 Hepatitis B Virus
14.3.3 Acquired Immune Deficiency Syndrome (AIDS)
14.4 Answers to Check Your Progress Questions
14.5 Summary
14.6 Key Words
14.7 Self Assessment Questions and Exercises
14.8 Further Readings

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

ZOO-202: Microbiology

BLOCK-I: INTRODUCTORY MICROBIOLOGY

Unit I

Introduction to Microbiology, Haeckel's three–kingdom concept, Whittaker's Five-kingdom concept, Three-domain concept of Carl Woese.

Unit II

Classification of Bacteria according to Bergey's Manual. Fungi: Classification of fungi based on Alexopoulos system. General Characteristics of Fungi, Industrial uses of Yeast and Moulds. Lichens - Structural organization and their properties.

Unit III

Viruses: ICTV system of classification, General properties, Morphology and ultra-structure of virus (RNA, DNA).

BLOCK-II: MICROSCOPY, METHODS, NUTRITION AND MICROBIAL GROWTH

Unit IV

Principles and their applications of Simple, Compound, Fluorescent, Electron microscopes.(SEM & TEM) and Confocal microscopes.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

Unit V

Stains and staining techniques: Simple, Differential and Structural staining methods, Imaging techniques.

Unit VI

Preservation methods of microbes for storage and microscopic studies, Culture collections, Sterilization and disinfection.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Unit VII

Auxenic and Synchronous culture, Aerobic and Anaerobic Culture media and Nutritional types. Growth curve, Generation time and growth kinetics. Factors influencing microbial growth.

BLOCK-III: GENERAL CHARACTERISTICS OF BACTERIA, ALGAE AND PROTOZOA

Unit VIII

Prokaryotic cell structure & Organization: Cell membrane, Plasma membrane, Cytoplasmic matrix, Inclusion bodies, Ribosome, Nucleiod, Prokaryotic cell wall, Capsule, Slime layers, S layers, Pili and Fimbriae, Flagella and Motility.

Unit IX

Classification of Algae based on Fritsch system – General characteristicss of Micro and Macroalgae - Biological and Economic importance.

Unit X

Protozoa –General characteristics, .Impotance of Entamoebahistolytica and Plasmodium sp.

BLOCK-IV: MOLECULAR TECHNIQUES FOR IDENTIFICATION, INFECTIOUS DISEASES

Unit XI

Molecular Taxonomy, 16S/18S rRNAs and its importance in identification of microorganisms.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

Unit XII

Phylogenetic tree, Types and construction of Phylogenetic tree, Molecular tools in assessing microbial diversity.

Unit XIII

Metagenomics - Sequencing methods, Data Analysis and applications.

Unit XIV

Bacterial Diseases (Tuberculosis, Typhoid, Leprosy) Viral diseases (Hepatitis, HIV, Ebola)

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Animal Physiology

I - M.Sc(Zoology) / II - Semester

Choice Based Credit System(CBCS)

- By

Prof. P. Neeraja
Prof. K.S. Reddy
Department of Zoology
Sri Venkateswara University
Tirupati-517502, Andhra Pradesh, India.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

Centre for Distance and Online Education

Sri Venkateswara University

Tirupathi, AP -517 502

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Year : 2024

Edtion : First

Printed

by

StudentsHelpline
Expect more from us ...

(An ISO 9001 : 2015 Certified Publishers)

326/C, Surneni Nilayam
Near B K Guda Park, S R Nagar
Hyderabad - 500 038 TS
PNo:+91 40 23710657, 238000657, 23810657
Cell:+91 94405 75657, 93925 75657, 93935 75657
Reg. Off.: 5-68, Pedda Gorpadu, Pakala, Tirupathi - 517 112 AP
mail: studentshelpline.in@gmail.com

for

Director

Centre for Distance and Online Education
Sri Venkateswara University
Tirupathi, AP -517 502
mail : directorddesvu@gmail.com
Cell: +91 877-2289380
www.svudde.in

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

35031- ANIMAL PHYSIOLOGY

Contents **Page**

BLOCK – I INTRODUCTION TO DIGESTIVE, RESPIRATORY AND EXCRETORY SYSTEMS

UNIT – I INTRODUCTION TO ANIMAL PHYSIOLOGY **Pages 1- 5**

1.1. Introduction
1.2. Definition & Divisions of Physiology
1.3. Relationship of Physiology with other sciences
1.4. Significance of the study
1.5. Let us sum up
1.6 Unit-End Exercises
1.7 Answer to check your progress
1.9 Suggested readings

UNIT – II DIGESTIVE SYSTEM IN MAN **Pages 6-18**

2.1. Introduction to digestive system
2.2. Physiology of digestion
2.3. Absorption and assimilation
2.4. Gastrointestinal hormones and their control in digestion
2.5. Let us sum up
2.6. Unit-End Exercises
2.7. Answer to check your progress
2.8. Suggested readings

UNIT III- RESPIRATORY SYSTEM IN MAN **Pages 19-28**

3.1. Introduction to respiratory system
3.2. Types and mechanism of respiration
3.3. Transportation of gases
3.4. Control of respiration
3.5. Let us sum up
3.6. Unit-End Exercises
3.7. Answer to check your progress
3.8. Suggested readings

UNIT IV- EXCRETARY SYSTEM OF HUMAN **Pages 29- 35**

4.1. Introduction to excretory system
4.2. Structure and function of nephron
4.3. Urine formation and its regulation
4.4. Let us sum up
4.5. Unit-End Exercises
4.6. Answer to check your progress

4.7. Suggested readings

BLOCK II- CARDIOVASCULAR SYSTEM AND NERVOUS SYSTEM

UNIT V BLOOD **Pages 36 -46**

5.1. Introduction
5.2. Blood composition
5.3. Haemopoiesis
5.4 Formed elements
5.5. Blood volume and its regulation
5.6. Haemostasis
5.7. Let us sum up
5.8. Unit-End Exercises
5.9. Answer to check your progress
5.10. Suggested readings

UNIT VI CIRCULATORY SYSTEM **Pages 47- 53**

6.1. Introduction
6.2. Types of heart
6.3. Structure of human heart
6.4 Heart beat and cardiac cycle
6.5. Blood pressure
6.6. ECR and its applications
6.7. Let us sum up
6.8. Unit-End Exercises
6.9. Answer to check your progress
6.10. Suggested readings

UNIT VII NERVOUS SYSTEM **Pages 54- 62**

7.1. Introduction
7.2. Types and functions of neurons
7.3. Central and peripheral nervous system
7.4 Synapse and its transmission
7.5. Neuromuscular junction
7.6. Let us sum up
7.7. Unit-End Exercises
7.8. Answer to check your progress
7.9. Suggested readings

BLOCK III EFFECTORS AND RECEPTORES

UNIT VIII MUSCLES **Pages 63- 72**

Structure
8.1. Introduction
8.2. General structure and types of muscles
8.3. Mechanism of muscle contraction
8.4. Chemical changes during muscle contraction
8.5. Kymograph

8.6. Let us sum up
8.7. Unit-End Exercises
8.8. Answer to check your progress
8.9. Suggested readings

UNIT IX: PHYSIOLOGY OF VISION, HEARING AND TACTILE RESPONSE **Pages 73-83**

9.1 Introduction
9.2 Physiology of vision
9.3 Physiology of hearing
9.4 Tactile response
9.5 Let us sum up
9.6 Unit end exercises
9.7 Answer to check your progress
9.8. Suggested readings

UNIT X THERMOREGULATION **Pages 84-92**

10.1 Introduction
10.2 Thermoregulation in animals
10.3 Tolerance to high temperature
10.4 Cold and Freezing
10.5 Physiology of hibernation and activation
10.6 Let us sum up
10.7 Unit end exercises
10.8 Answer to check your progress
10.9 Suggested readings

UNIT XI OSMO-IONIC REGULATION AND PRESSURE ADAPTAION **Pages 93- 100**

11.1 Introduction
11.2 Osmo-ionic regulation in freshwater and marine fishes and crustaceans
11.3 Response to hyper and hypo-osmotic media
11.4 Adaptation to pressure in high altitude
11.5 Buoyancy
11.6 Let us sum up
11.7 Unit end exercises
11.8 Answer to check your progress
11.9 Suggested readings

BLOCK IV ENDOCRINOLOGY AND ANIMAL BEHAVIOUR **Pages 101-115**

UNIT – XII

12.1 Introduction
12.2 Endocrine glands and their hormones
12.3 Mechanism of action of hormones

Contents **Page**

12.4 Hypo and hyper sections and their diseases
12.5 Let us sum up
12.6 Unit end exercises
12.7 Answer to check your progress
12.8 Suggested readings

UNIT XIII NEUROENDOCRINE GLANDS **Pages 116- 119**
13. 1.Introduction
13.2 Neuro endocrine control of hormones
13.3. Invertebrate hormones
13.4. Hormonal control of insect metamorphosis
13.5 Let us sum up
13.6 Unit end exercises
13.7 Answer to check your progress
13.8 Suggested readings

UNIT XIV BIOLOGICAL CLOCK **Pages 120- 124**
14.1 Introduction
14.2 Biological clock
14.3. Circadian rhythm
14.4. Circannual and lunar periodicities
14.5 Let us sum up
14.6 Unit end exercises
14.7 Answer to check your progress
14.8 Suggested readings

MODEL QUESTION PAPER **Pages125-126**

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

ZOO-203: Animal Physiology

BLOCK – I: INTRODUCTION TO DIGESTIVE, RESPIRTORY AND EXCRETORY SYSTEMS

Unit- I: Definition, Divisions of physiology, Relationship of physiology with other sciences, Significance of the study.

Unit –II: Digestive system in man, Physiology of digestion, Absorption and Assimilation, Gastrointestinal hormones and their control in digestion.

Unit—III: Respiratory system in man, Types and mechanism of respiration- Transportation of gases, Control of respiration.

Unit- IV: Excretory system of human, Structure and functions of nephron, Urine formation and its regulation.

BLCOK – II: CARDIO VASCULAR SYSTEM AND NERVOUS SYSTEM

Unit –V: Blood: Composition, Haemopoiesis, formed elements, Blood volume and its regulation, Haemostasis.

Unit- VI: Types of heart, Structure of human heart, Heart beat and Cardiac cycle, Blood pressure, ECR and its application.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

Unit –VII: Types and functions of neurons, Central and Peripheral Nervous System, Synapse and its transmission, Resting and action potential, Neuro-muscular junction.

BLOCK – III: EFFECTORS AND RECEPTORS

Unit VIII : General structure and types of muscles, Sarcomere, Ultra structure of skeletal muscle, Mechanisms of muscle contraction, Chemical changes during muscle contraction, Kymograph.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

Unit- IX: Physiology of vision, hearing and tactile response.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Unit –X: Thermoregulation in animals. Tolerance to high temperature, cold and freezing, Physiology of hibernation and aestivation.

Unit –XI: Osmo-ionic regulation in freshwater and marine fishes and crustaceans – Response to hyper and hypo-osmotic media. Adaptation to pressure in high altitude – Buoyancy.

BLOCK – IV: ENDOCRINOLOGY AND ANIMAL BEHAVIOUR

Unit – XII: Endocrine glands and their hormones – Mechanism in action of hormones. Hypo and Hyper secretion of hormones (Thyroid, adrenal and pancreas) and their diseases.

Unit- XIII: Neuro endocrine control of hormones, Invertebrate hormones and Hormonal control of insect metamorphosis.

Unit- XIV: Biological clock, Endogenous rhythm, Circadian, Circannual and Lunar periodicities.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Environmental Biology

I - M.Sc(Zoology) / II - Semester

Choice Based Credit System(CBCS)

- By

Prof. P. Neeraja
Prof. K.S. Reddy

Prof. M. Bhaskar

Department of Zoology
Sri Venkateswara University
Tirupati-517502, Andhra Pradesh, India.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

Centre for Distance and Online Education

Sri Venkateswara University

Tirupathi, AP -517 502

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

Year : 2024

Edtion : First

Printed

by

StudentsHelpline
Expect more from us ...

(An ISO 9001 : 2015 Certified Publishers)

326/C, Surneni Nilayam
Near B K Guda Park, S R Nagar
Hyderabad - 500 038 TS
PNo:+91 40 23710657, 238000657, 23810657
Cell:+91 94405 75657, 93925 75657, 93935 75657
Reg. Off.: 5-68, Pedda Gorpadu, Pakala, Tirupathi - 517 112 AP
mail: studentshelpline.in@gmail.com

for

Director

Centre for Distance and Online Education
Sri Venkateswara University
Tirupathi, AP -517 502
mail : directorddesvu@gmail.com
Cell: +91 877-2289380
www.svudde.in

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

CONTENTS

Pages

BLOCK – I: ECOSYSTEM

UNIT – I ECOSYSTEM **1-11**

1.1. Introduction:

1.2. Objectives:

1.3. Ecosystem:

1.4 .Structure of Ecosystem:

- 1.4.1. Abiotic Factors:
- 1.4.2 Biotic Factors:
- 1.4.3Producers:
- 1.4.4 Consumers:
- 1.4.5 Primary Consumers:
- 1.4.6 Secondary Consumers:
- 1.4.7 Tertiary consumers:
- 1.4.8 Reducers or Decomposers:

1.5 Trophic Structures In Ecosystem:

- 1.5.1 Energy:
- 1.5.2 Primary Production:
- 1.5.3 Secondary Production:

1.6 Food Chain:

- 1.6.1 Types of food chains:
- 1.6.2 Grazing Food Chain:
- 1.6.3 Predator Chain:
- 1.6.4 Detritus Food Chain:
- 1.6.5 Linking of Grazing and Detritus Food Chains:

1.7 Food Web:

- 1.7.1 Importance of Food Web:
  - 1.7.1.1 Trophic levels:

1.8 Energy Flow:

1.9 Ecological Pyramids:

- 1.9.1 The Pyramid of Numbers:
- 1.9.2 The Pyramid of Biomass:
- 1.9.3 The Pyramid of Energy:
- 1.9.4 Inverted Pyramids:
  - 1.9.4.1 Inverted Pyramids of Numbers:
  - 1.9.4.2 Inverted Pyramid of Biomass:

1.10. Summary

UNIT II: ABIOTIC FACTORS, SOIL ORGANISMS, BIOLOGICAL EFFECTS OF LIGHT AND TEMPERATURE. **12-36**

2.1 Introduction:

2.2. Objectives:

2.3 Abiotic Factors:

2.3.1Type of Abiotic Environmental Factors:

2.4 Soil Organisms:

2.4.1Microfauna:

2.4.2 Microflora:

2.4.2. 1 Soil bacteria:

2.4.2.2 Actionmycete fungi:

2.4.3Mesofauna:

2.4.4Macrofauna of soil:

2.4.5 Adaptations of soli animals:

2.5 Biological Effects of Light:

2.5. 1 Light Receptors of Animals:

2.5. 2 Light Variations in Different Environments:

2.5.3. Effect of Light on the Plants:

2.5.3.1. Direct effects of light on plants:

2.5.3.2. Indirect effects of light on plants:

2.5.4Effects of Light on Animals:

2.5.4.1. Effect of light on protoplasm:

2.5.4.2. Effect of light on metabolism:

2.5.4.3. Effect of light on pigmentation:

2.5.4.4. Effect of light on animal movements:

2.5.4.4.1. Celestial orientation:

2.5.4.5. Photoperiodism and biological clocks (Biorhythms):

2.5.4.5.1 Types of biorhythms:

2.5.4.5.1.1Circadian rhythms:

2.5.4.5.1.2Circatidal rhythms:

2.5.4.5.1.3Circalunar rhythms:

2.5.4.5.1.4 Semilunar rhythms:

2.5.4.5.1.5Circannual rhythms:

2.5.4.5.1.6 Mode of function of biological clocks:

2.5.4.6. Effect of light on reproduction:

2.5.4.7. Effect of light on development:

2.6 Temperature:

2.6.1 Nature of temperature

2.6.2 Heat Budget

2.6.3 Temperature Stratification

2.6.4 Range of Temperature Tolerance
2.6.5 Poikilotherms and Homeotherms
2.6.6. Factors or Variables Affecting Organismal Response to Temperature
2.6.7. Effect of Temperature on Plants and Animals:
2.6.7.1 Temperature and cell:
2.6.7.2 Temperature and metabolism:
2.6.7.3 Temperature and reproduction:
2.6.7.4Temperature and sex ratio:
2.6.7.5 Temperature and ontogenetic development:
2.6.7.6. Temperature and growth:
2.6.7.7 Temperature and coloration:
2.6.7.8 Temperature and morphology:
2.6.7.9 Temperature and cyclomorphosis:
2.6.7.10Temperature and animal behaviour:
2.6.7.11Temperature and animal distribution:
2.6.7.12 Temperature and moisture:
2.6.8 Thermal Adaptation of Plants And Animals
2.6.8.1 Formation of heat resistant spores, cysts, seeds, etc.
2.6.8.2 Removal of water from tissue:
2.6.8.3 Dormancy:
2.6.8.4 Thermal migration:

UNIT III: THERMAL STRATIFICATION, CONCEPT OF LIMITING FACTORS, SHELFORD'S LAW OF TOLERANCE AND ECOTYPES-GRASSLAND AND POND ECOSYSTEM. **37-46**

3.1 Introduction:
3.2 Objectives
3.3 Thermal Stratification:
3.3.1 Thermal Stratification of a Lake:
3.3.1.1Winter:
3.3.1.2 Spring:
3.3.1.3 Summer:
3.3.1.4 Autumn:
3.3.1.5 Winter:
3.4 Limiting Factors:
3.4.1.1The Law of Minimum:
3.4.1.2 Factor Interaction:
3.4.1.3Shelford's Law of Tolerance:
3.4.1.3.1 The salient Features of Shelford's Law of Tolerance:

3.4.1.4 The Combined Concepts of Limiting Factors:
3.5 GRASSLAND ECOSYSTEM:
3.5.1. Grassland Flora:
3.5. 2. Grassland Fauna:
3.5.3. Types of Grassland Ecosystem:
3.6. Pond Ecosystem:
3.6.1 Biotic Communities of Ponds:
3.6.1. 1Neuston
3.6.1. 2 Plankton
3.6.1. 3 Nekton
3.6.1. 4 Benthos
3.6.2. Biota of littoral zone:
3.6.2. 1 Flora:
3.6.2.2 Fauna:
3.6.3. Biota of limnetic zone:
3.6.4. Biota of profoundal zone:
3.6.5. Benthos of Pond Bottom:

UNIT IV: MARINE ECOLOGY **47-58**
4.0 Introduction
4.0.1. Objectives
4.1. Divisions of marine environments
4.2. Physical and chemical properties of seawater
4.2.1. Introduction
4.2.1.1 Physical properties of seawater
4.2.1.2. Chemical properties of seawater
4.3. Particulate organic matter
4.3.1. Introduction
4.3.2. Nature and origin of the particulate organic matter in the sea
4.4 summary
4.5 model question paper
4.6 suggested readings

UNIT V: PRIMARY AND SECONDARY PRODUCTION **59-83**
5.0 Primary and secondary production
5.1 Introduction
5.1.1 Objective

5.1.2 Primary production
5.2.0 Estimation of primary production
5.3.0 Factors influencing productivity
5.4.0 Secondary production or zooplankton production
5.4.1. Introduction
5.4.2. Classification
5.4.3. Methods of collection
5.4.4. Estimation of zooplankton
5.5.0 Adaptation of plankton, red tide, inter tidal and deep sea ecology
5.5.1. Adaptations of plankton
5.5.2. Redtide
5.5.3. Intertidal ecology
5.5.3.1. Introduction
5.5.3.2. Rocky shore
5.5.3.3. Sandy shore
5.5.3.4. Muddy shore
5.6.0. Deep sea ecology
5.6.1. Physical characteristics of the deep sea
5.6.2. Adaptations of deep sea animals
5.7.0 Summary
5.8.0 Model question paper
5.9.0 Suggested readings

UNIT VI: UNIQUE FEATURES OF CORAL REEFS, SEAWEEDS, SEAGRASSES AND MANGROVES **84-100**

6.0. Objectives
6.1 Coral reefs- introduction
6.1.1 Conditions required for good coral reef formation
6.1.2 Types of coral reefs found in India
6.1.3 Distribution of coral reefs in India
6.1.4 The importance of coral reefs
6.1.5 Threats
6.2 Seaweeds
6.2.1 Introduction
6.2.2 Green algae (chlorophyta)
6.2.3 Brown algae (phaeophyta)
6.2.4 Red algae (rhodophyta)
6.2.5 Importance of seaweeds
6.3 Seagrasses
6.3.1 Introduction
6.3.2 Seagrass taxonomy
6.3.3 Distribution of sea grasses
6.3.4 Importance of seagreasses

6.3.5 Threats to seagrasses
6.3.6 Monitoring
6.4. Mangroves
6.4.1 Introduction
6.4.2 Occurrence and distribution of mangroves in India
6.4.3 Importance of mangroves
6.4.4 Threats to mangroves
6.4.5 Conservation of mangroves
6.5 Estuarine Ecosystem
6.5.1 Introduction
6.5.2 Physico – chemical features of estuaries
6.5.3 Chemical factors
6.5.4 Biotic communities of estuaries
6.6 summary
6.7 model question paper
6.8 suggested readings

BLOCK III: BIO-GEOCHEMICAL CYCLE

UNIT VII: BIOSPHERE: TYPES- HYDROSPHERE, LITHOSPHERE AND ATMOSPHERE. **101-129**

7.1 Introduction:
7.2 Objectives:
7.3 Biosphere Types:
7.3.1 Atmosphere:
7.3.2 Various Zones of Atmosphere:
7.3.2.1 Troposphere:
7.3.2.2 Stratosphere:
7.3.2.3 Mesosphere:
7.3.3.4 Ionosphere:
7.3.3.5 Exosphere:
7.3.3.6Air:
7.3.4 Physiological inter-relationships of gases and animals:
7.3.5 Air as a medium for living organism:
7.3.6 Biota of the air:
7.4 HYDROSPHERE:
7.4. 1Physical Properties of Water:
7.4 2. Chemical Properties of Water:
7.4.2.1 Solubility of gases in water:
7.4.2.1.1 Oxygen:
7.4.2.1.2 Nitrogen:
7.4.2.1.3. Carbon dioxide:

7.4.2.1.4 Hydrogen sulphide:

7.4.3Effect of Factor of Aquatic Environment on Aquatic Organisms:

7.4. 4 Water and Ecological Adaptations:

7.4.4.1 Hydrophytes and hydrocoles and their adaptations:

7.4. 4. 2 Xerophytes and Xerocoles and their Adaptations:

7.5 LITHOSPHERE:

7.5. 1 Soil:

7.5. 1.2. Soil forming rocks:

7.5.1.3. Chemistry of minerals of soil-forming rocks:

7.5.2 Process of Soil Formation:

7.5.2.1 Weathering of Soil Forming Rocks:

7.5.2.1.1Physical weathering:

7.5.2.1.2Chemical weathering:

7.5.2.1.3Biological weathering:

7.5.2.2 Products of Weathering and soil Types:

7.5.2.3Mineralization and Humification:

7.5.2.3.1Role of earthworms in soil formation and soil fertility:

7.5.2.3.2 Formation of Organo-Mineral Complexes:

7.5.2.4 Soil Profile:

7.5.2.5Climate and Soil Types:

7.5.2.5.1Laterization:

7.5.2.5.2 Podsolization:

7.5.2.5.3Gleization:

7.5.2.5.4Melanization:

7.5.2.5.5 Calcification:

7.5.2.6Morphology of soil:

7.5.2.6.1 Texture of soil:

7.5.2.6.2 Structure of soil:

7.5.2.6.3Soil colour:

7.5.2.6.4 Soil color and temperature:

7.5.2.6.5 Physical Properties of Soil:

7.5.2.6.6Soil atmosphere:

7.5.2.6.7 Soil solution:

7.5.2.6.8 Chemical Properties of Soil:

7.5.2.6.8.1. Inorganic elements and compounds of soil:

7.5.2.6.8.2. Organic matter of soil:

7.5.2.6.8.3. Colloidal properties:

7.5.2.6.8.4. Soil pH:

UNIT- VIII GENERAL ACCOUNT OF COMPLETE AND INCOMPLETE CYCLE; GASEOUS CYCLE **130-134**

8.0. Introduction

8.1. Types of Biogeochemical Cycles:

8.1.1 Gaseous Cycles

8.1.2 Sedimentary Cycles:

8.1.3 Carbon cycle:

8.1.4 Flow of Carbon into the Biotic System:

8.1.5 Photosynthesis:

8.1.6 Formation of Shell:

8.1.7 Flow of Carbon into the Abiotic System:

8.1.8 Respiration:

8.1.9 Decomposition:

8.1.10 Shells:

8.1.11 Coal:

8.1.12 Forest Fire

8.2. Nitrogen Cycle

8.2.1. Electrochemical Fixation:

8.2.2. Biological Fixation:

8.2.3. Flow of N_2 into the Abiotic System

8.2.4. Decomposition

8.2.5. Excretion:

8.2.6. Denitrification:

8.2.7. Sedimentation:

8.3.Oxygen cycle

8.3.1. Photosynthesis:

8.3.2. Photodissociation

8.4. SUMMARY:

UNIT IX SEDIMENTARY CYCLE **135-136**

9.0. Introduction

9.1 Sedimentary Cycles

9.2. Phosphorus cycle

9.3 .Sulphur cycle

UNIT X: POPULATION AND COMMUNITY ECOLOGY **137-143**

10.1. Introduction

10.2. Population Concept

10.3. Density

10.4. Natality or Birth-Rate
10.5. Mortality or Death Rate
10.6. Vital Index
10.7. Age Distribution
10.8. Age Pyramids
10.9. Population Growth
10.10. Regulation of Population
10.11 Summary

UNIT -XI COMMUNITY STRUCTURE **144-145**
11.1 Introduction
11.2. Ecotone and Edge Effect:
11.3. Summary:

UNIT XII. COMMUNITY SUCCESSION **146-149**
12.1 Salient Features of Community Succession:
12.2 Climax:
12.3 Types of Succession:
12.4 Significance of Succession:
12.5 Summary:

UNIT XIII – ENVIRONMENTAL POLLUTION AND MANAGEMENT **150-181**
13.0. Objectives
13.1 Types of environmental pollution and their biological effects
13.1.1 Introduction
13.1.2 Air pollution
13.1.2.1 Introduction
13.1.2.2 Kinds and sources of air pollution
13.1.2.3 Various effects of air pollution
13.1.2.4 Air pollution control
13.1.3 Water pollution
13.1.3.1 Introduction
13.1.3.2 Diverse sources of water pollution
13.1.3.3 Effects of water pollution
13.1.3.4 Water pollution control
13.1.4 Soil pollution
13.1.4.1 Introduction
13.1.4.2 Soil pollutants
13.1.4.3 Effects of soil pollution
13.1.4.4 Control of soil pollution
13.1.5 Noise pollution
13.1.5.1 Introduction

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

13.1.5.2 Sources of noise
13.1.5.3 Effects of noise pollution
13.1.5.4 Control of noise pollution
13.2.0 Climate Change, Green House Effects and Global Warming
13.2.1 Introduction
13.2.2 Causes for climate change
13.2.3 Effect of climate change
13.2.4 Global warming
13.3.0 Bioremediation
13.3.1 Introduction
13.3.2 Bioremediation strategies
13.4.0 Environmental Awareness
13.4.1 Introduction
13.4.2 Non-formal environment education and awareness
13.4.3 Other awareness programs
13.4.4 National Organizations
13.4.5 Prevention and Control of Pollution
13.4.6 Conservation of Forests and Wildlife
13.4.7 Non-Governmental Organizations
13.4.8 International Organizations
13.5 Summary
13.7 Suggested readings

UNIT XIV CONSERVATION OF NATURAL RESOURCES **182-203**

14.0. Introduction
14.1. Kinds of Natural Resources
14.1.1 Renewable Natural Resources
14.1.2. Forest Resources
14.1.3. Land Resources
14.1.4. Water Resources
14.1.5. Non-Renewable Natural Resources
14.2 Biodiversity Hot Spots of India
14.2.1 Introduction
14.2.2 Genetic diversity
14.2.3 Species diversity
14.2.4 Ecosystem diversity
14.2.5 Hot Spots of India
14.2.6 National Parks and Sanctuaries of India
14.3 Endangered and Threatened Species
14.3.1. Common Endangered, Threatened and Vulnerable animal of India
14.4 Germplasm Conservation
14.4.1 Introduction
14.4.2 In Situ Conservation
14.4.3 Ex Situ Conservation Out of The Natural Habitat (Species-Based)

14.4.4 Cryopreservation
14.5 Environmental Laws
14.5.1 Introduction
14.5.2 National Environmental Laws
14.5.3 International Environmental Laws
14.6 Summary
14. 7. Suggested readings

ZOO-204: Environmental Biology

BLOCK 1: INTRODUCTION TO IMMUNOLOGY

UNIT I Historical Perspectives and Scope of Immunology

UNIT II Lymphoid Organs Structure and Functions of Primary and Secondary Lymphoid Organs

UNIT III Molecules of Immune System–Antibodies, Complements, Cytokines, Interferons, Types, Sources and Functions. Antigen: Classification and Epitopes.

Unit IV Elements of Immune System: Hematopoiesis, T- Lymphocytes, B-Lymphocytes, Generation of Lymphocyte specificity and diversity.

UNIT V Antigen Processing and Presentation, Subsets of T Cells, Memory, Helper and Suppressor Cells, Myeloid Cells, Major histocompatiability complex (MCH)

BLOCK II : IMMUNITY AND IMMUNE RESPONSE

UNIT VI Immunity: Types of Immunity – Innate, Adaptive Immunity.

UNIT VII Immune Response: Types of Immune Response, Effector Mechanism of humoral and Cell Mediated Immune Responses.

UNIT VIII Antibody-Dependent Cell-Mediated Cytotoxicity, Natural killer cells. Immunity to infections-Immunoprophylaxis, Vaccines and immunization schedule.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

BLOCK III : IMMUNE DISORDRS

UNIT IX Infectious Diseases; Hypersensitivity – Types I, II, III and IV.

UNIT X Autoimmune disorders and Immunodeficiency diseases. Organ Transplantation. Antibody Engineering.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI

UNIT XI : Cancer, Types and Nature, Immunotherapy; Immune Responses against Tumors and Transplants.

BLOCK IV IMMUNOLOGICAL TECHNIQUES

UNIT XII: Immunocytochemistry, Antibody generation and Radioimmunoassay.

UNIT XIII: Detection of Molecules Using Immunoblot Techniques, ELISA and Vaccine development.

UNIT XIV: Immunoprecipitation and Immunofluorescence microscopy, Acquired Immuno deficiency Syndrome (AIDS) detection and Hybridoma technology, FACS, Immunofluorescent assay.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

DIRECTOR
Centre for Distance and
Online Education (CDOE)
Sri Venkateswara University
TIRUPATI - 517 502.

REGISTRAR
S.V. UNIVERSITY
TIRUPATI