

9

NOTES OF LESSON

D. Vithya
Asst. Professor
Dept. of Biotechnology

Do/Hr	1	2	3	4	5
I	III UG MLT			III UG MLT	I UG CB.
II			I UG CB.		III UG MLT.
III		I UG CB.			
IV	←	I UG	Major	Practical.	→
V	I UG CB.		III UG MLT	I UG CB.	
VI		I UG CB.		III UG MLT.	

Nov-2020

- III - UG MEDICAL LABORATORY TECHNOLOGY - 5
 I - UG CELL BIOLOGY. - 6
 I - UG Lab in cell biology. - 6

NOTES OF LESSON - MLT & CELL BIOLOGY

2020 - NOV.

SEMESTER V: MBE I
MEDICAL LABORATORY TECHNOLOGY

Course Code: U5RBTMBE1

Max Marks: 100

Hours/Week: 5

Credits: 4

Objectives:

1. To understand the basic needs of clinical laboratory
2. To insist the students to start clinical Laboratory for employment by knowing all pathogens and biochemical diagnosis

UNIT-I: Introduction-Organization of Clinical laboratory

Basic needs, functional components-Basic laboratory safety, Carcinogens, Chemicals and radioactive substances, Corrosive chemicals, Explosive chemicals, Fire fighting equipment, First aid in laboratory accidents, Flammable chemicals-First Aid in laboratory accidents.

UNIT-II: General comments on Specimen collection

Transport, Handling and preservation of Sputum, Blood, Urine and feces. Units of measurement: The Metric system-Preparation of reagent Solutions (Molar, percentage)-Laboratory calculations.

UNIT-III: Haematology:

Components of Blood and their functions-Human Blood group systems-Rh Blood group-Collection of Blood-transportation of Blood-storage of Blood-Haematopoietic system of the body-Determination of Haemoglobin concentration.

UNIT-IV: Bacterial diseases

Pathology, Laboratory Diagnosis, Prevention and treatment of Typhoid, Cholera, Tuberculosis and Botulism

UNIT-V: Fungal and Viral Diseases

General account on Mycosis, Aspergillosis, Candidiasis and Fungal eye infections

Pathology, Laboratory Diagnosis, Prevention and treatment of Rabies AIDS and Dengue fever

TEXT BOOKS:

1. Textbook of Medical Laboratory Technology Vol 1 & 2 by Darshan P. godkar Praful B. Godkar, Bhalani Publishing House; 3rd edition (2014)
2. A Handbook Of Medical Laboratory Technology (English)-2nd Edition, Jaypee Brothers Medical Publishers, 2015
3. Text book of Microbiology by Ananda Narayanan and Paniker, 1998

REFERENCES:

1. Medical Laboratory Technology (Volume I): Procedure Manual for Routine Diagnostic Tests, 2010, by Kanai, L Mukherjee and Swarajit Ghosh
2. Basic and Practical Microbiology-Ronald M. Atlas, 2003. Mac.Millan Company, New York.

NET REFERENCES:

1. <http://www.getfreebooks.com/?p=2970>
2. <http://libguides.usd.edu/content.php?pid=309677&sid=2538615>

5/6/20

Introduction about MLT

- DO-II → MLT also called clinical laboratory science
- HN-V → Allied health profession concerned with diagnosis, treatment & prevention of disease through the use of clinical laboratory tests.
- These tests helps doctors to detect, diagnose and treat diseases.
- There are two levels of MLT workers
 - ① Technicians
 - ② Technologist

Technologist :-

They work in 5 major areas of lab

- 1) Blood Banking
- 2) clinical laboratory chemistry
- 3) Hematology
- 4) Immunology
- 5) Microbiology.

They also work in the areas of cytotechnology, phlebotomy, urinalysis, coagulation, serology and parasitology.

Technicians :-

They do routine lab testings manually according to instructions. They work under technologists. They set up, clean and maintain laboratory equipment.

6/6/20

Organization of clinical lab :-

DO-III

HN-VI

American Society for clinical laboratory Science (ASCLS) dedicated to establishing developing & maintaining the highest standards in clinical laboratory methods & research. The Association of Molecular Pathology is a non-profit scientific society dedicated to

16/9/20

Do - III

Hs - I

Protein test :-

Test measures the amount of albumin and globulin in body. It may also be used if you have unexpected weight loss, fatigue or the symptoms of a kidney or liver disease. Proteins are important building blocks of all cells and tissues. Proteins are necessary for your body's growth, development and health. Blood contains albumin & globulin. Albumin keep fluid from leaking out of your blood vessels. Globulin protein play an important role in your immune system. The normal range for total protein is b/w 6 & 8.3 gm per deciliter. Elevated total protein may include inflammation or infections, bone marrow disease

12/9/20

Do - I

Hs - II

Triglycerides test :-

It is usually part of lipid profile that is used to help to identify an individual's risk of developing heart disease and help to make decisions about what treatment may be needed if there is borderline or high risk. As part of lipid profile, it may be used to monitor people who have risk factors for heart disease, those who have had heart attack, or those who are being treated for high lipid or high triglyceride levels.

- Adults → Less than 150 mg/dl
- children → Less than 75 mg/dl
- Ages 10-19 → " " 90 mg/dl
- Adults older than 40 → 115 "



Dr. G. MANIGANDAN, Ph.D., SET, NET
Head, Department of Biotechnology
J.J. College of Arts and Science (Autonomous)

Dr. J. PA. SURAMAN
PRINCIPAL
College of Arts and Science

MCA, Ed. Ph.D.

ice

Dr. V. Subramanian

Assistant Professor

Department of Biotech

J.J.C

Nov - 2020.

Do/Hr	1	2	3	4	5
I	I Pg mic.				I Pg MIC(L)
II	← I Pg - Major Practical →				
III			I Pg mic		
IV	I Pg mic			I Pg mic.	
V		I Pg mic.			I Pg mic.
VI					

I Pg - Microbiology. - 6

I Pg - Lab in Microbiology,
Biochemistry & Genetics - 6.

12

MICROBIOLOGY

Course code: P1R1BTCC1

Hours/ Week: 6

Credits: 5

Max Marks: 100

Internal Marks: 25

External Marks: 75

COURSE OBJECTIVES

- To introduce the students to the field of microbiology with special emphasis on microbial diversity, morphology, physiology and nutrition; methods for control of microbes and host-microbe interactions.
- To know about the Microorganisms, its structure and classification.
- To learn about the isolation and general characteristics of Microorganisms.
- To study about the pathogens, its diagnostic methods, prevention and treatment for the diseases.
- Motivate the students to become a successful Entrepreneur.

Total Instructional Hours: 72

UNIT I: Basic Microbiology

Hours: 15

Introduction to Microbiology: Scope of microbiology and emerging avenues, Development of microbiology, Microbial taxonomy and detailed classification of the microbial world as per Bergey's manual of classification (Bacteria, Archaea, Eukarya),

UNIT II: Ultra structure of Prokaryotic and Eukaryotic

Hours: 15

Ultra structure of Prokaryotic and Eukaryotic cell- The Prokaryotic Cell: Size, shape and arrangement of bacterial cells; structure of cell wall, and structures external (glycocalyx, flagella, pili, etc.,) and internal (plasma membrane, cytoplasm, inclusion bodies, etc.,) to the cell wall. The Eukaryotic Cell: Cilia, flagella, cytoskeleton, cytomembrane systems, mitochondria and chloroplast Comparison of Prokaryotic and Eukaryotic cell.

UNIT III: Microbial Nutrition, Growth and reproduction of microorganisms

Hours: 13

Cultivation of microorganisms; culture media and types of culture media. Nutritional requirements of microorganisms - nutritional classification of bacteria. Growth curve, Mathematical expression of growth; Measurement of growth and growth yields, Counting of bacteria, Synchronous growth, and continuous culture, growth as affected by environmental factors. Reproduction - sexual and asexual.

UNIT IV: Sterilization and Preservation of Microorganisms:

Hours: 13

Sterilization - Physical methods, chemical methods and Radiation methods, Antimicrobial agents. Antibiotics and their mode of action, Biosafety and levels of biosafety, Types of microbiological safety cabinets, GLP and GMP, Preservation of Microorganisms- lyophilization and Cryopreservation.

UNIT V: Medical Microbiology:

Hours: 12

Diseases caused bacteria, virus, fungi, and protozoan's; Fungal diseases, Host parasite interaction- recognition and entry process of different pathogens in plants and animals, Toxins produced, Vaccines, Anti-microbial agents, Antibiotics and disinfectants, National Immunization Programme

UNIT VI: Latest Learning's (For CIA Purpose only)

Hours: 0

Latest development related to the course during the semester concerned

TEXT BOOKS

1. A text book of Microbiology – R.C.Dubey, Dr.K.Maheswari, 2012, M.Chand Publishers 1st Edition.

10/6/20

I / III

Microbiology

Microbiology is the study of organisms and agents that are generally too small to be seen clearly by the unaided eye. These organisms include viruses, bacteria, algae, fungi and protozoa.

11/6/20

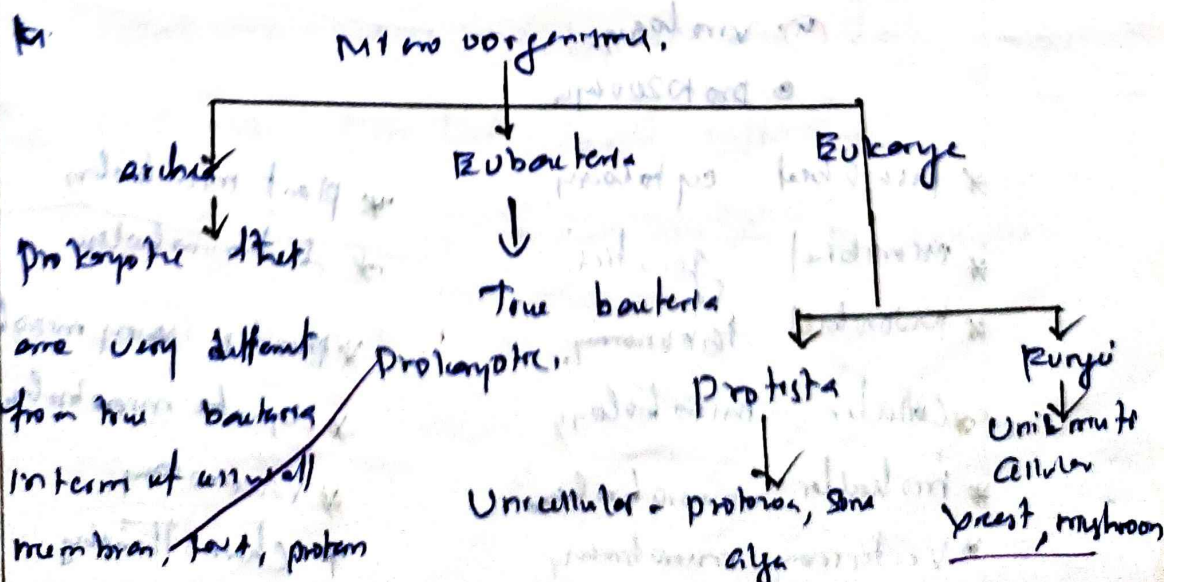
II / IV

Sub disciplines

- * General Microbiology
- * Medical microbiology
- * Public health and epidemiology: studies on controls transmission frequency, and distribution of disease
- * Immunology
- * Agricultural microbiology
- * Microbial ecology
- * Food microbiology
- * Industrial microbiology
- * Biotechnology

12/6/20

III / V

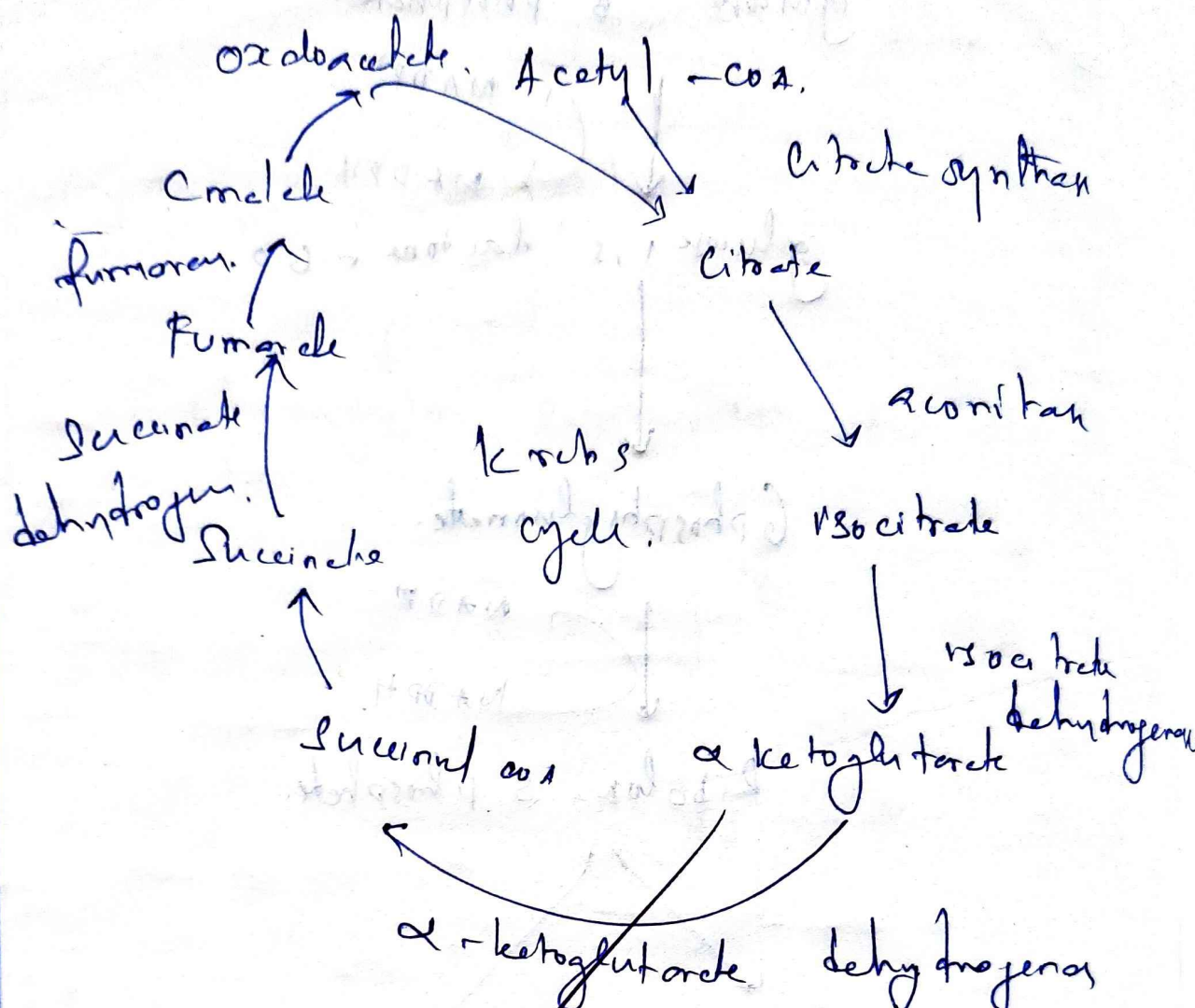


⊗ Synthesis

15/8/20

II / III

Krebs cycle.



Verified,
GT

Dr. G. MANIGANDAN, Ph.D., SET, NET
 Head, Department of Biotechnology
 J.J. College of Arts and Science (Autonomous)
 Pudukkottai - 622 422

Dr. J. PARASURAMAN, M.A., M.B.A., M.C.A., M.Phil., B.Ed., Ph.D.
 PRINCIPAL
 J.J. College of Arts and Science
 (Autonomous)
 J.J. Nagar, Sivapuram Post,
 PUDUKKOTTAI-622 422



Dr. L. Vivekanandan,
 Assistant Professor,
 Dept of. Biotechnology
 J. J. C. Pdkk.

Do/Hr	1	2	3	4	5
I	III UGA EBT.		I UGA mic.		
II	I UG A Mic.				
III	I UG A Mic.		← I UG-A - Allied Lab. →		
IV		III UG A EBT.			
V	I UG-A Mic.			III UGA EBT.	
VI		III UGA EBT.	I UGA Mic		III UGA EBT.

APR 2021

I UG-A- Microbiology - 5
 III UG A - Environmental biotechnology. - 6
 I UG-A - Lab in Microbiology & Biochemistry. - 3.

**SEMESTER - II - ALLIED COURSE- III
MICROBIOLOGY**

Course Code: U2R1BTAC3
Hours/Week: 5
Credits: 3

Max Marks: 100
Internal Marks: 25
External Marks: 75

COURSE OBJECTIVES

- To get a basic idea about Microbiology.
- To learn about the classification of Microorganisms.
- To know about the general characteristics and pathogenicity of Microorganisms.
- To enhance the students knowledge on the historical aspects and development of microbiology
- To acquire an overall knowledge on the morphology and functions of the structures with the prokaryotes and eukaryotes.

Total Instructional hours: 60

UNIT I: Introduction to Microbiology

Hours: 10

Introduction-History and Scope of microbiology. Classification of microorganisms – Haeckel's three kingdom concept, Whittaker's five kingdom concept. General Methods of classifying Bacteria: The intuitive method, numerical taxonomy and genetic relatedness. Classification of bacteria according to Bergey's manual, - Classification of Viruses, Algae, Fungi and Protozoa.

UNIT II: Structure of Bacteria

Hours: 12

The Prokaryotic Cell: Size, shape and arrangement of bacterial cells; structure of cell wall, and structures external (glycocalyx, flagella, pili, etc.,) and internal (plasma membrane, cytoplasmic inclusion bodies, etc.,) to the cell wall. Comparison of Prokaryotic and Eukaryotic cell.

UNIT III: Nutrition and growth

Hours: 10

Aerobic and anaerobic nutritional requirements, Micronutrients, Macronutrients, Nutritional types of Microorganisms. Types of media: simple media, differential media, enriched media. Growth factors, Growth curve, Factors influencing and affecting microbial growth. Methods for preservation and storage of Microbial cultures.

UNIT IV: Reproduction and Physiology of Microorganisms

Hours: 11

Introduction, Habitat, Structure and Reproduction of Microorganisms: Viruses, Algae, Fungi, Actinomycetes and Protozoa. Physiology of Microorganisms: Glycolysis, Pentose phosphate pathway, ED pathway, Krebs's cycle. Mechanism of Electron transport chain, oxidative Phosphorylation.

UNIT V: Extremophiles and emerging microorganisms

Hours: 11

Nature, special features of the thermophilic, methanogenic and halophilic Archaea; photosynthetic bacteria, cyanobacteria. Swine flu, Rota, Ebola, Dengue virus and Chikungunya virus – Morphology, Cultural characteristics, Pathogenicity, Laboratory diagnosis, Preventive measures and treatment.

UNIT VI: Latest learnings (For CIA Purpose only)

Hours: 08

Latest development related to the course during the semester concerned

TEXT BOOKS

1. Text book of Microbiology – Dr.R.Arora, 2008, CBS Publisher 3rd Edition.
2. A text book of Microbiology – R.C.Dubey, K.Maheswari, 2012, M.Chand publishers Edition.
3. Microbiology – Bernard Davis, 2011, Lippincott Publishers 4th Edition.

10-01-20

I/III

INTRODUCTION TO MICROBIOLOGY

Microbiology is the study of organisms & agents that are generally too small to be seen clearly by the unaided eye. These organisms include viruses, bacteria, algae, fungi & protozoa.

Subdisciplines of Microbiology:

1. General Microbiology
2. Medical Microbiology -
3. Public health & epidemiology -
Studies & controls transmission, frequency & distribution of disease
4. Immunology - study of immune system
5. Agricultural Microbiology -
study of impact of microbes on agriculture
6. Microbial ecology -
Relationships between microbes & their habitats.
7. Food microbiology -
Prevention of food borne disease, microbes that make food & drink.
8. Industrial microbiology -
commercial use of microbes to produce products.
9. Biotechnology -
Manipulation of organisms to form useful products.

11-01-20

II/IV

Classification of microorganisms:

Microbes

Archaea

(Prokaryotes that are very different from true bacteria)

Eubacteria

(True bacteria)

Eukarya

Protista

(Unicellular - protozoa, some fungi)

Fungi

(Uni- & multi-cellular)

22-3-20
V / II

Rhodophyta -

- * also called Red algae.
- * grows in fresh, brackish & salt water.
- * Reserved food material is Floridean starch.
- * eg. Gelidium.

Pyrrhophyta -

- * also known as dinoflagellates.
- * most dinoflagellates are marine, but some live in fresh water.
- * Reserved food material is starch & Glucan.
- * eg. Nitzschia & Pyrodinium.

Charophyta -

- * also called stoneworts or brittleworts.
- * Reserved food material is starch.
- * survive in fresh & brackish water.
- * eg. Chara globularis.


Dr. G. MANIGANDAN, Ph.D., SET, NET
Head, Department of Biotechnology
J.J. College of Arts and Science (Autonomous)
Pudukkottai - 622 422




Dr. J. PARASURAMAN, M.A., M.B.A., M.C.A.,
M.Phil., B.Ed., Ph.D.

PRINCIPAL
J.J. College of Arts and Science
(Autonomous)
J.J. Nagar, Sivapuram Post,
PUDUKKOTTAI-622 422

M. Maheswari M.Phil,
 Assistant Professor,
 Dept. of Biotechnology,
 J.J.C, Pdk.

Do/Hr	1	2	3	4	
I	III Ug B Mar. B			I Ug B	
II	I Ug B Gen Mol		III Ug B Mar. B		III Ug B Mar. B
III	I Ug B Gen Mol				
IV	← I Ug B Major Practical →				
V	III Ug B Mar. B	I Ug B Gen Mol		III Ug B Mar. B	
VI		III Ug Mar. B		I Ug B Gen Mol	

APR - 21.

I Ug B' - Genetics & Molecular biology - 5
 III Ug B' - Marine Biotechnology. - 5.
 I Ug B' - Lab in Genetics & Molecular biology - 5

15

1/02/2021

Dominance

Introduction

⇒ Dominance is a relationship between alleles of one gene in which one allele is expressed over a second allele at the same locus.

⇒ The first allele is dominant and the second allele is recessive. Dominance is a key concept in mendelian inheritance.

Incomplete dominance

⇒ Incomplete dominance also called partial dominance occurs when phenotype of the heterozygous genotype is distinct from and often intermediate to the phenotypes of the homozygous genotypes.

Eg: Snap dragon, four o'clock plant.

Co-Dominance

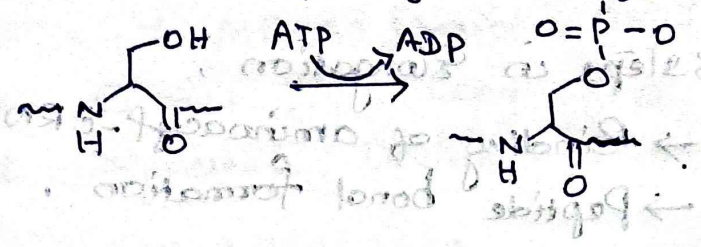
⇒ When both alleles of a pair of fully expressed in a heterozygote they are called co-dominant alleles.

⇒ Such alleles exhibit a unique pattern of expression with heterozygous being phenotypically distinguishable from both the homozygous and expressing both alleles equally.

N-Acetylation
 Lipidation
 Proteolysis.

Phosphorylation

o-Phosphorylation at Serine residues



Lac Operon

Operon is a group of genes that are transcribed at the same time.

They usually control an important biochemical process.

They only found in Prokaryotes.

Lac Operon consist of three genes each involved in processing the sugar lactose.

one of them is the gene for the enzyme β -galactosidase.

This enzyme hydrolyses lactose into glucose & galactose.

Handwritten signature



Dr. G. MANIGANDAN, Ph.D., SET, NET
 Head, Department of Biotechnology
 J.J. College of Arts and Science (Autonomous)
 Pudukkottai - 622 422

Dr. J. PARASURAMAN, M.A., M.B.A., M.C.A.,
 N. Phil., B. Ed., P. Ed.
 PRINCIPAL
 J.J. College of Arts and Science
 (Autonomous)
 J.J. Nagar, Sivapuram,
 PUDUKKOTTAI-62.

D. Vittya
 Assistant Professor
 Dept. of Biotech
 J.J.C

Do/Hr	1	2	3	4	5
I		II Pg EDZ			III UG BT
II	II Pg E			← III UG Maj Lab →	
III	← III UG Maj Lab →				
IV	III UG-A BT	III UG-A Maj Lab	II Pg E		
V		II Pg E	III UG-A BT		III UG-A BT
VI	III UG-A BT				II Pg E

APR - 2021

- II Pg - Enzymology & Enzyme Technology - 5
- III UG-A - Bioinformatics - 5
- III UG-A - Lab in Bioinformatics - 7

UNIT I

Classification, nomenclature and general properties of enzymes. Factors affecting enzyme activity – temperature, pH, substrate concentration, enzyme concentration, inhibitors. Active site – definition and structure. Multienzyme complex, multifunctional enzymes. A brief account of non-protein enzymes-ribozymes and enzymes. Units of activity, transition state.

UNIT II

Enzyme kinetics – pre-steady state and steady state kinetics. Bisubstrate, multisubstrate reaction. Michaelis Menton equation. Line weaver Burk plot, K_m , and K_I value. Significance of V_{max} and K_m values. Enzyme specificity – absolute, rigid specificity. Nucleophilic and electrophilic attack.

UNIT III

Enzyme inhibition – Irreversible and reversible, competitive, non-competitive and uncompetitive inhibitors. Kinetics, differentiation and graphical methods. Determination of inhibition constant. Coenzyme – Types, function and regeneration, mechanism of action of lysozyme, chymotrypsin, DNA polymerase, ribonuclease and LDH. Zymogen and allosteric enzymes.

UNIT IV

Metabolic regulation of enzymes. Techniques of enzyme immobilization and their applications. Mechanism of light activation of enzymes. A brief account on enzyme modification (enzyme engineering) and its products through r-DNA technology. Biosensors.

UNIT V

Clinical and industrial uses of enzymes. Industrial utilization of enzymes, practical aspects of large scale production and purification of enzymes. Medical applications of enzymes. Enzyme therapy. Enzyme reactors, membrane reactors, continuous flow packed

Introduction of Enzyme

It is the branch of biochemistry concerned with enzymes. The set of enzymes made in a cell determines which metabolic pathways occur in the cell. The study of enzymes called enzymology.

It was first introduced by W. Kühne in 1878. The study of enzymes is known as enzymology.

Enzymes are located in the cells, cytoplasm, mitochondria, tissues & body fluids.

Enzymes help to speed up reactions of digestion & metabolism.

The term enzyme was derived from Greek means "in yeast", because the yeast cells were the first to reveal enzyme activity in living organisms.

Enzymes are generally globular protein acting alone or in larger complexes. All protein enzymes are linear chain of amino acid that fold to produce a three dimensional structure.

Enzymes are usually much larger than their substrates. Size range from just 62 a.a residues for the monomer to over 2,500 residues in the animal fatty acid synthase.

9/3/21

II/III

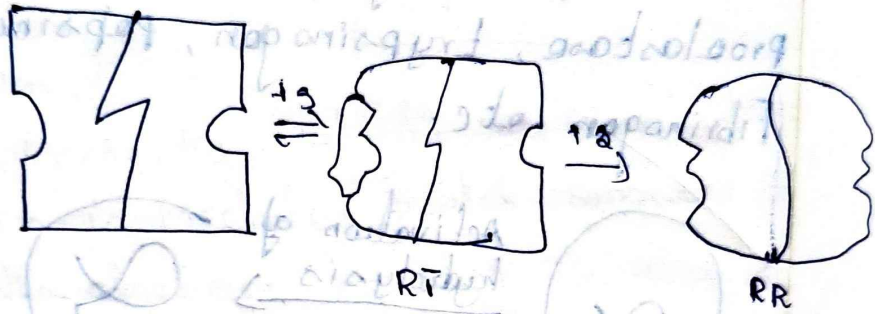
A stimulator is often the substrate itself. The regulatory enzymes for which substrate & modulator are identical are called its substrate.

Comparison of the two allosteric model :-

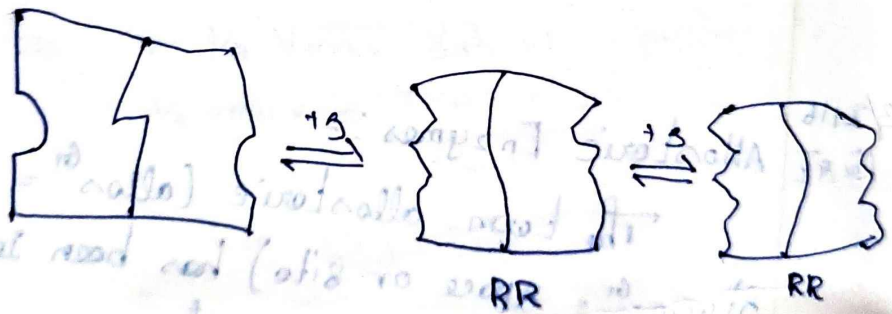
A) Simple sequential model

B) concerted or symmetry model

Simple Sequential Model :-



Concerted Model or Symmetry model :-



Effect of activator & allosteric inhibitor on substrate binding

The diagram shows an enzyme with a substrate binding site. An allosteric inhibitor (I) binds to a site on the enzyme, causing a conformational change that reduces the enzyme's affinity for the substrate (S). Conversely, an allosteric activator (A) binds to a similar site, causing a conformational change that increases the enzyme's affinity for the substrate (S).

Dr. G. MANIGANDAN, Ph.D., SET, NET
 Head, Department of Biotechnology
 J.J. College of Arts and Science (Autonomous)
 Pudukkottai - 622 422

Dr. J. PARASURAMAN, M.A., M.B.A., M.C.A.,
 M.Phil., B.Ed., Ph.D.
 PRINCIPAL
 J.J. College of Arts and Science
 (Autonomous)
 J.J. Nagar, Sivapuram Post,
 PUDUKKOTTAI-622 422