

**DEPARTMENT OF PHARMACY
M.I.T., MUZAFFARPUR**



**AFFILIATED TO
ARYABHATTA KNOWLEDGE UNIVERSITY,
MITHAPUR, PATNA**

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**Name of Course: Pharmaceutical Chemistry -V
Course code (T): 091502
Course code (P): 091502 P
Semester : V
Academic year : 2018-2019**

PHARMACEUTICAL CHEMISTRY -V

B. PHARM – FIFTH SEMESTER

1. Course Syllabus

Module -1

1. Biochemical organization of the cell and transport processes across cell membrane.
2. The concept of free energy, determination of change in free energy -from equilibrium constant and reduction potential, bioenergetics, production of ATP and its biological significance.
3. Enzymes: Nomenclature, enzyme kinetics and its mechanism of action, mechanism of inhibition, enzymes and iso-enzymes in clinical diagnosis.
4. Co-enzymes: Vitamins as co-enzymes and their significance. Metals as co-enzymes and their significance.

Module-2

1. Carbohydrate Metabolism: Conversion of polysaccharide to glucose-I-phosphate, Glycolysis and fermentation and their regulation, Gluconeogenesis and glycogenolysis, Metabolism of galactose and galactosemia, Role of sugar nucleotides in biosynthesis, and Pentosephosphate pathway.
2. The Citric Acid Cycle: Significance, reactions and energetic of the cycle, Amphibolic role of the cycle, and Glyoxalic acid cycle.
3. Lipids Metabolism: Oxidation of fatty acids, oxidation & energetic, α -oxidation, Biosynthesis of ketone bodies and their utilization. Biosynthesis of saturated and unsaturated fatty acids, Control of lipid metabolism, Essential fatty acids & eicosanoids

(prostaglandins, thromboxanes and leukotrienes), phospholipids, and sphingolipids.

4. Biological Oxidation: Redox-potential, enzymes and co-enzymes involved in oxidation reduction & its control, The respiratory chain, its role in energy capture and its control, Energetics of oxidative phosphorylation, Inhibitors of respiratory chain and oxidative phosphoryla Mechanism of oxidative phosphorylation.

5. Nitrogen & Sulphur Cycle: Nitrogen fixation. ammonia assimilation, nitrification and nitrate assimilation, Sulphate activation. sulphate reduction. Incorporation of sulphur in organic compounds. Release of sulphur from organic compounds.

6. Metabolism of Ammonia and Nitrogen Containing Monomers: Nitrogen balance. Biosynthesis of amino acids. Catabolism of amino acids. Conversion of amino acids to specialized products, Assimilation of ammonia. Urea. cycle, metabolic disorders of urea cycle. Metabolism of sulphur containing amino acids. Porphyrin biosynthesis. formation of bile pigments. hyperbilirubinemia. Purine biosynthesis. Purine nucleotide interconversion. Pyrimidine biosynthesis. and Formation of deoxyribounucleotides.

Module-3

1. Biosynthesis of Nucleic Acids: Brief introduction of genetic organization of the mammalian genome, alteration and rearrangements of genetic material, Biosynthesis of DNA and its replication. Mutation: Physical & chemical mutagenesis / carcinogenesis. DNA repair mechanism. Biosynthesis of RNA.
2. Genetic Code and Protein Synthesis: Genetic code. Components of protein synthesis and Inhibition of protein synthesis. Brief account of genetic engineering and polymerase chain reactions.

3.Regulation of gene expression.

2. Recommended Textbooks/ Reference books:

1. Harper's Biochemistry R.K.Murray and Others (Prentice Hall of India, New Delhi)
2. Text Book of Biochemistry by West & Todd (Oxford & IBH Pub., Co., New Delhi)
3. Fundamentals of Biochemistry by Dr.A.C.Deb (New Central Book Agency, Calcutta)
4. Text Book of Biochemistry by Dr.A.V.S.S.Rama Rao (UBS Publishers & Distributors, New Delhi)
5. Text Book of Biochemistry by Dr. U. Satyanarayana

ODD SEM (JULY- DEC 2018) TIME TABLE FOR 3 rd , 5 th & 7 th SEMESTER, B.PHARM, WITH EFFECT FROM 16.07.2018.

DAY	SEMESTER	9 AM TO 10	10 -11 AM	11- 12 AM	12 -1 PM	2- 3 PM	3 -4 PM	4-5 PM
MON	THIRD SEM	APHE II SK	PHARM ANAL II GT	PHARMACEUTICS III AB	PHARMACOGNOSY II NRB	CLASS TEST		
	FIFTH SEM	PHARMACEUTICS V RKC	PHARMACEUTICS V LAB RKC			CLASS TEST		
	SEVENTH SEM	PHARMA. BIOTECH SNS	PHARM CHEM VII RP	PHARMA. INDUST. MANAG.	PHARMACOLOGY III RP	CLASS TEST		
TUES	THIRD SEM	PHARMACEUTICS III AB	PHARM CHEM IV SW	PHARMACEUTICS III AB(T)	PHARM ANAL II GT(T)	PHARMACEUTICS III LAB AB		
	FIFTH SEM	PHARM CHEM V SNS	PHARMACEUTICS VI AB	PHARMA CEUTICS V RKC	PHARMACOLOGY I SK	PHARM CHEM V LAB SNS		
	SEVENTH SEM	PHARMACEUTICS VIII RKC	PHARM CHEM VII RP	PHARMACOLOGY III RP	PHARMACEUTICS VIII RKC(T)	PHARMACOLOGY III LAB RP		
WED	THIRD SEM		PHARMACOGNOSY II NRB(T)	PHARMACOGONOSY II NRB	PHAR ANAL II GT	PHARMACOGONOSY II LAB NRB		
	FIFTH SEM	PHARMACOLOGY I SK	PHARM CHEM V SNS	PHARMACEUTICS VI AB	PHARMACOLOGY I SK(T)	PHARMACOLOGY I LAB SK		
	SEVENTH SEM	PHARM CHEM VII RP(T)	PHARMACEUTICS VIII RKC	PHARM CHEM VII RP	ELECTIVE OPT	PHARM CHEM VII RP		
THURS	THIRD SEM	APHE II SK(T)	PHARM CHEM IV SW	APHE II SK	PHARM CHEM IV SW(T)	PHARM ANAL II LAB GT		
	FIFTH SEM	PHARM CHEM V SNS	PHARMACEUTICS VI AB	PHARMACOGONOSY IV SW		PHARMACOGONOSY IV LAB SW		
	SEVENTH SEM	PHARMACEUTICS VIII RKC	PHARMA. BIOTECH SNS(T)	PHARMACOLOGY III RP	ELECTIVE OPT	ELECTIVE LAB-OPT		
FRI	THIRD SEM	APHE II SK	PHARMACUTICAL CHEMISTRY IV LAB SW			APHE II LAB SK		
	FIFTH SEM	PHARMACOGONOSY IV SW	PHARMACEUTICS V RKC	PHARMACOGONOSY IV SW(T)	PHARMACEUTICS V RKC(T)	PHARMACEUTICS VI LAB OPT AB		
	SEVENTH SEM		ELECTIVE OPT (T)	ELECTIVE OPT	PHARMA. BIOTECH.SNS	PHARMACEUTICS V III RKC LAB		
SAT	THIRD SEM	PHARMACOGONOSY II NRB	PHARM CHEM IV SW	PHAR ANAL II GT	PHARMACEUTICS III AB			
	FIFTH SEM	PHARM CHEM V SNS(T)	PHARMACOLOGY I SK	PHARMACEUTICS VI AB	PHARMACOGONOSY IV SW			
	SEVENTH SEM	PHARMACOLOGY III RP(T)	PHARMA. INDUST. MANAG.	PHARMA. BIOTECH SNS				

2. Program Objectives (POs)

The graduates of the programme will possess:

1. The knowledge of core concepts of Biochemistry.
2. The knowledge of Principles of Metabolism of Carbohydrates, Proteins & lipids
3. Clinical significances of enzymes for exact diagnosis of different diseases arising from abnormal metabolism.
4. To understand concept of genetic engineering

3. Course Outcomes (COs)

- 1 Recall the biochemical organization of the cell, transport process and describe enzymes and isoenzymes in the field of clinical diagnosis. metals and Vitamins as co-enzymes and their significance in human body.
2. Explain the metabolism of carbohydrate, lipid, protein and their role in our body
3. Analyze carbohydrate, lipid, protein, the generation of ATP and isolate RNA and DNA from different sources.
4. Illustrate various mechanisms related to genetics, PCR, repair mechanism

4. Mapping of COs with Pos

PO	CO1	CO2	CO3	CO4
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

5. Assessment Methods for Cos

5.1. Theory

S.No	Assessment Tools	Marks	Outcomes
1	Sessional Examination	20	CO1 CO2 CO3 CO4
2	Assignment	02	CO1 CO2 CO3 CO4
3	Presentation	02	CO1 CO2 CO3 CO4
4	Quizzes	01	CO1 CO2 CO3 CO4
5	Attendance	05	NA
6	University Examination	70	NA

5.2. Practical

S.No	Assessment Tools	Marks	Outcomes
1	Attendance	05	CO1 CO2 CO3 CO4
2	Experiment valuation	10	CO1 CO2 CO3 CO4
3	Internal Viva- voce	05	CO1 CO2 CO3 CO4
4	University Practical Exam	30	CO1 CO2 CO3 CO4

6. Delivery Methodology

Outcomes	Methods	Supporting Tools
CO 1	Chalk-Talk, Interactive classroom, ICT usage, Case study discussion about diseases, Group discussions, , Web based learning	Board, Laptop, Projector, You Tube, Whatsapp, Google,
CO2	Chalk-Talk, Interactive classroom, ICT usage, Case study discussion about diseases, Group discussions, , Web based learning	Board, Laptop, Projector, You Tube, Whatsapp, Google,
CO3	Chalk-Talk, Interactive classroom, ICT usage, Case study discussion about diseases, Group discussions, , Web based learning	Board, Laptop, Projector, You Tube, Whatsapp, Google,
CO4	Chalk-Talk, Interactive classroom, ICT usage, Case study discussion about diseases, Group discussions, , Web based learning	Board, Laptop, Projector, You Tube, Whatsapp, Google,

7. Teaching plan

7.1. Theory

Lecture No.	Contents
1	Biochemical organization of the cell and transport processes across cell membrane.
2	Biochemical organization of the cell and transport processes across cell membrane.
3	The concept of free energy
4	determination of change in free energy -from equilibrium constant and reduction potential
5	Bioenergetics, production of ATP and its biological significance.
6	Enzymes: Nomenclature
7	Enzyme kinetics and its mechanism of action, mechanism of inhibition, Class Test
8	Enzymes and iso-enzymes in clinical diagnosis.
9	Co-enzymes: Vitamins as co-enzymes and their significance Metals as co-enzymes and their significance.
10	Carbohydrate Metabolism: Conversion of polysaccharide to glucose-I-phosphate, Glycolysis
11	Fermentation and their regulation, Gluconeogenesis and glycogenolysis,
12	Fermentation and their regulation, Gluconeogenesis and glycogenolysis,
13	Metabolism of galactose and galactosemia,
14	Role of sugar nucleotides in biosynthesis, and Pentosephosphate pathway.
15	The Citric Acid Cycle: Significance, reactions and energetic of the cycle, Amphibolic role of the cycle, and Glyoxalic acid cycle.
16	The Citric Acid Cycle: Significance, reactions and energetic of the cycle, Amphibolic role of the cycle, and Glyoxalic acid cycle.
17	Lipids Metabolism: Oxidation of fatty acids, oxidation & energetic, a-oxidation, Class Test
18	Biosynthesis of ketone bodies and their utilization.
19	Biosynthesis of saturated and unsaturated fatty acids, Control of lipid metabolism
20	Essential fatty acids & eicosanoids (prostaglandins, thromboxanes and leukotrienes), phospholipids, and sphingolipids.
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22	Biological Oxidation: Redox-potential, enzymes and co-enzymes involved in oxidation reduction & its control,
23	The respiratory chain, its role in energy capture and its control,
24	Energetics of oxidative phosphorylation,
25	Inhibitors of respiratory chain and oxidative phosphoryla
26	Mechanism of oxidative phosphorylation
27	Nitrogen Cycle, Nitrogen fixation. ammonia assimilation, nitrification and nitrate assimilation
28	Sulphur Cycle, Sulphate activation.
29	Sulphate reduction Class Test
30	Incorporation of sulphur in organic compounds. Release of sulphur from organic compounds.
31	Metabolism of Ammonia and Nitrogen Containing Monomers
32	Biosynthesis of amino acids. Catabolism of amino acids.
33	Conversion of amino acids to specialized products, Assimilation of ammonia. Urea. cycle, metabolic disorders of urea cycle. Metabolism of sulphur containing amino acids
34	Porphyryr biosynthesis. formation of bile pigments. hyperbilirubinemia.
35	Purine biosynthesis. Purine nucleotide interconversion. Pyrimidine biosynthesis. and Formation of deoxyribounucleotides.
36	Biosynthesis of Nucleic Acids: Brief introduction of genetic organization of the mammalian genome, alteration and rearrangements of genetic material, Biosynthesis of DNA and its replication.
37	Mutation: Physical & chemical mutagenesis / carcinogenesis
38	DNA repair mechanism. Biosynthesis of RNA.
39	Genetic Code and Protein Synthesis: Genetic code
40	Components of protein synthesis and Inhibition of protein synthesis.
41	Brief account of genetic engineering and polymerase chain reactions.
42	Regulation of gene expression

7.2. Practical

Exp. No	Experiment
1	Preparation of standard buffers (citrate, phosphate and carbonate) and measurement of pH
2	Titration curve for amino acids
2	Separation of amino acids by two dimensional paper chromatography and gel electrophoresis

3	The separation of lipids by TLC.
4	Separation of serum proteins by electrophoresis on cellulose acetate
5	Quantitative estimation of amino acids
6	Quantitative estimation of proteins
7	The identification of c-terminal amino acids of a protein
8	The determination of glucose by means of the enzyme glucose oxidase.
9	The isolation and assay of glycogen from the liver and skeletal muscle of rats
10	Enzymatic hydrolysis of glycogen by. alpha-and beta-amylases
11	The isolation and determination of RNA and DNA.
12	Effect of temperature on the activity of alpha -amylase.
13	.Estimation of SGOT, SGPT, ALP and BRN in the serum