DEPARTMENT OF BIOCHEMISTRY
St. Edmund's College

PAPER I (Theory)
Biomolecules and Biophysical Techniques

Marks: 75 (Internal Assessment= 19 & End Semester = 56)

Biomolecules

Course Description	Instructor	Contact Hours
Water : Molecular Structure of Water	BK	1.0
Water : Hydrogen bonds & Physical Properties of water	BK	1.5
pH, pKa and buffers in laboratory and biological system	BK	3.5
Properties, structures of monosaccharide's(glucose & fructose)	BK	1.0
Properties, structures of disaccharides(sucrose, maltose and lactose)	BK	1.5
Properties, structures of polysaccharides(dextrins, starch, glycogen, cellulose)	BK	2.5
Stereochemistry of sugars- chiral carbon, epimers, anomers, mutarotation	BK	2.0
Chair and Boat form, glycosides, glycopyranose and fructopyranose	BK	2.5
Alpha Amino acid : structure and properties	HSR	3.0
Proteins: Primary structure (structure of peptides bonds- restricted rotation, cis/trans)	HSR	1.5
Proteins: Secondary Structure (α, β and supersecondary structure)	HSR	3.0
Proteins: Tertiary Structure- Protein folding	HSR	2.5
Proteins: Quaternary Structure	HSR	1.5
Fatty Acids: Nomenclature and chemical properties	JW	1.5
Lipids Classification: Simple and Complex	JW	1.5
General Structure and Function of major lipid subclasses: acylglycerols, phosphoglycerides, spingolipids, waxes, terpene, steroids and prostaglandins.	JW	6.0
Nucleotides: Chemistry and Properties	KH	1.5
Nucleic Acids: DNA forms and function	KH	2.5
Nucleic Acids: RNA forms and functions	KH	2.0

Biophysical Techniques

Course Description	Instructor	Contact Hours
Principle and application of Centrifugation	JW	1.5
Principle and application of Spectroflourimetry	HSR	1.5
Principle and application of Nuclear Magnetic Resonance	KH	2.0
Microscopy- Light and Electron Microscopy	JW	3.5
Principle and application of Chromatography (Gel, Ion-exchange and Affinity)	HSR	3.5
UV and Visible Spectrophotometry	HSR	3.0
X-Ray Crystallography	HSR	1.5
Electrophoresis- Polyacrylamide Gel Electrophoresis(PAGE) and SDS-PAGE	KH	2.0
Isotopes, radioactive decay, α, β and γ radiation	JW	1.5
Detection of radioactivity- scintillation counting, quenching and autoradiography	JW	3.5

PAPER I (Practical)
Biomolecules and Biophysical Techniques
Marks: 25 (Internal Assessment= 06 & End Semester = 19)

Preparation of Buffer Solution using Henderson-Hasselbalch Equation	BK	3.0
Verification of Beer-Lambert's Law	BK	3.0
Estimation of Protein by Lowry's Method	KH	3.0
Estimation of Protein by Bradford's Method	KH	3.0
Estimation of DNA using Diphenylamine	KH	3.0
Estimation of RNA using Orcinol	KH	3.0

Sl	Subject Name	Topic	Sub-topic	Teacher	Date
1	Cell Biology	Prokaryotes	Cell Structure & components	JW	5th Feb
2	Physiology	Physiology	Introduction to Physiology	KH	5th Feb
3	Cell Biology	Prokaryotes	Cell Structure & components (continuation)	JW	6th Feb
4	Physiology	Hormones	General Classification of Hormones	HSR	6th Feb
5	Physiology	Physiology	Introduction to Physiology (continuation)	KH	7th Feb
6	Physiology	Hormones	General Classification of Hormones (continuation)	HSR	7th Feb
7	Physiology	Hormones	General Classification of Hormones (continuation)	HSR	8th Feb
8	Physiology	Hormones	General Classification of Hormones (continuation)	HSR	8th Feb
9	Physiology	Physiology	Homeostasis	KH	9th Feb
10	Physiology	Physiology	Homeostasis (continuation)	KH	9th Feb
11	Cell Biology	Prokaryotes	Cell Structure & components (continuation)	JW	10th Feb
12	Cell Biology	Cell Structure	Plant & Animal Cells	OK	10the Feb
13	Cell Biology	Prokaryotes	Cell Structure & components	JW	12th Feb
14	Physiology	Physiology	Introduction to Physiology	KH	12th Feb
15	Cell Biology	Prokaryotes	Cell Structure & components (continuation)	JW	13th Feb
16	Physiology	Hormones	General Classification of Hormones	HSR	13th Feb
17	Physiology	Physiology	Introduction to Physiology (continuation)	KH	14th Feb
18	Physiology	Hormones	General Classification of Hormones (continuation)	HSR	14th Feb
19	Physiology	Hormones	General Classification of Hormones (continuation)	HSR	15th Feb
20	Physiology	Hormones	General Classification of Hormones (continuation)	HSR	15th Feb
21	Physiology	Physiology	Homeostasis	KH	16th Feb
22	Physiology	Physiology	Homeostasis (continuation)	KH	16th Feb
23	Cell Biology	Prokaryotes	Cell Structure & components (continuation)	JW	17th Feb
24	Cell Biology	Cell Structure	Plant & Animal Cells	OK	17the Feb

Sl No.	Subject Name	Topic	Sub-topic	Teacher	Date
1	Microbiology	Taxanomy	Classification of microorganism	OK	5th Feb
2	Immunology	Immunity	Concept of Immunity	HSR	5th Feb
3	Molecular Biology	Nucleic acid	Nucleic acid as genetic	BK	5th Feb
4	Molecular Biology	DNA	DNA Replication in prokaryotes	JW	5th Feb
5	Microbiology	Taxanomy	Classification of microorganism (cont)	OK	6th Feb
6	Immunology	Immunity	Concept of Immunity (continuation)	HSR	6th Feb
7	Molecular Biology	Nucleic acid	Nucleic acid as genetic (continuation)	BK	6th Feb
8	Microbiology	Microbial Genetics	Introduction to Genetics	KH	6th Feb
9	Molecular Biology	DNA	DNA Replication in prokaryotes(cont)	JW	7th Feb
10	Microbiology	Microbial Genetics	Introduction to Genetics (continuation)	KH	7th Feb
11	Microbiology	Taxanomy	Classification of microorganism (cont)	OK	7th Feb
12	Molecular Biology	Nucleic acid	Nucleic acid as genetic (continuation)	BK	7th Feb
13	Microbiology	Microbial Genetics	Introduction to Genetics (continuation)	KH	8th Feb
14	Molecular Biology	DNA	DNA Replication in prokaryotes(cont)	JW	8th Feb
15	Microbiology	Taxanomy	Classification of microorganism (cont)	OK	8th Feb
16	Immunology	Immunity	Innate & Adaptive Immunity	HSR	8th Feb
17	Immunology	Immunity	Innate & Adaptive Immunity(conti)	HSR	9th Feb
18	Immunology	Immunity	Innate & Adaptive Immunity(conti)	HSR	9th Feb
19	Molecular Biology	DNA	DNA Replication (semi conservative)	JW	9th Feb
20	Microbiology	Taxanomy	Types & General Characteristics	OK	9th Feb
21	Microbiology	Microbial Genetics	Introduction to Genetics (continuation)	KH	10th Feb
22	Molecular Biology	Nucleic acid	Experimental Evidence	BK	10th Feb
23	Microbiology	Taxanomy	Types & General Characteristics(cont)	OK	10th Feb
24	Molecular Biology	DNA	DNA Replication (semi conservative)	JW	10th Feb
25	Microbiology	Taxanomy	Classification of microorganism	OK	12th Feb

26	Immunology	Immunity	Concept of Immunity	HSR	12th Feb
27	Molecular Biology	Nucleic acid	Nucleic acid as genetic	BK	12th Feb
28	Molecular Biology	DNA	DNA Replication in prokaryotes	JW	12th Feb
29	Microbiology	Taxanomy	Classification of microorganism (cont)	OK	13th Feb
30	Immunology	Immunity	Concept of Immunity (continuation)	HSR	13th Feb
31	Molecular Biology	Nucleic acid	Nucleic acid as genetic (continuation)	BK	13th Feb
32	Microbiology	Microbial Genetics	Introduction to Genetics	KH	13th Feb
33	Molecular Biology	DNA	DNA Replication in prokaryotes(cont)	JW	14th Feb
34	Microbiology	Microbial Genetics	Introduction to Genetics (continuation)	KH	14th Feb
35	Microbiology	Taxanomy	Classification of microorganism (cont)	OK	14th Feb
36	Molecular Biology	Nucleic acid	Nucleic acid as genetic (continuation)	BK	14th Feb
37	Microbiology	Microbial Genetics	Introduction to Genetics (continuation)	KH	15th Feb
38	Molecular Biology	DNA	DNA Replication in prokaryotes(cont)	JW	15th Feb
39	Microbiology	Taxanomy	Classification of microorganism (cont)	OK	15th Feb
40	Immunology	Immunity	Innate & Adaptive Immunity	HSR	15th Feb
41	Immunology	Immunity	Innate & Adaptive Immunity(conti)	HSR	16 th Feb
42	Immunology	Immunity	Innate & Adaptive Immunity(conti)	HSR	16 th Feb
43	Molecular Biology	DNA	DNA Replication (semi conservative)	JW	16 th Feb
44	Microbiology	Taxanomy	Types & General Characteristics	OK	16 th Feb
45	Microbiology	Microbial Genetics	Introduction to Genetics (continuation)	KH	17th Feb
46	Molecular Biology	Nucleic acid	Experimental Evidence	BK	17th Feb
47	Microbiology	Taxanomy	Types & General Characteristics(cont)	OK	17th Feb
48	Molecular Biology	DNA	DNA Replication (semi conservative)	JW	17th Feb

DR. OMARLIN KYNDIAH

BIOCHEMISTRY DEPARTMENT

DEPARTMENT OF BIOCHEMISTRY
St. Edmund's College

PAPER V (Theory)
Intermediary Metabolism

Marks: 75 (Internal Assessment= 19 & End Semester = 56)

Course Description	Instructor	Contact Hours
Introduction to Metabolism	OK	1.0
Carbohydrates Metabolism	OK	1.5
Glycolysis	OK	3.0
Warburg Effect and Alcoholic fermentation	OK	1.5
Tricarboxylic Acid Cycle	OK	3.0
Regulation of Glycolysis	OK	2.0
Regulation of TCA Cycle	OK	1.5
Gluconeogenesis	OK	1.5
Pentose Phosphate Pathway	OK	2.5
Glycogenesis	XY	2.0
Glycogenolysis	XY	2.5
Nucleotide Metabolism – an introduction	XY	1.0
Source of atom in purine and pyrimidine molecule	XY	1.5
Biosynthesis of Purine	XY	3.0
Biosynthesis of Pyrimidine	XY	3.0
Catabolism of Purine	XY	1.5
Catabolism of Pyrimidine	XY	1.5
Regulation of Purine and Pyrimidine biosynthesis	XY	3.5
Lipid Metabolism- an introduction	JW	1.0
Hydrolysis of triacylglycerol	JW	1.0
Transport of fatty acids into mitochondria	JW	0.5
β-oxidation of saturated fatty acids	JW	1.5
Oxidation of unsaturated and of odd chain fatty acids	JW	3.0
ATP yield from from fatty acid oxidation	JW	0.5
Biosynthesis of saturated and unsaturated fatty acids	JW	4.0
Biosynthesis and regulation of triglycerides	JW	2.0
Biosynthesis and regulation of cholesterol	JW	3.0
Amino acid Metabolism – General Reactions : transamination, oxidative deamination and decarboxylation	XY	2.5
Urea Cycle	XY	1.5
Biosynthesis of Glutamine & regulation	OK	3.0
Biosynthesis of Tryptophan & regulation	OK	4.5
Biosynthesis of Histidine & regulation	OK	4.5
Degradation of amino acids	OK	2.5
Introduction to bioenergetics	BK	1.0
Photosynthetic electron transfer chain	BK	2.0
Respiratory electron transfer chain	BK	2.0
Photophosphorylation	BK	1.5
Mechanism of ATP Production	BK	1.5
Inhibitors of Electron Transfer Chain (ETC)	BK	1.0
Uncouplers of oxidative phosphorylation	BK	1.5

PAPER V (Practical)

Intermediary Metabolism

Marks: 25 (Internal Assessment= 06 & End Semester = 19)

Isolation of casein from milk	BK	6.0
Isolation and Estimation of starch from potato	BK	6.0
Isolation and Estimation of glycogen from animal tissue	BK	7.0
Isolation and Estimation of photosynthetic pigments	OK	4.0

Course-level learning outcomes that a student of this course is required to demonstrate are:

- To understand the importance of lipids as storage molecules and as structural component of biomembranes.
- Understanding the importance of high energy compounds, electron transport chain, synthesis of ATP under aerobic and anaerobic conditions.
- To acquire knowledge related to the role of TCA cycle in central carbon metabolism, importance of anaplerotic reactions and redox balance.
- Students will be exposed with the fact that perturbations in the carbon metabolism can lead to various disorders such as diabetes and cancer.
- Appreciation of the fact that differences in the properties of metabolic enzymes of the host and pathogens can be exploited for the development of new drugs.
- To gain insights into metabolic engineering for the production of useful biomolecules.

Suggested Readings (Theory):

Nelson D.L and Cox Micheal M- Lehninger's Principles of Biochemistry (Seventh Edition), Macmillan Publication
Jeremy M. Berg John L. Tymoczko Gregory J. Gatto, Jr. Lubert Stryer- Biochemistry (Eight Edition), W.H.Freeman & Co Ltd
Zubay G (1999) Principle of Biochemistry (Fourth Edition), WC Brown Communication, Inc.
Harper's Illustrated Biochemistry 31st Edition (2018), Murray et al. Mc Graw Hill Publication
Voet D and Voet JG (2012) Principles of Biochemistry (4th Edition), John Wiley & Sons
Devlin DT. Textbook of Biochemistry with Clinical Correlation (2010), 7th Edition. Wiley Publication

Suggested Readings (Practical):

Boyer RF (2009) Modern Experimental Biochemistry, 5th Edition. Impression Pearson Edn.
Sadasivam S and Manickam A (2005) Biochemical Methods, New Age Int. Publication, New Delhi
Plummer DT (2008 Reprint) An Introduction to Practical in Biochemistry, Third Edn. Tata McGraw Hill

DEPARTMENT OF BIOCHEMISTRY
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PAPER VI (Theory)
Nutritional and Clinical Biochemistry

Marks: 75 (Internal Assessment= 19 & End Semester = 56)

Course Description	Instructor	Contact Hours
Nutrition and dietary habit – an introduction	BK	1.0
Nutritive value of carbohydrates, fats, proteins	BK	2.0
Nutritive value of Vitamins (A,D,E,K B-complex and Vitamin C)	BK	3.0
Nutritive value of minerals (Ca, Fe and Iodine)	BK	2.0
Basal Metabolic Rate (BMR)	BK	1.5
Specific Dynamic Action (SDA) and Recommended daily Allowance(RDA) of food	BK	2.5
Protein-Calorie Malnutrition- Kwashiorkor and Maramus	BK	2.5
Over nutrition and Obesity	BK	2.0
Basic Concept of Clinical Biochemistry	XY	1.5
Definition and scope in Health and Disease	XY	1.5
Collection and preservation of biological fluid- blood, plasma, serum, urine, cerebral spinal fluid (CSF) and amniotic fluid.	XY	4.0
Analysis of blood, Urine and CSF	XY	3.0
Normal value of important constituents in blood(Plasma/serum)	XY	2.5
CSF and Urine	XY	1.5
Clearance Test for Urea	XY	1.5
Enzymes used in clinical diagnosis	HSR	1.5
Enzyme pattern in health and diseases (lipases, amylase, cholinesterases, alkaline and acid phosphatise, SGOT, SGPT, LDH and CPK)	HSR	3.0
Isozymes and diagnostic test	HSR	2.5
Functional test of Kidney and Liver	HSR	3.0
Inborn errors of metabolism (alkaptonuria, phenylketonuria, albinism)	HSR	2.0
Metabolic disorders (Hypo- and Hyper- glycemia, gout and porphyrias)	HSR	2.5

PAPER VI (Practical)
Nutritional and Clinical Biochemistry
Marks: 25 (Internal Assessment= 06 & End Semester = 19)

Estimation of blood haemoglobin	JW	4.5
Estimation of blood glucose	JW	5.0
Estimation of serum GOT	HSR	6.0
Estimation of serum GPT	HSR	6.0
Estimation of blood Urea	HSR	6.0
Estimation of serum alkaline phosphatase	HSR	6.0
Estimation of bilirubin	HSR	6.0
Estimation of creatinine	HSR	6.0

DEPARTMENT OF BIOCHEMISTRY
St. Edmund's College

PAPER III (Theory)
Proteins and Enzymes

Marks: 75 (Internal Assessment= 19 & End Semester = 56)

Proteins

Course Description	Instructor	Contact Hours
Protein Isolation and purification techniques – an introduction	HSR	3.0
Salt Precipitation	HSR	2.0
Dialysis	HSR	1.5
Chromatography	HSR	4.0
Criteria for homogeneity	HSR	1.5
Protein Sequencing	HSR	4.0
Protein Turnover	HSR	2.5

Enzymes

Course Description	Instructor	Contact Hours
Enzymes – an introduction and properties	OK	2.0
Significance of activation energy and free energy	OK	1.5
Enzymes Classification – IUB Classification and Nomenclature System	OK	4.0
Enzyme activity and Specific Enzyme Activity	OK	1.5
Enzyme-Substrate Complex	OK	1.0
Concept of substrate binding sites and active sites	OK	2.0
Factors affecting enzyme activity	OK	3.0
Coenzymes (Pyridoxal Phosphate, NAD & FAD)	JW	1.5
Cofactors	JW	1.5
Mechanism of enzymes catalysis (Chymotrypsin & Lysozyme)	BK	3.0
Michealis-Memten Equation- derivation (Equilibrium assumption & Steady state)	OK	3.0
Significance of K_M, k_{cat} and V_{max}	OK	2.5
Lineweaver-Burk Plot	OK	0.5
Enzyme Inhibition – Competitive, Non-competitive and Un-competitive	OK	3.5
Regulation of Enzyme activity – allosteric regulation, covalent modification, zymogenicity	OK	4.5

PAPER III (Practical)
Proteins and Enzymes
Marks: 25 (Internal Assessment= 06 & End Semester = 19)

Separation of proteins by SDS-PAGE	JW	8.0
Gel Filtration chromatography using protein mixture or dye	JW	6.0
Assay of Urease/Amylase activity	OK	4.0
Determination of KM and Vmax of Urease/ Amylase	OK	4.5
Effect of temperature on enzyme activity	OK	4.0
Effect of substrate concentration on enzyme activity	OK	3.5

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