RATHNAVEL SUBRAMANIAM COLLEGE OF ARTS & SCIENCE (Autonomous)
Sulur, Coimbatore – 641 402

SCHEME OF EXAMINATIONS – CBCS PATTERN

PROGRAMME: M.Sc (Biochemistry)

Syllabus effective for the students admitted during the academic Year 2017 Batch & onwards

(2017 – 2019)

HOD **PRINCIPAL** **COE**

RATHNAVEL SUBRAMANIAM COLLEGE OF ARTS AND SCIENCE

DEPARTMENT OF BIOCHEMISTRY

PROGRAMME OUTCOMES (POs):

PO1	To provide outcome based education in the respective disciplines and to impart skills which will enable the students secure job in their core disciplines in this digitally transforming era.
PO2	To develop the art of critical thinking, creativity and to imbibe emerging trends thereby to excel in their interested domains of specializations.
PO3	To inculcate and develop research competence systematically besides the capacity to analyze the viability of new ideas, entrepreneurship and professionalism based on the students' choice and aptitude.
PO4	To instill a culture of life-long learning and the ability to understand the socio-economic issues.

PROGRAMME SPECIFIC OUTCOMES: (PSOs)

Upon completion of Master of Biochemistry, STUDENTS are able to achieve the following outcomes.

PSO1	To understand the fundamental concepts and master the pertinent experimental and theoretical techniques in Molecular Gene expression, Proteomics, Pathology, Clinical research and Nano-sciences so as to inflate the understanding of biology.
PSO2	To transform the way by using sophisticated technologies and thereby gaining insights from clinical data to make cognizant decisions, predictions and to reveal the proficiency in quantitative reasoning and analytical skill within a student.
PSO3	To understand the research oriented learning that develops methodical and integrative problem-solving approaches in the biochemical industries by enabling them to write effective project reports in multidisciplinary environment.
PSO4	To augment the students in pre-clinical studies and cancer biology enabling them to invent new ideas to develop their entrepreneurial skills, decisive thinking and self-governance.

RATHNAVEL SUBRAMANIAM COLLEGE OF ARTS & SCIENCE
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SCHEME OF EXAMINATIONS
M.Sc (Biochemistry)
2017-2019 BATCH

Semester	Course Opted	Course Name	D	L	CIA	SE E	Marks	Credits
I	CE -I	EMPLOYABILITY SKILLS I	3	2	25	75	100	-
	M -I	RESEARCH TECHNIQUES	3	4	25	75	100	4
	M -II	MOLECULAR BIOLOGY	3	4	25	75	100	4
	M -III	ENZYME TECHNOLOGY	3	4	25	75	100	4
	MP -I	LAB IN GENERAL BIOCHEMISTRY	6	5	-	-	-	-
	MP -II	LAB IN ENZYMOLOGY PLANT AND ANIMAL TISSUE CULTURE	6	5	-	-	-	-
	MP -III	COMPUTATIONAL BIOCHEMISTRY AND MOLECULAR STRUCTURE VISUALISATION.	3	4	40	60	100	4
	M -IV	STEM CELL AND CANCER BIOLOGY	3	4	25	75	100	-
		Total		32			600	28

Semester	Course Opted	Course Name	D	L	CIA	SE E	Marks	Credits
II	M - V	METABOLIC REGULATION	3	4	25	75	100	4
	M -VI	RECOMBINANT DNA TECHNOLOGY	3	4	25	75	100	4

	EL -I	PHARMACEUTICAL NANOTECHNOLOGY AND NANOBIOPHOTONICS	3	4	25	75	100	4
	M -VII	IMMUNOLOGY	3	4	25	75	100	4
	M -VIII	HUMAN PHYSIOLOGY, HORMONES AND SIGNAL TRANSDUCTION	3	4	25	75	100	4
	MP - I	LAB IN GENERAL BIOCHEMISTRY	6	6	40	60	0	4
	MP - II	LAB IN ENZYMOLOGY PLANT AND ANIMAL TISSUE CULTURE	6	6	40	60	100	4
	CE -II	EMPLOYABILITY SKILLS II	3	2	25	75	100	-
		Total		34			800	28

Semester	Course Opted	Course Name	D	L	CIA	SEE	Marks	Credits
III	CE -VI	EMPLOYABILITY SKILLS	3	2	25	25	50	-
	M -X	BIOINFORMATICS	3	4	25	75	100	4
	M -XI	DRUG BIOCHEMISTRY	3	4	25	75	100	4
	M -XII	CLINICAL RESEARCH	3	4	25	75	100	4
	MP -IV	LAB IN IMMUNOLOGY AND r DNA TECHNOLOGY	6	5	-	-	-	-
	MP -V	LAB IN RESEARCH TECHNIQUES	6	5	-	-	-	-
	E - I	ELECTIVE – II MINI PROJECT AND VIVA VOCE	3		40	60	100	4
	M -IX	FORENSIC BIOCHEMISTRY	3	4	25	75	100	4
	EL - II	ELECTIVE III – EDC: HOSPITAL MANAGEMENT	3	4	25	75	100	4

		Total	32		600	28

Semester	Course Opted	Course Name	D	L	CIA	SEE	Marks	Credits
IV	M -XIII	BIOSTATISTICS AND RESEARCH METHODOLOGY	3	5	25	75	100	4
	M P - III	LAB IN IMMUNOLOGY AND R-DNA TECHNOLOGY	6	5	40	60	100	4
	MP - IV	LAB IN RESEARCH TECHNIQUES	6	5	40	60	100	4
	Pro - I	PROJECT REPORT AND VIVA VOCE	3	9	40	60	100	4
		Total		24			400	16

M - Major Paper;
MP- Major Practical;
EL – Elective;
Pro – I- Major Project and Viva voce;
EDC - Extra Disciplinary Course – Hospital Management;
** Project Viva Voce Marks 80:20 respectively will jointly be assessed based on 40:60 ratio application.
"Employability Skills (ES) classes are held in first three semesters. Exams will be conducted in their II and
III semesters.
Two Extra Credits will be given. This is 'Mandatory' to get a degree."
ELECTIVE – I : 1a Advanced Clinical Biochemistry
1b. Introduction to Clinical Trials

Course Title : RESEARCH TECHNQUIES	Course Code : 13A
Semester : I	Course Group : DSC I
Teaching Scheme in Hrs (L:T) : 3:1	Credits : 4
Map Code: C(THEORY – APPLICATION)	Total Contact Hours: 60
CIA: 25 Marks	SEE # :75 Marks
Programme: MSC-BC	# - Semester End Exam

No	Course Outcome (Cos): After completion of this course, the students will be able to	PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	Explain the terms like pH, pOH, acidic, basic, neutral solutions and pH meter to acquire the practical skill.	PSOs	10	U
CO2	Outline the importance of suitable chromatographic technique for actual analytical purposes.	PSOs	5	U
CO3	Apply the applications of centrifugation and chromatography in biological investigation.	PSOs	5	AP
CO4	Illustrating the use of electrophoresis techniques and its analysis of biomolecule separations.	PSOs	10	U
CO5	List out various spectroscopic techniques and its instrumentation methods.	PSOs	10	R
CO6	Explain the theoretical principles of radioactivity and appreciate the uses of radioisotopes.	PSOs	4	U
CO7	Motivating the students in handling the basic experimental techniques.	PSOs	4	AN

UNIT-I (LECTURE HOURS: 12)

Buffers -Introduction (Basics of acidity & basicity). pH (Definition, determination of pH using indicators). Hendersons Hasselbach equation (Relatioship between pKa & pH). pH meter (Working, principle and instrumentation). Types of electrodes – (Principle, working of calomel, silver/silver chloride, working, applications, hydrogen electrodes, working, diagram, applications).Centrifugation – (Introduction, Basic principles of centrifugation, Relative centrifugal force). Preparative and Analytical centrifugation – Preparative (Differential centrifugation, Principle, working, instrumentation with diagram, applications, Density gradient centrifugation (Principle, working, types, Isopynic, Rate – zonal centrifugation, Basic principles of sedimentation Applications). Analytical – (Ultracentrifuge, Rotors-types, principle, working, applications).

Activity

- Differentiate the solutions given based on its pH using pH meter and pH paper .
- Group discussion on different types of centrifugation

UNIT-II (LECTURE HOURS: 12)

Chromatography – (Introduction , Definition, stationary phase, mobile phase, retardation factor) Paper chromatography. – (Types- Ascending, descending, Circular, Principle, Technique& applications).Thin layer chromatography (Adsorbents, Mobile phase, stationary phase, solvents used, Principle, Technique& applications). Ion exchange chromatography –(Ion exchangers-anion & cation exchange resins, Mobile phase, stationary phase, Principle, Technique & applications). Molecular sieve chromatography – (Principle, Types of gels, Mobile phase, stationary phase, Molecular weight determination of proteins, technique& applications).

Affinity chromatography – (Principle, Mobile phase, stationary phase, Types of ligands used, Technique & applications). GLC – (Principle, Mobile phase, stationary phase, Carrier gas, columns, Technique & applications).HPLC- (Principle, Mobile phase, stationary phase, Pumping systems, column packing, Technique & applications). HPTLC – (Principle, Technique & applications).

Activity

- Packing of column using burette, cotton, sand and silica gel.
- Quiz on Chromatography techniques using Kahoot app.

UNIT -III (LECTURE HOURS: 12)

Electrophoresis- (Introduction - Definition, migration of ions in electric field, factors affecting electrophoretic mobility).Paper electrophoresis- (Principle, Types (Horizontal, vertical) Technique& applications).Gel electrophoresis – (Principle, - Types of gel electrophoresis-Agarose, SDS –PAGE, technique, applications). Pulse field Gel electrophoresis – (Principle, Technique& applications).

Immuno electrophoresis- (Principle, Antigen- antibody interaction, Single radial immunodiffusion , Ouchterlony double diffusion, Rocket immune electrophoresis,technique, applications). Isoelectric focusing – (Ampholytes Principle, technique& applications).

Blotting - Southern blot –(Principle, Techniques for DNA detection, applications)

Northern and western blot –(Principle, Techniques for RNA and protein detection, applications)

Activity

- Chart work to differentiate Horizontal electrophoresis and Vertical electrophoresis.
- Using paper model for blotting techniques- Capillary, electro transfer and semi-dry blotting.

UNIT-IV (LECTURE HOURS: 12)

Spectrometry – (Introduction - Basic principles, laws of absorption, Beer Lamberts law).

Colorimetry – (Principle, Instrumentation & applications).UV-Visible spectrophotometry – (Principle, Instrumentation & applications). Flame spectrophotometry – (principle,Types, Emission flame & Atomic absorption spectrophotometry, techniques and applications).

Spectrofluorimetry – (Principle, types- Fluorescence, phosphorescence, Techniques, Instrumentation & applications). FTIR (Fourier Transform Infrared Spectroscopy – Principle, Instrumentation & applications).

Molecular characterization studies- (NMR – Principle, Instrumentation & applications).

X-Ray diffraction – (Bragg's equation, Reciprocal lattice concept, Molecular structure of crystal).Mass spectrometry –(Principle, Types, GCMS & LCMS, Technique & applications).

SEM , TEM –(Principle, Technique & applications).

Activity

- Demonstration on principle and working of colorimeter (selection of filter using coloured solution).
- Interpretation on the reports submission of UV- VIS/ FTIR.

UNIT -V (LECTURE HOURS: 12)

Isotopes- (Introduction - Definition, radioactive decay-negatron, positron, alpha emission, electron capture, gamma rays). Radioactivity- (Units of radioactivity - Curie, Bequerel, specific activity). Measurement of radioactivity methods –(Gas ionization - GM counter, proportion counter, Principle, techniques and applications).Excitation - Scintillation counting (Prinicple,

instrumentation working, applications).Photographic method – (Autoradiography, Principle, technique and applications).Clinical applications – (Tracer techniques, Diagnosis, Therapy).
Activity

- Article collection on environmental disasters of radioactive isotopes and methods of disposal of radioactive waste .
- Diagrammatic representation using different isotopes used for cancer studies.

Text Books :

T1-Analytical Techniques in Biochemistry and Molecular Biology - Authors: Katoch, Rajan, 2011.

T2- Principles and Techniques of Biochemistry and Molecular biology – Edition 7th - Keith Wilson and John Walker, 2016.

T3 - An introduction to Practical Biochemistry- Edition 3rd - David Plummer- 2017.

Reference Books:

R1 –Biophysical chemistry, Avinash Upadhyay and Kakoli Upadhyay,4th Edition 2019.

R2- Introduction to Principles and Techniques of Biochemistry and Molecular Biology , Wilson and Walker's - Edition 8th 2018.

Course Title : MOLECULAR BIOLOGY	Course Code : 13B
Semester :I	Course Group : DSC II
Teaching Scheme in Hrs (L:T) : 3:1	Credits : 4
Map Code: C(THEORY – CONCEPT)	Total Contact Hours: 60
CIA: 25 Marks	SEE # : 75 Marks
Programme: MSC-BC	# - Semester End Exam

No	Course Outcome (Cos): After completion of this course, the students will be able to	PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	Explain the basic concepts of replication in DNA.	PSOs	12	U
CO2	Explore the DNA repair mechanism and types of DNA damage.	PSOs	12	R
CO3	Describe the use of Prokaryotic transcription and its regulation.	PSOs	14	U
CO4	Explain about eukaryotic transcription and post transcriptional processing.	PSOs	14	R
CO5	Understand the concepts of both prokaryotic and eukaryotic translation.	PSOs	12	U
CO6	Explain about Genetic code and its clinical significance.	PSOs	10	R

UNIT-I (LECTURE HOURS: 12)
REPLICATION

DNA Replication -Types of replication (Semiconservative, Conservative, Dispersive) Meselson and Stahl experiment (E.coli, heavy isotope, N^{15}, N^{14}). Replications in circular chromosomes - Plasmid replication (Initiation, Elongation,Termination). Rolling circle model (Initiation, helicase enzyme, Topoisomerase Single strand binding proteins, Elongation, Eukaryotes, Prokaryotes, Termination, ligase enzyme, circular plasmid molecule). Theta model (unwinding replication, Lagging strand, Leading strand). Replication of mitochondrial DNA (Nuclear DNA, mitochondrial DNA, Replication of mt- DNA with diagram).
DNA replication in prokaryotes (Initiation, Enzymes and proteins involved in replication - helicase enzyme, Topoisomerase, Single strand DNA binding Proteins, DNA polymerase IV, V, Elongation, DNA polymerase I, II, III, Leading strand, Ladding strand, Okazaki fragment, Termination, Terminus sequence). Inhibitors of replication (Novobiocin, Nalidixic acid, Ciprofloxacin, Etoposide and Adriamycin).
Eukaryotic replication – (Initiation, ORC, G1 phase, Pre – S phase, SPhase, Elongation, DNA polymerase alpha, epsilon, delta, Termination, Telomerase enzyme).

UNIT-II (LECTURE HOURS: 12)
DNA Repair and Recombination Mutations
DNA damage – (Dependent on various factors- cell type, age of the cell, extracellular environment, sources of damage). Types of DNA damage (Types- oxidative damage, Hydrolytic damage, DNA strand breaks).DNA repair mechanism –DNA repair (Definition, Mechanism - Nucleotide excision repair- distort the DNA double helix). Base excision repair- (changes to DNA bases, Glycosylases DNA polymerase, DNA ligase). Mismatch repair (Mut S, Mut L, Mut H, Enzymes). Recombination repair (Homologous, Site- specific and Transposition). Double stranded break repair (Homologous,non-homologous). SOS response- (Rec- A Protein, Lex- A repressor, error – prone repair system). Recombination – Homologous recombination (Holliday model). Site specific recombination (Lysogenic cycle, integrative mechanism) .

UNIT-III(LECTURE HOURS: 12)
Prokaryotic transcription and regulation – Transcription (Definition, Gene structure, Promoter region, RNA coding sequence, Terminator region, Initiation, Elongation, Termination).
Termination of transcription - Rho dependent (Definition, type 1 terminator, Hair pin loop). Rho independent termination (Definition, type 2 terminator, RNA polymerase).
Regulation of transcription in prokaryotes – lac operon(Definition, operon model, lac Z, lac Y, lac a, positive and negative regulation). Arabinose operon (Three structural genes, enzymes arabinose model, positive and negative regulation). Trytophan operon (trp E, trp D, trpC, trp B and trp A, structure of trp operon, Negative control).

UNIT-IV (LECTURE HOURS: 12)
Eukaryotic transcription and regulation-(Eukaryotic gene control and RNA polymerases, regulatory sequence in eukaryotes, activators and repressors of transcription, transcriptional factors, Transcription initiation by RNA polymerase I, II and III, Elongation, RNA polymerase, Termination).Transcriptional regulation in eukaryotes –(Types- hormonal steroid hormone receptors, phosphorylation - Stat proteins). Post transcriptional processing –(Definition, mRNA, rRNA and tRNA, Alternative splicing, RNA editing).

UNIT-V (LECTURE HOURS: 12)
Translation and Genetic code - Genetic code (salient features of genetic code, Wobble hypothesis).Components of protein synthesis –(mRNA, ribosomes and tRNA).
Protein synthesis in bacteria and eukaryotes –(initiation, elongation, termination).Post-translational modifications (prokaryotes and eukaryotes). Inhibitors of protein synthesis-(Protein

targeting - signal sequence hypothesis, targeting of proteins to different compartment of mitochondria, ER, plasma membrane, lysosomes, peroxisomes and chloroplast).Molecular basis of mutation- Types of mutation (missense, nonsense, silent, point and Frameshift mutation)

Text Books

1. Molecular biology of the Gene, James Watson, 7th Edition, 2017.
2. Principles of Molecular biology, VeeraBalaRastogi, 2nd Edition (Rev) 2016.
3. Freifelder's Essentials of Molecular biology, Malacinski, Jones and Bartlett, 4th Edition, 2015.
4. Molecular biology, W.H.Freeman and Co. Weaver, R.F. 2015.

Reference Books

1. Karp's Cell & Molecular biology , Gerald Karp, Janet Iwasa, Wallace Marshall, 9th Edition, 2019.

2. Molecular Cell Biology, Harvey Lodish, 8th Edition, 2018.

3. Molecular biology of the Gene, Watson, Steitz, Hopkins,Roberts, 4th Edition , 2016.

Course Title : ENZYMES AND ENZYME TECHNOLOGY	Course Code : 13C
Semester :I	Course Group : DSC III
Teaching Scheme in Hrs (L:T) : 3:1	Credits : 4
Map Code: C(THEORY – CONCEPT)	Total Contact Hours: 60
CIA: 25 Marks	SEE # : 75 Marks
Programme: MSC-BC	# - Semester End Exam

No	Course Outcome (Cos): After completion of this course, the students will be able to	Pos &PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	Explainthe classification of enzymes according to IUB, isolation and purification of enzymes from different sources through various biochemical techniques.	PO1& PS01	10	U
CO2	Summarize the structure of coenzymes and their role in various metabolic function.	PO1& PS01	5	U

CO3	Illustrate the mechanism of enzyme kinetics and enzyme inhibition in enzyme catalytic reaction	PO1& PS01	10	U
CO4	Describe the mechanisms involved in covalent modification of Glycogen Phosphorylase in animal and Glutamine synthetase in *E. coli* organism.	PO1& PS01	10	An
CO5	List out the mechanism of action of isoenzymes and proteolytic enzymes	PO1& PS01	10	An
CO6	Apply the methods of immobilizations and its applications in pharmaceutical and food industry.	PO1& PS01	10	Ap
CO7	Identify the role of enzyme in diagnosis and treatment of various diseases.	PO1& PS01	5	An

UNIT -I (LECTURE HOURS: 12)

ENZYME- INTRODUCTION ,NOMENCLATURE AND CLASSIFICATION

Introduction- (Definition, properties and history of enzyme) Nomenclature andclassification- International Union of Biochemistry (IUB) – (6 Major Enzymes and subdivision of enzymes with examples).Intracellular localization of enzymes– Location of enzymes in cellular and subcellular organelles(Mitochondria, Nucleus,Golgiappartus, Lysosome). Isolation and purification of enzymes: Methods of homogenization–(Mammalian tissue, Plant, Fungal and Bacterial material homogenization)Methods ofseparation and purification of enzymes-Methods that depend on size or mass– Gel filtration. Centrifugation. - Ultra centrifugation and Dialysis - Membrane centrifugation of enzymes.-(principle and mechanism).Methods based on polarity- Ion exchange chromatography, Electrophoresis and Isoelectric focusing.(principle and mechanism)

Unit of enzymeactivity: Turn over number of an enzyme -International Unit ofenzyme ,Katal(Definition and Reaction) Specificity of enzyme activity: Types of specificity-Absolute specificity, Stereo specificity, Optical Specificity , Group specificity or Relative specificity and Reaction specificity – (Definition. Reaction and examples)

Activity

1 - Animations illustrating on localization of enzymes in the cell

2 - Group discussion on the topic how “Enzymes Help Us Digest Food”

UNIT- II (LECTURE HOURS: 12)

COENZYMES

Introduction- Organic compounds - prosthetic groups - Integral part of active site.Nicotinamide coenzymes- NAD+ and NADP+- (Structure and functions) Flavin nucleotides - FMN and FAD+- (Structure and functions)Coenzyme A- CoA.SH- (Structureand functions) Biotin- Free biotin, Protein bound biotin. –(Structure and functions) Folate coenzymes– THF-(Structure and functions) Lipoic acid- Coenzyme in decarboxylation of pyruvate.- (Structure and functions) TPP- Thiamine Pyrophosphate–(Structure and functions)

Pyridoxal phosphate–(Structure and functions) Active site- Binding sites and catalytic sites. (Introduction- and characteristic features of Active sites).Mode of

action- Lock and Key model and Induced fit heory- Mechanism with diagrammatic representation)Determination of active site residues- (Identification of substrate and inhibitors action in enzyme catalytic reaction)

Activity

1 - Model presentation for Lock and key and Induced fit theory

2 - Team work for making chart preparation for Coenzymes.

UNIT- III (LECTURE HOURS: 12)

ENZYME KINETICS

Steady state theory – Definition and concept-(Rate of formation of ES, Rate of dissociation and Graph), Km - Michaelis constant. and Vmax– (Definition and Equation) MichaelisMenten Derivation- Derive the equation and significance of M.M equation. (Definition and Derivation) LB Plot , EadieHoftsee and Hanes plot-.(Derivation, Graph and Significance)Mechanism of bisubstrateReaction:Single displacement and Double displacement Reaction:Random - order mechanism- Ternary complex formation. (Introduction and Mechanism)Ping - pong mechanism– (Introduction and Mechanism- Non sequential mechanism)Factors influencing or affecting enzyme catalytic reaction-(Effect of pH ,Temperature, Enzyme, Substrate and Time – Mechanism and Graph).Allosteric inhibition and feedback inhibition

Allosteric Inhibition –Introduction and mechanism- (Binding action of enzyme in Allosteric site – Allosteric activator and Allosteric inhibitors).Feedback Inhibition-Mechanism of action- (CTP and L-Isoleucine act as a feedback inhibitor for feedback inhibition).Reversible and irreversible inhibition: Reversible Inhibition:. (Introduction and Types)Competitive, Non-Competitive and Uncompetitive inhibition. Competitive Inhibition - Introduction and mechanism-(Substrate analogue mechanism. Example- Malonate reaction in TCA cycle. Allopurinol reaction in Purine catabolism- Substrate analogue drug for Gout treatment – Reaction for inhibiting the synthesis of Uric acid).Non-competitive inhibition- Mechanism with suitable examples- (Metal ions – Lead, Mercury, Cyanide and Arsenic in Non-competitive inhibition. Role of Non-competitive inhibitor- Cyanide in Respiratory chain reaction. (ETC)).)

Activity

1. Working model presentation on Ping- Pong mechanism.

2 -Making poster presentation on reversible inhibitors in enzyme catalytic reaction.

UNIT- IV(LECTURE HOURS: 12)

REGULATION OF ENZYMES AND PROTEOLYTIC ENZYMES

Covalent modification of enzymes: Glycogen phosphorylase– Introduction and Mechanism(Phosphorylation and Dephosphorylation reaction in animal muscle cells.) Glutamine synthetase-Introduction and Mechanism–(Covalent modification mechanism in *E. coli* bacteria.)Isoenzyme-Introduction and features of Isoenzymes-Lactate Dehydrogenase - Introduction, Types - (LDH 1-5 and applications of LDH.)Multienzyme complex -Pyruvate Dehydrogenase – Introduction and mechanism of action of PDH – (Steps involved in PDH reaction).

Proteiolytic enzyme:Chymotrypsin- Introduction -Mechanism of action of proteolytic enzyme- (Cleavage to specific amino acid residues)Carboxy peptidases-Introductionand mechanism (Action of cleavage of carboxy terminal end of protein compounds. Action of Zn in carboxy peptidase). Lysozyme –Introduction , Mechanism of action (-Digestion process of bacterial cell wall). Ribozyme ---Introduction and action (Non protein enzyme – Mechanism)Abzyme - Catalytic antibody – (Introduction and Mechanism of action in immune system)

Activity

1 -Quiz- Kahoot on the topic for Proteolytic enzymes.

2. Making clay model presentation for covalent modification of enzymes.

UNIT- V- (LECTURE HOURS: 12)

ENZYME IMMOBILIZATION AND INDUSTRIAL APPLICATION OF ENZYMES

Enzyme immobilization- (Introduction and mechanism) Methods of immobilization:(Types with suitable example)– Adsorption, Cross linking, Covalent Bonding, Entrapment and Encapsulation. Advantages and application of immobilized enzymes (Role of immobilized in– Food industry and pharmaceutical aspects) Industrial uses of enzymes-Textile and Foodindustries –(Baking of bread, brewing industries. Washing powders, immobilized glutamatedehydrogenase linked to alcohol dehydrogenase).

Role of enzyme in diagnosis and treatmentSerum Marker enzyme – ALT, AST, LDH, CPK,ACP, ALP, (Hepatic and other diagnostic application) Cancer marker enzymes-Prostatic acid phosphatase (PAP),Alkaline phosphatase Neuron-specific enolase, Aromatase. (Role of enzymes for cancer diagnosis) Covid-19 Viral disease- Angiotensin Converting Enzyme -2 receptor action- ACE-2 (Mechanism of action of enzyme in COVID-19) Therapeutic enzyme for various diseases. (Action of Asparaginase, Collagenase, Streptokinase, Urokinase, Penicillinase etc).Antioxidant enzymesMechanism of action of antioxidantenzymes-(Role in free radical scavenging activity.- SOD, Catalase, and Glutathione peroxidase)Role of enzyme in genetic engineering aspects-Enzymes in rDNA technology - Future prospects–(Restriction endo nucleases, Polymerase, Ligase, Helicase, Topoisomerase for Genetic Engineering aspects.)

Activity

1 – Debate on different methods of enzyme immobilization

2 - Making a PPT presentation on industrial application of enzymes.

Text Books :

T1 - Fundamentals of Enzymology | Edition:2 | Oxford Science Publications, Newyork. | Nicholas c. price, Lewis stevens 2010

T2 - Enzymes - Biochemistry, Biotechnology, Clinical chemistry. | Edition:3 | East west Press Pvt Ltd, New Delhi. | TREVOR PALMER. And PHILIP BONNER (2014)

Reference Books :

R1 – Lehninger Principles of Biochemistry, David. L.Nelson, Michael M. Cox . Eight edition ,2021.

R2- Harper's Illustrated Biochemistry, Victor Rodwell, David Bender, Kathleen Botham and Peter Kennelly, Thirty First Edition -May-2018.

R2- Enzyme Chemistry: Impact and Applications, 3rd Edition by Colin J Suckling and Gibson Colin .L -2010

Course Title : LAB IN GENERAL BIOCHEMISTRY	Course Code :
Semester :I	Course Group : MP I
Teaching Scheme in Hrs (P) : 5	Credits : 2
Map Code: H (PRACTICAL - EXPERIMENTS)	Total Contact Hours: 75
CIA: 40 Marks	SEE # : 60 Marks
Programme: MSC-BC	# - Semester End Exam

List of experiments

UNIT I

1. QUANTITAIVE ANALYSIS

a) Estimation of Starch - Anthrone method
b) Isolation and Estimation of Glycogen - Colorimetry method
c) Estimation of Protein - Lowry's method
d) Estimation of DNA - Diphenyl amine method
e) Estimation of RNA - Orcinol method
f) Estimation of Phenol - Colorimetry method
g) Estimation of Calcium - Titrimetry method
h) Estimation of Chloride - Titrimetry method
i) Estimation of Vitamin - C - Colorimetry method
j) Estimation of Phosphorous - Fiske - Subbarow method
k) Estimation of Total Protein, Albumin: Globulin ratio -

2. DETERMINATION OF LIPID PROFILE

a) Determination of Total Cholesterol
b) Determination of Phospholipids
c) Determination of Triglycerides
d) Determination of HDL Cholesterol
e) Determination of LDL Cholesterol

Course Title : LAB IN ENZYMOLOGY PLANT AND ANIMAL TISSUE CULTURE	Course Code :
Semester :I	Course Group : MP II
Teaching Scheme in Hrs (P) : 4	Credits : 2
Map Code: H (PRACTICAL - EXPERIMENTS)	Total Contact Hours: 60
CIA: 40 Marks	SEE # : 60 Marks
Programme: MSC-BC	# - Semester End Exam

List of experiments

UNIT - I

1. DETERMINATION OF ACID PHOSPHATASE ACTIVITY

a) Effect of pH on Acid Phosphatase activity
b) Effect of Temperature on Acid Phosphatase activity
c) Effect of Substrate concentration on Acid Phosphatase activity -

2. ENZYMATIC ASSAYS IN LIVER AND SERUM

a) Assay of SGPT in Serum
b) Assay of SGPT in Liver
c) Assay of SGOT in Serum
d) Assay of SGOT in Liver
e) Determination of Serum Acid Phosphatse activity
f) Determination of Serum Alkaline Phosphatse activity

3. PLANT TISSUE CULTURE

a) Media preparation, Sterilization
b) Micropropagation
c) Callus indution & Embryo culture
d) Mitotic preparation from Onion root tip

Course Title : LAB IN COMPUTATIONAL BIOCHEMISTRY AND MOLECULAR STRUCTURE	Course Code : 13P
Semester :I	Course Group : MP III
Teaching Scheme in Hrs (P) : 3:1	Credits : 2
Map Code: H (PRACTICAL - EXPERIMENTS)	Total Contact Hours: 60
CIA: 40 Marks	SEE # : 60 Marks
Programme: MSC-BC	# - Semester End Exam

List of experiments

UNIT - I

IMAGE FILE MANIPULATIONS

Perform the basic image file manipulations using GIMP. (Cell Structure) - To create a new image file, To open an existing

image file, To save an image and to export an image file to .gif and other formats

TOOLBOX IN GIMP

Generate or develop an image file by exploring the basic tools in GIMP.(Cell Structure) - Use of Selection Tools : Rectangle , Ellipse ,Free , Fuzzy ,By Color , Scissors, Foreground. Use of Brush Tools: Bucket Fill - Blend- Pencil - Paintbrush - Eraser - Airbrush- Ink - Clone - Healing - Perspective Clone- Blur - Smudge- Dodge/Burn. Use of Transform Tools: Move - Align - Crop - Rotate - Scale - Shear - Perspective - Flip. Handling different types of Color Tools: Color -Hue-Saturation- Colorize -Brightness-Contrast -Threshold -Levels-Curves- Posterize

INSTALL GIMP SOFTWARE

Demonstrate on steps involved in installing GIMP software in your computer - Download the GIMP installer- Run the GIMP installer- Follow the prompts to install GIMP- Select what file formats you want to associate with GIMP- Finish the installation.

To detect the mutated cell for inherited Parkinson’s disease using Animation. - Text effects-Color theory and animations

Identify the tumour in brain image using masking effects. - Use of layers - Masking effects.

USING FILTERS

Create Effects using variety of filters - Try different types of filters: Blur -Artistic-Distorts-Noise-Edge Detect- Light and Shadow-Generic-Decor-Render-Animation

How to create Layers in GIMP - Steps involved in creating and duplicating layers, adding colours to the layer

TEXT EFFECTS

How to Create Text Effects in GIMP - Steps Followed: Open up a new document in GIMP-Place your basic text in the document-Add filters and adjust layers-Merge all layers into one.

PROJECTS

ATP Energy Production process in Mitochondria using GEGL operations - Using Color Theory-GEGL operations.

Spot out the cancer cell from the normal cell using filters. - Use various filter operations.

BIOLOGICAL DATABASES
PROTEIN DATABASES - PIR, ExPASY, TrEMBL
NUCLEIC ACID DATABASE - GENBANK, EMBL, DDBJ
STRUCTURAL DATABASE - MMDB, PDB
SPECIALIZED DATABASE - KEGG PATHWAY
SEQUENCE, SEARCH, COMPARISON & ALIGNMENT OF NUCLEOTIDE & PROTEIN
SIMILARITY SEARCHING - BLAST & FASTA
MULTIPLE SEQUENCE ALIGNMENT - Clustal W & Construction of phylogenetic tree
MULTIPLE SEQUENCE ALIGNMENT
PHYLOGENETIC ANALYSIS - Phylip, Phylodraw & Mega 4
3D STRUCTURE PREDICTION - Swiss model & RasMol
GENBANK - Using GenBank submit the sequence of Hemoglobin gene

Text Books :
Multimedia: Making it Work | Edition:8 | TMGH | Tay Vaughan(2010)
Photoshop 6; The complete reference | Edition:5 | TMGH | Adele Droblas Greenberg AND Seth Greenberg(2001)
Reference Books :
GIMP Pocket Reference: Image Creation and Manipulation | Edition: | | Sven Neumann( )
The Book of GIMP – A Complete Guide to Nearly Everything | Edition: | | Karine Delvare AND Olivier Lecarme ( )

Understand the key features of the origin the basics, properties and types with their derivatives of stem cells

PO1& PS01 10 U

CO2 Determine the causes of cancer cells, neurodegenerative disease and the fate mapping of stem cells.

PO1& PS01 10 U

CO3 Infer the future challenges associated with stem cell applications.

PO1& PS01 8 An

CO4 Illustrating the interruption of carcinogens and mutagens in the normal cell cycle.

PO1& PS01 10 U

CO5 Explain the types of cancer and its treatment through stem cell therapy

Course Title : STEM CELL AND CANCER BIOLOGY	Course Code : 13D
Semester :I	Course Group : DSC IV
Teaching Scheme in Hrs (L:T) : 3:1	Credits : 4
Map Code: C(THEORY – CONCEPT)	Total Contact Hours: 60
CIA: 25 Marks	SEE # : 75 Marks
Programme: MSC-BC	# - Semester End Exam

No	Course Outcome (Cos): After completion of this course, the students will be able to	PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	Understand the key features of the origin the	PSOs	12	U

CO2	basics, properties and types with their	PSOs	12	U
CO3	derivatives of stem cells	PSOs	12	U
CO4	Determine the causes of cancer cells,	PSOs	12	An
CO5	neurodegenerative disease and the fate	PSOs	12	An

UNIT-1 (LECTURE HOURS: 10)

Stem cells

Introduction (Definition, Undifferentiated biological cells, Inner cell mass), History of stem cells (Potential in the field of medicine, ethics Concept of stem cells - Symmetric stem cell division, asymmetric stem cell division and progenitor division), Properties (Unipotent, oligopotent, totipotent, pluripotent),Adult stem cells (Generation and culturing Haematopoietic stem cells - Generation and culturing Isolation - Production and Culture of stem cells , Preparing medium, Monolayer culture Advantage and disadvantage of stem cell - Attributes, Limitations and Oppostion)

ACTIVITY

Making clay models of different stem cells -

Exhibiting cartoon way of representing a stem cell

UNIT-2 (LECTURE HOURS: 10)

Types of stem cells(primal, embryonic and adult stem cells Primal cells Introduction, Types of stem cells), Cord blood Embryonic stem cells (Embryo, Inner cells mass, Invirto) ,fertilization Adult stem cells (Pluripotent, Haemotopoietc stem cells),Neural stem cell (Introduction, multipotent cells),Derived stem cells(Ectoderm derived stem cell and Endoderm derived stem, Development), Neurodegenerative diseases(Introduction Implications and causes),Aging (Introduction, Aging, Decline in stem cell function)

ACTIVITY

1. To download animations illustrating working of neural cells -
2. To label images on a worksheet in differentiating Stem Cells for Research -

UNIT-3 (LECTURE HOURS: 10)

STEM CELL THERAPIES

Skin replacement (Introduction, Skin replacement, Grafting, Complications and therapy using stem cells),Brain cell Transplantation (Repairing damaged cells of CNS, Brain injury and therapy),Diabetes (Types, Replacement of Pancreatic cells and therapy), Heart failure (Heart attacks and potential stem cell-based therapies), Issues related to stem cells (Ethical and legal issues ,Challenges in stem cell usage).

ACTIVITY

1. Debate on the merits and demerits of stem cell therapies and its ethical issues -
2. Article collection of recent stem cell research from journals -

UNIT-4 (LECTURE HOURS: 9)

Cell cycle and cancer

Introduction of cell phases (Mitotic phase, Interphase, Centromere, Chromatids) ,Cancer (Tumor, Metastasis, Neoplasmas),Apoptosis (Introduction, Engulfment, Necrosis, Dendrites)

Cancer symptoms (Early symptoms, APC, tumor suppressor cells) leukemia (Introduction Definition, Reciprocal), translocationHistory and causes (Genetics, origin of cancer) Cancer stem cells (Introduction and its nature).

ACTIVITY

1. Debate on life after cancer -
2. To download animations illustrating Apoptosis -

UNIT-5 (LECTURE HOURS: 9)

Causes and types of cancer Causes of cancer (Physical and Biological factors, Carcinogen, Radiation exposure, Tumour promoters),Types of cancer (Tumour, Benign tumour, malignant tumour, Metastasis),Properties (Transformation of normal cells, Apoptosis failure), Types (Biological therapy, Radiation therapy, Targeted cancer therapy , Immunotherapy)

ACTIVITY

1. To make a Group discussion on causes, control measures of Cancer cells. -
2. Prepare a chart differentiating normal and a cancer cell -

Text Books :

Molecular Cell Biology | Edition:5 | Freeman and company
| LODISH H ET AL(2004)Regenerative medicine |
Edition:1 | NIH | Bethesda(2006)

Reference Books :

Understanding Stem cells | Edition:1 | National Academy Of Sciences | THOMAS P ZWAKA(2010)

Course Title : METABOLIC REGULATION	Course Code : 23A
Semester :II	Course Group : DSC V
Teaching Scheme in Hrs (L:T) : 3:1	Credits : 4
Map Code: C(THEORY – CONCEPT)	Total Contact Hours: 60
CIA: 25 Marks	SEE # : 75 Marks
Programme: MSC-BC	# - Semester End Exam

No	Course Outcome (Cos): After completion of this course, the students will be able to	PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	Understand the structure of six metabolic pathway of carbohydrates and its regulations.	PSOs	12	U
CO2	Describe the structure of lipid metabolic pathway and its regulations.	PSOs	12	U
CO3	Understand the metabolic pathway of amino acids and Illustrate the catabolic pathway of protein metabolism such as urea cycle and its regulations.	PSOs	12	U
CO4	Describe the conversion of amino acids into some specialized products during various metabolic process such as the formation of neurotransmitters, polyamine, heme and various nucleotide synthesis.	PSOs	6	AN
CO5	Distinguish the relationship between the biosynthesis of plant pigments chlorophyll and blood pigments haemoglobin and its functions in different scenario of plants and animals.	PSOs	6	AN
CO6	Describe the mechanism of absorption, metabolism and functions of essential mineral ions in our body.	PSOs	6	AP
CO7	Discuss the structure of the metabolic regulatory pathway of two different nuclotides such as purine and pyrimidine biosynthesis by denovo and salvage pathway and its catabol	PSOs	6	AN

UNIT - I (LECTURE HOURS: 12)
Carbohydrate metabolism

Glycolysis - Introduction, Pathway and reactions.
Regulation of glycolysis - Hexokinase, Phosphofructokinase and pyruvate kinase as regulatory enzymes in glycolysis hormone regulation
Anaplerotic reactions - Filling up Reactions
Gluconeogenesis - Regulation by allosteric and substrate level control mechanisms
TCA cycle - Steps: Regulation at branch points, pyruvate dehydrogenase complex, citrate synthase and alpha - ketoglutarate dehydrogenase.
Glycogen metabolism - Regulation of glycogen phosphorylase, glycogen synthase by effectors, covalent modification and hormones.
Activity
Carbohydrate metabolism - Preparing an activity based on Carbohydrate metabolism by using edible carbon source and vinegar .
UNIT-II (LECTURE HOURS: 12)
Lipid metabolism
Fattyacid biosynthesis - Lipogenesis pathway and reactions
Fatty acid degradation- - Beta oxidation
Regulation of saturated fatty acid synthesis: - Acetyl COA carboxylase and fatty acid synthetase complex. Role of hormones, effect of diet on fatty acid synthesis
Ketone bodies - Formation and utilization
Regulation & biosynthesis - Triacyl glycerols, cholesterol, phosphotidyl choline, phosphotidyl Ethanolamine.
Biosynthesis and regulation of prostaglandins - Eicosanoids, Thromboxanes, and Leukotrienes.
Actvity
lipid metabolism - Demonstrating the lipid metabolism by using animal fat and a glass beaker in flame
UNIT - III (LECTURE HOURS: 12)
Amino acid metabolism
Gamma-Glutamyl cycle. - Gamma glutamyl transferase and reactions.
Metabolism of glutathione - Structure & reactions
SAM pathway - Methionine as methyl donor
Urea cycle - Pathway, reactions & regulation.
An overview of integrated metabolic pathways - Major metabolic pathways & control sites. Food intake and starvation induced metabolic change.
Activity
Amino acids - Preparing a chart model demonstrating the conversion of amino acids to its end product.
UNIT - IV (LECTURE HOURS: 12)
Porphyrin metabolism
Hemoglobin - Biosynthesis , degradation & regulation
Minerals
Calcium - Sources, absorption, metabolism, biological roles and clinical significance
Phosphate - Sources, absorption, metabolism, biological roles and clinical significance
Iron - Sources, absorption, metabolism, biological roles and clinical significance
Trace elements
Copper - Sources, absorption, metabolism, storage and transport
Manganese - Sources, absorption, metabolism, storage and transport
Fluoride - Sources, absorption, metabolism, storage and transport
Activity
Minerals in diet - Preparing a chart model to illustrate the importance of the minerals in diet
UNIT - V (LECTURE HOURS: 12)
Nucleic acid metabolism
Purine biosynthesis - De novo and salvage pathways. Degradation.
Pyrimidine biosynthesis - De novo and salvage pathways. Degradation.
Regulation of purine biosynthesis - PRPP aminotransferases
Regulation of pyrimidine biosynthesis - Aspartate carbamoyl transferase.
Activity

Nucleic acid metabolism - Preparing a chart model illustrating the nucleic acid metabolism

Text Books :

T1- Harpers illustrated Biochemistry | Edition:26 | McGraw Hill publication | ROBERT .K MURRAY,(2003

T2 - Text book of Biochemistry
EDITION:4 | Oxford and IBH publishing Co Pvt Ltd. | EDWARD STAUTON WEST & WILBERT R TODD(1974)

T3-Biochemistry | Edition:5 | W.H.Freeman & company,New York. | LUBERT STRYER , JEREMY M BERG (2003)
T4 - Plant physiology | Edition:2 | Prentice hall India Ltd | G.RAY NOGGLE GEORGE J FRITZ,(1992)
T5 - Plant Biochemistry & Molecular Biology | Edition:1 | John Wiley & Sons Publications | PETER J LEA (1995)

Reference Books :

R1-Biochemistry | Edition:3 | Tata Mc Graw Hill Education Private Ltd | S.C. Rastogi(2010)
R2-Plant Physiology | Edition:4 | CBS Publishers and Distributors | Robert .M. Devlin Francis H. Witham(1986)

Course Title : RECOMBINANT DNA TECHNOLOGY	Course Code : 23B
Semester :II	Course Group : DSC VI
Teaching Scheme in Hrs (L:T) : 3:1	Credits : 4
Map Code: C(THEORY – CONCEPT)	Total Contact Hours: 60
CIA: 25 Marks	SEE # : 75 Marks
Programme: MSC-BC	# - Semester End Exam

No	Course Outcome (Cos): After completion of this course, the students will be able to	PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	Learn the basic techniques involved in recombinant DNA manipulations including DNA restriction, ligation, transformation and selection of recombinant plasmid.	PSOs	10	U
CO2	Understand the functions of several vectors used in cloning and Devise their own cloning strategies for DNA	PSOs	5	U
CO3	Illustrate creative use of modern tools and techniques for manipulation and analysis of genomic sequences.	PSOs	10	U
CO4	To describe the application of recombinant DNA technology in biotechnological research and Construct cDNA and genomic DNA libraries	PSOs	10	AN
CO5	To understand the strategizing research techniques employing in rDNA technology	PSOs	10	AN
CO6	Learn the preparation of insert and vectors for the cloning	PSOs	10	AP

UNIT I (LECTURE HOURS: 12)
Introduction to Recombinant DNA
Definition, Recombinant DNA and evolution - Host controlled restriction modification
The range of manipulative enzymes
DNA polymerase, Polynuceotide kinase - Functions
T4 DNA ligase - Joining DNA molecules
Terminal deoxynucleotidyl I transferase - Functions
Reverse transcriptase and Topoisomerase - Functions
Restriction endonucleases Type I, II & III - Characteristics of Type II Restriction endonuclease, nomenclature, restriction sites
Activity

DNA manipulating enzymes - 1. Group discussion on various DNA manipulating enzymes
DNA Polymerase - 2. Download animation of mechanism of DNA Polymerase
UNIT II (LECTURE HOURS: 12)
Vectors- Definition, Properties and its types
Vectors - Definition, Properties of good vectors
Plasmids and Cosmids - Plasmids- Types, Structural and Functional Organization of Plasmids, Cosmids- Principle and cloning
Bacteriophage vector - Lambda phage, M13 single strand phage vector
yeast cloning vectors - YAC, YEP
Animal viral vector - SV 40
Plant viral vector - Cauliflower mosaic virus vector (CaMV)
Activity
E.coli vector EcoRI - 1.Use paper models to simulate the process of inserting insulin gene of interest into your E.coli vector EcoRI
Vectors - 2.Display the images of different vectors and make a comparison chart mentioning the difference in vector size and gene holding capacity
UNIT III (LECTURE HOURS: 12)
Introduction of the vector into suitable host- Gene transfer techniques
Introduction of the vector into suitable host: - Properties of good host, preparation of competent cells
Transformation of DNA to bacterial, plant and animal cells - Transformation -Calcium mediated transformation
Microinjection - Gene transfer to animal cell, plant cell
Lipofection - Gene transfer to Animal cell
Electroporation - Gene transfer to animal cell, plant cell and bacterial cell
Nuclear transplantation - Transgenic sheep

Homologous recombination - Recombinant virus
Natural genetic engineering by Agrobacterium - Ti plasmid, binary vector strategy
Activity
microinjection - 1.Demonstration of microinjection method using models.
Gene transfer methods - 2. Animation depicting the various methods used for introducing vector into suitable host
UNIT IV (LECTURE HOURS: 12)
Screening of Recombinants

Reporter genes and selectable marker genes - Neomycin , hygromycin, green fluorescence protein

Selection of clones having specific DNA insert - colony hybridization, hybrid arrested translation, nucleic acid hybridization, complementation
Immunochemical methods for screening - colony/plaque screening with antibodies
Gene library and Functional genomics
Gene library - Construction cDNA library and genomic library
Functional genomics - DNA chips and microarray gene screen technology; site directed mutagenesis

Activity
Microarray - 1.Demonstrate the mechanism of microarray gene screen technology by powerpoint presentation
Screening methods - 2.Group discussion on screening methods for Recombinants
UNIT V (LECTURE HOURS: 12)
Techniques in Recombinant DNA technology
Blotting Techniques - Southern, Northern, Western blotting
immunological techniques - Enzyme linked Immunoabsorbant Assay
PCR - Making multiple copies of DNA
DNA Finger printing using RFLP - Digesting the DNA and mapping, Applications
RAPD - Randomly Amplified Polymorphic DNA

Chromosome walking and jumping - Identification of neighboring sequences
DNA sequencing - Chemical and enzymatic method
Hazards of Recombinant DNA technology and regulations
Hazards of rDNA technology and regulations. - Rules and regulation to control the hazards of genetically modified organisms.
Activity
ELISA - 1.Animation depicting the antigen and antibody reaction in ELISA
DNA Fingerprinting - 2.Case study: A person was murdered by an unknown person. How will you find the accused using DNA finger printing
Text Books :
T1-Gene Cloning by T.A.Brown | Edition:5 | BlackWell Publishers, London | T.A.Brown(2006)
T2-Principles of Gene ManipulationEdition | Edition:3 | Blackwell Scientific Publication | S.B.Primrose AND R.W.Old (2006)
T3-Biotechnology | Edition:3 | Book and Allied Kolkata | U Sathyanarayan (2005)
T4-From Genes to Clones | Edition:2 | Panima Publishers | E.L.Winnecker(2003)
T5-Genes VI | Edition:3 | Oxford University Press | B.Lewin(2000)
T6-Recombinant DNA technology and molecular cloning | Edition:2 | Scientific American Publication Black well publica | Kary B. Mullis (1996)
T7-Immunology | Edition:5 | WH Freeman andcompany NY | Richard AGold boy AND Thomas JKindt(2003)
Reference Books :
R1-Molecular Cloning | Edition:3 | Cold Spring Harbour laboratory | Kaaren AJanssen AND NinaIrwin(2001)

Course Title : IMMUNOLOGY	Course Code : 23C
Semester :II	Course Group : DSC VII
Teaching Scheme in Hrs (L:T) : 3:1	Credits : 4
Map Code: C(THEORY – CONCEPT)	Total Contact Hours: 60
CIA: 25 Marks	SEE # : 75 Marks
Programme: MSC-BC	# - Semester End Exam

No	Course Outcome (Cos): After completion of this course, the students will be able to	PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	To understand the concept immune system for protection against diseases	PSOs	10	U
CO2	To remember the antigen and antibody structure, types, function and immunological reactions.	PSOs	5	U
CO3	To apply immune techniques to understand know the measurement of antigen and antibody interaction .	PSOs	10	U
CO4	To explain the different types of hypersensitivity and various immunological disorders .	PSOs	10	AN
CO5	To understand the significance of different vaccines .	PSOs	10	AN
CO6	To study the important organs transplantation and its impact of rejection	PSOs	10	AP

UNIT I (LECTURE HOURS: 12)

Basic concepts of immunity

Introduction & types of immunity (Definition of Immunology, Antigens and Antibody) Cellular Components of the immune system- B cells, Plasma Cells-Structure and functionT cell subsets (Structure and Function Maturation and development of B and T (Th and Tc) lymphocytes) NK cells (Structure and Function) Macrophages & Leukocytes (Structure and Function, Leukocyte extravasation) Organisation and structure of the lymphoid organs Primary lymphoid organs

(Thymus and Bone Marrow) Secondary lymphoid organs –(Spleen, Lymph node, Peyers Patches, CALT & MALT)
Activity Mechanism of action of vaccines Adverse effects of Vaccination Cells of the Immune System - 1. Debate on the benefits and adverse effects of Vaccination 2. Chart/ Model of cells of the Immune System

UNIT II (LECTURE HOURS: 12)
Antigens
Introduction(Definition, Properties and Types) Soluble and Particulate, antigenic determinants Antigen recognition and presentation (MHC Class I and II Molecules, Pattern Recognition receptors, Activation of B&T cells)Antibodies Introduction (Definition, Properties and types) Classification and its function (IgG, IgA, IgM, IgE and IgD) Immune Response (Primary and Secondary immune response, Humoral and cell mediated immunity. Immune responses against bacterial, viral, fungal and parasitic agents. Evasion of infectious agents from immune system) Precipitation Techniques: Radial Immuno-diffusion (Single and Double), Agglutination : Blood grouping, Radio-Immuno Assay, Enzyme Linked Immunosorbent Assay (ELISA) and Western Blotting Immunofluorescence assay : Sorting of cells based on immune surface protein using Florescence activated cell sorter (FACS) technique.
Activity Humoral and Cell mediated immunity, Secretory Ig and largest populated Ig in blood - 1. Animations on Humoral and Cell mediated immunity 2. Discussion on the secretory Ig and largest populated Ig in blood.

UNIT III (LECTURE HOURS: 12)
Biology of the complement systems Complement system (Classical, alternate pathway and lectin pathway Complement fixation test - Direct and Indirect) Immunogenetics (Major histo-compatibility complex MHC I & MHC II) Transplantation immunology Autograft, Isograft, Allograft and Xenograft (Introduction and its Mechanism Bone marrow transplantation, organ transplants, immuno-suppressive therapy). Hybridoma technology and monoclonal antibodies Xenograft transplantation from various species.
Activity Transplantaion Immunology, MHC - 1. Animations on Transplantaion Immunology 2. Submission of report on how MHC provides self and non-self-cell discrimination.

UNIT IV (LECTURE HOURS: 12)
Hypersensitivity Types 1 & 2 (Mechanism, assay and treatment) Types 3, 4 & 5 (Mechanism, assay and treatment)Various aspects of Immunology Immunological disorders (Immunotolerance, Auto- immune disorders. Immuno-deficiencies- primary and secondary-complementary deficiency diseases) Tumor immunology(Tumor antigens, immune response to tumours, cancer cancer immunology: Monoclonal antibody, Interleukin 2, immune blockade therapies).
Activity Hypersensitivity, Auto Immune disorders - 1. Submission of Journals/ articles related to Hypersensitivity and a short report on the submitted article 2. CD with animations on Auto Immune disorders

UNIT V (LECTURE HOURS: 12)
Vaccines- Definition Methods of vaccine preparation (Synthetic vaccines & DNA vaccines) Vaccine development – (Identification of B and T epitopes for vaccine development, immuno screening of recombinant library) Immunological abnormalities Introduction (Types and Properties) AIDS (Diagnosis: Structure, Mechanism of infection, immunological abnormalities, diagnosis and prevention and vaccines) Avian flu (Diagnosis: Structure, Mechanism of infection, immunological abnormalities, diagnosis and prevention and vaccines) Swine flu (Diagnosis: Structure, Mechanism of infection, immunological abnormalities, diagnosis and prevention and vaccines)
Activity AIDS, Tumor Immunology - 1. Submission of reported status of AIDS currently in various countries and the research undertaken 2. CD with animations on synthetic vaccines.

Text Books:

T1 - Immunology | Edition:3 | W.H.Freeman Publishers | Barbara A Osborne AND Richard A Goldsby AND Thomas J Kindt (2006)

T2 - Immunology - An Introduction | Edition:4 | Saunders College of publishing | Ian R. Tizard(1994)

T3 - Immunology | Edition:7 | .ELBS Publishers, UK | David Male AND David B Roth AND DONALD C.BIANDRI . AND Ivan Roitt AND
Jonathan Brostoff (2001).

Reference Books :

R1- Immunology – Edition 6^{th} – Kuby, Kindt, Goldsby, Osborne (2007).

R2 - Immunology | Edition:1 | Mosby – Elsevier, London | Male & et al(2006)

R3 - Modern Pharmacology | Edition:5 | Lippincott Williams & Wilkins Publisher: | Craig CR AND Stitzel RE(2008)

R4 - Modern Pharmaceutics | Edition:1 | Marcel Dekker Inc. New York | Banker GS AND Rhodes M(2002)

Course Title : HUMAN PHYSIOLOGY,HORMONES AND SIGNAL TRANSDUCTION	Course Code : 23D
Semester :II	Course Group : DSC VIII
Teaching Scheme in Hrs (L:T) : 3:1	Credits : 4
Map Code: C(THEORY – CONCEPT)	Total Contact Hours: 60
CIA: 25 Marks	SEE # : 75 Marks
Programme: MSC-BC	# - Semester End Exam

No	Course Outcome (Cos): After completion of this course, the students will be able to	PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	Recognize functions of blood and variety of terms specific to human body and health.	PSOs	10	U
CO2	Analyze and describe the structure and functions of human anatomy and physiology including respiratory system, digestive system, circulatory system.	PSOs	5	U
CO3	To understand which elements in the various signaling pathways represent candidate drug targets for treatment of various diseases.	PSOs	10	U
CO4	To explain about activation, transport, metabolism and degradation along with importance of hormones.	PSOs	10	AN
CO5	Contribute to society by imparting physical understanding to health problems.	PSOs	10	AN
CO6	Aid to apply a wide knowledge about human mechanism in clinical level.	PSOs	10	AP

UNIT-I (LECTURE HOURS: 10)

DIGESTIVE SYSTEM AND BLOOD SYSTEM:

Human physiology- Homeostasis - Mechanism of homeostasis –(Maintenance of equilibrium of ions and other body fluids) Digestive System- (Introduction and physiological process) Secretion of digestive juices – Mechanism of secretion of pepsinogen and HCl.(Mechanism and action) Digestion and absorption of Carbohydrates, Proteins and Fats. (Process of

digestion and absorption in carbohydrates, proteins and fats). Gastro- Intestinal hormones. – (Introduction, Receptor mechanism of GI hormones)- Action of Cholecystokinin, Disease- Gastric ulcer and Gastritis – (Introduction, etiology. mechanism and treatment) .
Blood- Composition and function- (Introduction and types of blood) - RBC- Hemoglobin- (Introduction and structure) Disease state- Polycythemia, Anemia (Definition, symptoms and treatment) Leucocytes- WBC -Disease state - Leukemia, leucopenia, (Definition, symptoms and treatment) Platelets. Introduction, properties (Adhesion, aggregation and agglutination)Blood coagulation - Introduction and Mechanism – stages and Factors involved in blood coagulation) Disease state -Hemophilia- (Introduction, etiology and symptoms)
Activity
1.Plasma and serum - Blood - Separation of plasma & serum.
2.Microscopic observation- WBC, RBC, Platelets.
UNIT-II (LECTURE HOURS: 9)
RESPIRATORY,CIRCULATORY AND EXCRETORY SYSTEM
Respiratory system: Introduction – (Inspiration and Expiration) Transport and exchange of respiratory gases - Transport of gases -Mechaniam (Transport of oxygen and carbondioxide) and exchange of gases between lungs and blood , between blood and tissue (Partial pressure and Diffusion method). Buffer system - Action of oxyhemoglobin (Buffer system- Bicarbonate buffer) Circulatory System – Introduction, Heart as a pump-(Systolic and diastolic actions) Blood pressure.- Normal value –(Systolic and Diastolic pressure) Excretory System - Kidney - Structure of nephron, composition .Urine formation - Mechanism of urine formation (Glomerular filteration, Tubular reabsorption and Tubular secretion). Micturition- (Introduction and Mechanism)
Activity
1.Heart and Kidney - Display the Heart Model.
2. Structure of Nephron - chart preparation.

UNIT-III (LECTURE HOURS: 9)
NERVOUS SYSTEM AND NERVE CELL SIGNALING
Nervous system: Nerve Cell – Introduction -Neuron – (Structure and properties of neuron) Signal transduction – Introduction and Mechanism (Definition, signals, ligands and receptors) Nerve impulse transmission. Introduction and mechanism (Nerve cells - Synapses, Resting membrane potential, action potential, voltage gated ion-channels, impulse transmission). Neurotransmitters – Introduction, properties and types. (Criteria and mode of action of NT) Acetyl Choline, Serotonin and Catacholamine – (Introduction and mechanism of action). Role of G-proteins in vision – (Introduction and mechanism) G-protein visual cycle.
Activity
1.Neurotransmitters - Animation on the Nerve transmission - Mechanism.
2.Chart preparation on Neurotransmitters.
UNIT-IV (LECTURE HOURS: 10)
HORMONES -ANTERIOR AND POSTERIOR LOBE OF PITUTORY HORMONES
Introduction, classification of hormones . Hormones - Introduction (Chemical messengers) and Classification. Hormones of the hypothalamus and pituitary - - (chemical nature, Anterior and Posterior lobe of Pitutory Hormone - secretion, release and their biological functions.) Mechanism of Hormone Action – (Hormone Receptors, Signal Transduction. Mechanism of Hormone Action - Steroid hormones and glyco protein hormones – (General principles concerning nature and mechanism of action of steroid hormones and glyco protein hormones)
Activity
1.Hormones - Chart Preparation - on Hormonal regulation of body mass, eating and drinking.
Group discussion on
2.Hormones, biological clocks and daily and seasonal rhythms.
UNIT-V (LECTURE HOURS: 10)
RECEPTOR ACTION- NUCLEAR RECEPTOR , STERIOD RECEPTOR , RAS RECEPTOR AND TYROSINE RECEPTOR
Signaling by nuclear receptors: Ligands, nuclear and orphan receptors – (Structure and

functions).Steroid hormone receptor – Mechanism of action (Signaling pathway of the steroid hormone receptor). .Signal Transduction - Signal Transduction by G proteins, Ras and Receptor Tyrosine Kinases. (Introduction and mechanism) Disease - Signal Transduction in Human Disease- (Introduction, aetiology and mechanism).
Activity
1.Receptor - Animation on Receptor mechanism
2.Model on Receptor ligand binding - signaling action.

Text Books :
T1 Medical Physiology | Edition:5 | JP | Dr.SembulingamL AND SembulingamPrema(2012)
T2 Medical Physiology | Edition:11 | Arun printers | ChatterjeeCC(2003)
Reference Books :
R1 Endocrinology | Edition:1 | MJP | Prakash S. Lohar(2005)
R2 Molecular cell biology | Edition:6 | W.H.freeman | LodishHarvey(2007)

Course Title : PHARMACEUTICAL NANOTECHNOLOGY AND NANOBIOPHOTONICS	Course Code : 23E
Semester :II	Course Group : DSE I
Teaching Scheme in Hrs (L:T) : 3:1	Credits : 4 Credits
Map Code: C(THEORY – CONCEPT)	Total Contact Hours: 60
CIA: 25 Marks	SEE # : 75 Marks
Programme: MSC-BC	# - Semester End Exam

No	Course Outcome (Cos): After completion of this course, the students will be able to	PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	Recognize functions of blood and variety of terms specific to human body and health.	PSOs	10	U
CO2	Analyze and describe the structure and functions of human anatomy and physiology including respiratory system, digestive system, circulatory system.	PSOs	5	U
CO3	CO3: To understand which elements in the various signaling pathways represent candidate drug targets for treatment of various diseases.	PSOs	10	U
CO4	CO4: To explain about activation, transport, metabolism and degradation along with importance of hormones.	PSOs	10	AN

CO5	Contribute to society by imparting physical understanding to health problems.	PSOs	10	AN
CO6	Aid to apply a wide knowledge about human mechanism in clinical level.	PSOs	10	AP

UNIT I (LECTURE HOURS: 12)

Nanotechnology (Introduction , Biomaterials , types of biomaterials and Processes) Applications (Implants,Disease condition , Cosmetics) Nanoscale Materials, Nanoparticles , Nanowires (introduction role of nano materials , size of nano materials,Integrated Biosensor systems)Nanotubes , Nanochips (Minimize the risk of damaging the tissues)Quantum dots (Semiconductor nanoparticle,function of nanoparticle and application of nanoparticles)

UNIT II (LECTURE HOURS: 12)

Pharmaceutical nanotechnology (introduction, definition of pharmaceutical drug delivery system, action of drug , application of drug delivery system)Drug DeliveryIntroduction (Selfassembly and self organization) Types (Nanoparticle, size of nanoparticle, implantable,transdermal drug delivery)Nanoshells,Nanorobotics , Cantilevers (For diagnosis of diseases)Applications (Cancer therapy)

UNIT III (LECTURE HOURS: 12)

Nanotechnology in Food(Introduction, definition, Molecular building blocks, role of nanotechnology in food)Food chain (Plant/animal production, introduction)Food Processing (introduction, function, method of food processing,Nanocomposites in plastic films application of nanotechnology in food industry) Nanotechnology in Agriculture-Nanoagrochemicals (Atomically modified seeds, seeding iron,smart packaging)Health and environmental risks (Nanoparticle and toxicology)

UNIT IV (LECTURE HOURS: 12)

Nanobiophotonics (Biophotonics, function of biophotonics, role of nanobiophotonics in fabrication, Nanofabricating obey the principles,threats & defenses) Techniques (Introduction , Speed, accuracy,affordability ease of use)Types (Techniques in light sources) Applications(Optical interactions and excitation dynamics)

UNIT V (LECTURE HOURS: 12)

Research scope (Introduction ,Research scope in Canada, Japan, European countries)Intellectual property rights (Copy rights,Patents, Trade secrets) Safety guidelines , Environmental safety guidelines (Stake holders , safetyregulation)

Risk associated safety guidelines (Effects of fabrication processes, Health care markets) Public perception and regulation (Ethical, legal and social concern)

Text Books :

T1 – Pharmaceutical Nanotechnology | Edition:1 | Taylor and Francis group publication | NEELINA H MALSCH(2005) T2 – Principles of Nanotechnology | Edition:1 | IBH Publishers |KUMAR.(2007)

Reference Books :

Biopharmaceutics and Pharmacokinetics | Edition:1 | Himalaya Publishing House | Chatuwal G.R.(2003)

Pharmacology and Pharmacotherapeutics | Edition:16 | Ramadas Bhatkal for Popular Prakakasan Pvt Ltd. | R.S.Satoskar R.R. Satoskar(1999)

Course Title : LAB IN GENERAL BIOCHEMISTRY	Course Code : 13P
Semester :II	Course Group : MP I
Teaching Scheme in Hrs (P) : 5	Credits : 2
Map Code: H (PRACTICAL - EXPERIMENTS)	Total Contact Hours: 75
CIA: 40 Marks	SEE # : 60 Marks
Programme: MSC-BC	# - Semester End Exam

List of Experiments

UNIT - I

QUANTITATIVE ANALYSIS
Estimation of phenol by colorimetry method

Estimation of chloride by titrimetry method

Estimation of cholesterol by Zak's method

Separation of Lecithin from eggyolk

Extractions of lipids from egg

Estimation of Thiamine / Riboflavin from cereals by fiuorimetry methods

CHROMATOGRAPHIC ANALYSIS
Paper chromatography (ascending)

Thin layer chromatography

column chromatography

ELECTROPHORESIS
Agarose gel electrophoresis

SDS gel electrophoresis

Text Books

Biochemical Methods | Edition:2 | New Age International Publishers | ManickamSadhasivam(2005)

Course Title : LAB IN ENZYMOLOGY PLANT AND ANIMAL TISSUE CULTURE	Course Code : 13Q
Semester :II	Course Group : MP II
Teaching Scheme in Hrs (P) : 5	Credits : 2
Map Code: H (PRACTICAL - EXPERIMENTS)	Total Contact Hours: 75
CIA: 40 Marks	SEE # : 60 Marks
Programme: MSC-BC	# - Semester End Exam

List of experiments

UNIT - I

DETERMINATION OF ALPHA AMLASE ACTIVITY

Effect of pH on the rate of alpha amylase activity -
Effect of Temperature on the rate of alpha amylase activity -
Effect of substrate concentration on the rate alpha amylase activity -
DETERMINATION OF CATALASE ACTIVITY
Effect of pH on the rate of catalase activity -
Effect of Temperature on the rate of catalase activity -
Effect of substrate concentration on catalase activity -
ENZYMATIC ASSAYS IN LIVER
Determination of Liver Acid phosphatase activity -
Determination of Liver Alkaline phosphatase activity -
ANIMAL TISSUE CULTURE
Sterilisation- Filter method -
Culture of lymphocytes from Blood sample- Monitoring microbial contamination -
Checking for viability of cells. -
INVITRO CYTOTOXICITY ASSAY
MTT assay -
Tryphan Blue experiment -
Text Books :
Biochemical methds | Edition:2 | New Age Internatinal Publishers |
ManickamSadhasivam(2005)
Principles and practice of Animal Tissue culture | Edition:2 | University press publishers |
SudhaGangal(2010)
Reference Books :
Principles and Techniques of Practical Biochemistry | Edition:5 | Cambridge University Press |
Keith Wilson John M. Walker(2001)

Course Title : FORENSIC BIOCHEMISTRY	Course Code : 33A
Semester :III	Course Group : DSC IX
Teaching Scheme in Hrs (L:T) : 3:1	Credits : 4 Credits
Map Code: C(THEORY – CONCEPT)	Total Contact Hours: 60
CIA: 25 Marks	SEE # : 75 Marks
Programme: MSC-BC	# - Semester End Exam

Course outcome: (Cos)

No.	Course Outcome (Cos): After completion of this course, the students will be able	POs & PSOs	Cl. Ses	CL
CO1	Understand the concepts of nanotechnology and applications of nonmaterial's in biosensor systems .	PSO 1	10	U
CO2	Apply the nano particles in pharmaceuticals in pharmaceuticals aspects such as Nano wire, Nanotubes,Nanochips for clinical diagnosis and treatment.	PSO 2	10	U
CO3	Apply the Nanoparticles for cancer and skin diseases through combination of Nanoparticles with drug compounds by drug delivery mechanism	PSO 2	10	U & R
CO4	Applications of Nanoparticles for treatment for various diseases.	PSO 3	10	U &AN
CO5	Describes the role of nanotechnology as in agriculture field for making nutritional food products and smart packing materials.	PSO3	10	U &AN
CO6	Understand the concept of Nanobiophotechnics and its application.	PSO 3	5	U &AN
CO7	Identify and compare state of the art Nanofabrication methods and perform a critical analysis of theresearch literature.	PSO3	5	U &AN

UNIT-I (LECTURE HOURS: 12)

IDENTIFICATION (introduction, Definition and data to establish identity , race, religion, sex, age, stature, complexion and features, external peculiarities, anthroprometry, dactylography, and poroscopy-superimposition technique)FORENSIC ODONTOLOGY

Odontology (Medico-legal importance of age and sex)

Activity

How will you give first aid for an accident victim - Demo -?

UNIT-II (LECTURE HOURS: 12)

THANATOLOGY (introduction , Types of death,Modes of death and their patho-physiology-causes of death, classification and medico-legal aspects of natural death)Diagnosis of poisoning (Live and dead) DUTIES OF THE MEDICAL PRACTITIONER (Duties of the medical practitioner , In suspected case of poisoning)

ACTIVITY

1. Giving first aid: Accident victim-

2. Giving first aid: In case of seizures.-

UNIT-III (LECTURE HOURS: 12)

POST MORTEM CHANGES (Signs of death and changes following death and their medico-legal importance,Adipocere, mummification, embalming)Estimation of post mortem interval (time of death) (Presumption of death and survivorship)

MECHANICAL INJURIES (WOUNDS) (Classification and mechanism of wound production, Abrasions, Contusions, Incised wounds, Chop wounds, Stab wounds and Lacerated wounds and their medico-legal Importance) Firearms classification and cartridges (Firearm wounds by different firearms and their medico -legal importance -Bomb explosion Wounds.)

ACTIVITY

1.Case study : Collection of data from a murder site

UNIT-IV(LECTUREHOURS:12)

VIOLENTASPHYXIALDEATHS (introduction, Classification, Hanging, Strangulation by ligature Throttling, Smothering, Gagging, Overlaying, Burking, Choking, Drowning) DEATH DUE TO COLD (Death Due to cold, heat, electricity and radiation) Anaesthetic and operative deaths.

ACTIVITY

Chart work on OT equipments.

UNIT-V (LECTURE HOURS: 12)

MEDICO-LEGAL AUTOPSY (Protocol) ,Technique (Blotting & Finger printing) Postmortem report. EXAMINATION OF SET OF BONES(Ethical Consideration , Examining the set of bones)

ACTIVITY

How to collect Bone specimen for forensic examination.

Text Books :

Forensic science : an illustrated dictionary | Edition:1 | PBS publishers | John C. Brenner(2004)

Reference Books :

Encyclopedia of forensic sciences | Edition:1 | Editor-in- chief | Pekka J. Saukko, Geoffrey C. Knupfer(200)

Forensic science : an encyclopedia of history, methods, and techniques | Edition:2 | PBS | William J. Tilstone, Kathleen A. Savage, and Leigh(2006)

Course Title : DRUG BIOLOGY AND DYNAMICS	Course Code : 33B
Semester :III	Course Group : DSC X
Teaching Scheme in Hrs (L:T) : 3:1	Credits : 4
Map Code: C(THEORY – CONCEPT)	Total Contact Hours: 60
CIA: 25 Marks	SEE # : 75 Marks
Programme: MSC-BC	# - Semester End Exam

Course outcome: (Cos)

No.	Course Outcome (Cos): After completion of this course, the students will be able to	PSOs	Cl. Ses	CL
CO1	To understand the time course of drugs and study the reaction by ADME	PSO 1	12	U
CO2	To explain the interaction between drug and receptor and to determine the impact of drugs in use and addiction on induviduals	PSO 2	12	U
CO3	To analysis the safety of potential drugs and to analyze the impact of the drugs	PSO 1	12	R
CO4	To create an awareness on drug abuse	PSO 3	12	U &AN
CO5	To explain and understand the pharmacokinetics	PSO3	12	AN

UNIT-I (LECTURE HOURS: 12)

PHARMACOLOGY

General Pharmacology - Introduction

Classification - Pharmacology, Pharmacodynamics, Pharmacokinetics, Toxicology, Therapeutics.

DRUGS

Nature and sources of drugs - Animals, Plants, Microorganism, synthetic. Biosynthetic

Route of Adminitration - Oral, Injection, Transmucousal

Absorption - Passive Diffusion, Acitve transport, pinocytosis

Distribution - Plasma, Interstitial fluid compartment, trans cellular fluid compartment, cellular fluid compartment.

Metabolism - Phase I and Phase II

Elimination - Passive glomerular filtration, Active Tubular secretion, passive diffusion across the tubules.

ACTIVITY

1 - Discussion and pictorial presentation on different source of drugs

2 - Animation on ADME mechanism

UNIT-II (LECTURE HOURS: 12)

DRUG RECEPTORS

Cell surface receptors - Ion channels, G protein coupled receptors, Tyrosine kinases.

ADVERSE DRUG RESPONSE

Adverse drug reaction in man - Drug tolerance, Intolerance, Idiosyncracy, allergy, tachyphylaxis, Drug dependence

ASSAY OF DRUG POTENCY

Assay - Chemical assay, Bioassay, Immunoassay.

DRUG EXTRACTION

Methods of drug extraction - Decoction and Pelleting

ACTIVITY

1 - Model/Chart work on different types of drug receptors.

UNIT-III (LECTURE HOURS: 12)

TOXICOLOGY

Introduction - Definition and scope of toxicology

Classification - Various Sub disciplines of toxicology

DOSE RESPONSE CONCEPT

Dose response relationship - Graded and Quantal Dose response relationship.

DRUGS IN DISEASE

Respiratory Disease - Cough, Asthma, TB
Gastrointestinal tract - Vomiting, Peptic ulcer, diahhorea
Antimicrobial - Antibacterial, Antiviral, Antimalarial
Cancer chemotherapy - Introduction and Drugs used.
ACTIVITY
1 - Quiz on Toxicology
2- Making clay model of damaged organ

UNIT-IV (LECTURE HOURS: 12)

GENOME BASED MEDICINE
Cloning - Functional, Positional Cloning-for identifying diseased gene.
Analysis of human diseased gene - Huntington’s disease and Cystic fibrosis.
GENE THERAPY
Introduction - Basic approach of genetherapy
Human somatic cell gene therapy - Exvivo and invivo

Vectors used in gene therapy - Viral and non-viral vectors
Antisense Therapy - Antisense oligonucleotides
ACTIVITY
1 - Slide presentation on Functional and Positional Cloning
2 - Discussion of Articles related to Gene therapy
UNIT V (LECTURE HOURS: 12)

DRUG DISCOVERY
Aproaches - Introduction.
Target Identification and validation - Types of Targets, validation characters.
Identifying Lead compound - Qualities, Finding compounds.
Optimization of Lead compounds - Other outputs
PHARMACOKINETICS
Basic Concepts in Pharmacokinetics - Elimination - Metabolism + Excretion , Disposition - Distribution + Elimination
Important Pharmacokinetic Parameters - Primary pharmacokinetic parameters: Clearance and Volume of distribution. Secondary pharmacokinetic parameters: Half-life, Bioavailability
ACTIVITY
1 - Quiz on Drug discovery
2- Perform Docking of any ligand with its protein using AutoDock

Text Books :
RECOMBINANT DNA TECHNOLOGY | Edition:2 | W.H Freeman Company, Newyork |

JAMES D WATSON., MICHAEL GILMANMARK ZOLLER(2010)

BIOPHARMACEUTICAL BIOCHEMISTRY AND BIOTECHNOLOGY | Edition:2 | Wiley India Pvt Ltd, Ireland | Garywalsh(2013)

Reference Books :

Basic Bioinformatics | Edition:2 Nd | Narosa Publishing House, Chennai | Ignacimuthu S J(2013)

Pharmacology And Pharmacotherapeutics | Edition:25 | Popular Prakashan Pvt Ltd | Satoskar Rs Bhandarkarainapure(2017)

Textbook Of Toxicology | Edition:1 | I.K International Publishing House Pvt Ltd | BalaramPaniBalaramPani (2010)

Course Title : BIOINFORMATICS	Course Code : 33C
Semester :III	Course Group : DSC XI
Teaching Scheme in Hrs (L:T) : 3:1	Credits : 4
Map Code: C(THEORY – CONCEPT)	Total Contact Hours: 60
CIA: 25 Marks	SEE # : 75 Marks
Programme: MSC-BC	# - Semester End Exam

Course outcome: (Co's)

No.	Course Outcome (Cos): After completion of this course, the students will be able to	POs & PSOs	Cl. Ses	CL
CO1	To understand theretrieval of protein and genetic sequence	PSO 1	10	U
CO2	To know the transform raw data into meaningful information by applying computational techniques	PSO 2	10	U
CO3	To describe the principles and algorithms of pairwise and multiple alignments, and sequence database searching	PSO 2	10	U & R
CO4	To create the phylogenetic tree construction and application of phylogenetic analysis in evolutionary studies	PSO 3	10	U &An
CO5	To learn sequence analysis methods and tools used for gene prediction	PSO3	10	U &An
CO6	To apply the homology modeling forresearch	PSO 3	5	U &An
CO7	To evaluate the chemical structures and the uses of molecular modelling tools and their applications.	PSO3	5	U &An

UNIT-I (LECTURE HOURS: 12)

Bioinformatics

Introduction - Definition and objectives

Applications of bioinformatics - Applications related to information search,genetics,sequencecomparison,phylogeneticanalysis,pharmacogenomics,drug discovery etc.

Biological databases

Introduction - Definition, types of databases

Protein databases - Tr EMBL,PIR,Expasy

Nucleicacid database - Genbank,EMBL,DDBJ

Structural database - MMDB,PDB

Specialized database - Metabolic pathway-KEGG

Activity

1 - Visualisation of 3D structure of Keratin using Protein Data Bank (PDB)

2 - To retrieve the TCA cycle in Kyoto Encylopedia of Genes and Genomes (KEGG)

UNIT-II (LECTURE HOURS: 12)

Genome sequencing approaches

Clone by clone and whole genome shot gun method - Introduction, generation of sub clones, automated sequencing methods - Metagenomics

Sequence alignment & comparison (DNA and Protein) - Dot plot global and local alignment

Scoring matrices- - PAM and BLOSUM

Tools for similarity searching . - FASTA and. BLAST

Multiple sequence alignment - Clustal W.

Activity

1 - Group Discussion on Sequence alignment tools

2 - Perform Clustal W after downloading 5 different sequences of insulin mRNA from NCBI

UNIT-III (LECTURE HOURS: 12)

Phylogenetic analysis

Phylogenetic trees - Introduction,definition,types-rooted and unrooted trees.

Phylogenetic softwares

Methods of phylogenetic analysis- Distance methods - Distance matrices and Neighbour joining methods.

Character-based methods - Maximum parsimony, minimum evolution and maximum likelihood

Phylip - Phylogeny inference package-methods

Phylodraw - Tree drawing system

Visualisation tools

RASMOL and Swiss PDB viewer - Procedure and different options for viewing.

Activity

1 - Construct a phylogenetic tree using PHYLIP for collagen sequence from 5 different species

2 - Exhibit 3D structure and Ramachandran plot of p53 protein using Swiss PDB viewer

UNIT-IV (LECTURE HOURS: 12)

Genomics and genome projects

Human genome project (HGP) - Salient features and benefits of genomic research scope and applications

Proteomics

Secondary structure analysis - Choufasman,GOR

Prediction methods - Nearest Neighbour methods.

Sequence based protein prediction methods

Homology modeling - Comparitive modeling (Threading)- Swiss model

Ab initio Approach. - Molecular dynamics, Lattice models etc.

Activity

1 - Quiz on Genomics and Genome projects

2 - Make a chart presentation on protein structure prediction methods

UNIT-V (LECTURE HOURS: 12)

Computer aided drug designing

Introduction - Drug discovery process,complementaryinteractions,drug related terms.

Drug design approaches

Ligand based - QSAR, Pharmacophore hypothesis model.

Computer aided drug designing

Computer –Aided Molecular design - Quantum CACHE & Project Leader

Target based drug designing - Docking, Docking programmes- Auto Dock and LUDI.

ADME properties.

Approaches towards ADMET prediction - Reduction of drug toxicity,improve drug safety & Computational approaches.

Activity

1 - Perform Docking of any ligand with its protein using AutoDock (e.g. Glucose with Hexokinase)

Text Books :

Basic Bioinformatics | Edition:2 | Narosa Publishing House Ltd, New Delhi. | S.Ignacimuthu(2013)

Bioinformatics with Fundamentals of Genomics &Proteomics | Edition:1 | Tata McGraw-Hill Education Private limited, New De | Shubha Gopal, Anne Haake(2014)

Bioinformatics-concepts, skills and applications | Edition:2 | CBS Publishers, Delhi | SC Rastogi, Namita MendirettaParag Rastogi(2013)

Reference Books :

Bioinformatics sequence and genome analysis, | Edition:1 | - | DavidW.Mount(2014)

Bioinformatics, a Practical Approach | Edition:1 | Aparnaa publication, Tamilnadu| K. Mani N. Vijayaraj(2004)

Course Title :CLINICAL RESEARCH	Course Code : 33D
Semester :III	Course Group : M - XII
Teaching Scheme in Hrs (L:T:P) : 4:0:0	Credits :4
Map Code: C(THEORY – CONCEPT)	Total Contact Hours: 60
CIA: 25 Marks	SEE # :75 Marks
Programme: M.SC-BC	# - Semester End Exam

No	Course Outcome (Cos): After completion of this course, the students will be able to	PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	Understand the origin of clinical research and clinical trials	PSOs	12	U
CO2	Develop a comprehensive knowledge of the history and evolution of clinical trials	PSOs	12	U
CO3	Critical understanding of the purpose and context of each of the phases of clinical research	PSOs	12	U
CO4	Understand the study of clinical trial protocol design.	PSOs	12	U
CO5	Understand the most important ethical issues in clinical research.	PSOs	12	U

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UNIT- I : LECTURE HOURS: 12)

History & Background of Origin of Clinical Research

Thalidomide tragedy - Sulphanilamide disaster, Declaration of Helsinki, The Belmont Report.

Introduction of Clinical Research - Core research methodology

Types of clinical research - Treatment, Prevention, Diagnostic research

Principles of science - - Scientific method - Five basic components (Critical thinking, types of evidence, anecdotal, correlational, circumstantial evidence)

ROLE OF ORGANIZATIONS IN CONDUCTING CLINICAL RESEARCH

Government organization - UGC, BT, DST, ICMR

Commercial organization - non-profit organization

ACTIVITY:

Group discussion on difference between Clinical Research and Clinical Trial.

UNIT II (LECTURE HOURS: 12)

BASIC CLINICAL TRIAL

History of Good Clinical Practices (GCP) - Introduction to ICH, The Nuremberg Code, and Principles of ICH-GCP

GCP GUIDELINES AND TYPES

Guidelines - ICH Guidelines, Indian GCP guidelines, ICMR Guidelines

TYPES OF TRIALS

Trials - Prevention Trials, diagnostic trial, Treatment trial, Case cohort study, Observational studies, Quality of life trials

PHASES OF CLINICAL TRIALS

Phases of clinical trials - Phase I, Phase II, Phase III, Phase IV

ACTIVITY

1- Group Discussion on Four Phases in Clinical Trials

2 - Make a chart on Good Clinical Practice

UNIT III (LECTURE HOURS: 12)

CLINICAL TRIAL PROTOCOL DESIGN

FUNDAMENTALS OF TRIAL DESIGN - Randomized clinical trial, uncontrolled trials, protocol development, end points, Patient selection, sources and control of bias, Randomization, sample size and power

PRINCIPLES OF CONTROLLED CLINICAL TRIALS - Clinical trial protocol, consent in clinical trials, placebo, bias and methods to prevent bias.

ETHICAL ASPECTS: - Ethical principles underlined research involving human subjects, respect for persons, beneficence, justice, legal authorities for Institutional Review Board (IRB).

ACTIVITY

Group Discussion in Research problems faced by volunteers and investigators when testing new drugs

UNIT IV (LECTURE HOURS: 12)

CLINICAL DATA MANAGEMENT

Data Management - Overview, regulation, data management plan and CRF designing, database designing and implementation.

CLINICAL TRIAL MANAGEMENT

Investigator site perspective - Safety monitoring and oversight

Co-ordinating a clinical trial at the site. - - Sample size calculation, inclusion/exclusion criteria, randomization, choice of centre

DATA SAFETY MONITORING BOARD

LAB IN RESEARCH TECHNIQUES IN BIOCHEMISTRY

Concepts and management. - Committee- Trial steering, trial management, data monitoring committee.

ACTIVITY:

Chart preparation for clinical trial management

UNIT V (LECTURE HOURS: 12)

INTERNATIONAL REGULATORY BODIES AND GUIDELINES

US Food and Drug Administration (USFDA): - The FDA and Food Drug and Cosmetics Act, New drug development and approval.

India: - Regulatory laws, Schedule Y, registration of new drugs, requirements for registration, regulatory environment and practices

European Agency for Evaluation of medicinal Products (EMEA): - National registration , the decentralized procedures, mutual recognition procedures

INTELLECTUAL PROPERTY RIGHTS

Terminology - Patent Laws, TRIPS (Trade Related Intellectual Property Rights) Agreement, Trademarks, copyrights

CLINICAL TRIAL APPLICATION REQUIREMENTS

New Drug Application(NDA): - Pre NDA meeting , NDA submission Check list , NDA review check list ICD9 and ICD10

ACTIVITY

1 - Group Discussion on safety Data Guidelines

2 - Quiz on IPR

Text Books :

Clinical trial of drugs and biopharmaceuticals | Edition:- | CRC Press | CHI-JEN LEELUCIA H LEE(2006)

Text Book of clinical trials | Edition:2 | Willey india Pvt ltd | DAVID MACHINSIMONDAY(2010)

Course Title : LAB IN IMMUNOLOGY AND R-DNA TECHNOLOGY	Course Code :
Semester :III	Course Group : MP IV
Teaching Scheme in Hrs (P) : 5	Credits : 2
Map Code: H (PRACTICAL - EXPERIMENTS)	Total Contact Hours: 75
CIA: 40 Marks	SEE # : 60 Marks
Programme: MSC-BC	# - Semester End Exam

List of Experiments

UNIT I

IMMUNOLOGY

RA TEST

CRP TEST

WIDAL TEST

PREGNANCY TEST

IMMUNODIFFUSION - SINGLE, RADIAL

IMMUNODIFFUSION - DOUBLE

IMMUNOELECTROPHORESIS

ROCKET IMMUNO ELECTROPHORESIS

ELISA - HORMONE ASSAY

SEROLOGY

ASO TITRE

VDRL TITRE

DETERMINATION OF BLOOD GROUP

Text Books :

Biochemical Methods | Edition:1 | New Age International. | S. SadasivamA. Manickam(1996)

Reference Books :

Principles and Techniques of Practical Biochemistry | Edition:5 | Cambridge University Press | Keith WilsonJohn M. Walker(2001)

Course Title : LAB IN RESEARCH TECHNIQUES	Course Code :
Semester :III	Course Group : MP V
Teaching Scheme in Hrs (P) : 5	Credits : 2
Map Code: H (PRACTICAL - EXPERIMENTS)	Total Contact Hours: 75
CIA: 40 Marks	SEE # : 60 Marks
Programme: MSC-BC	# - Semester End Exam

List of Experiments

UNIT - I

HAEMATOLOGY

Enumeration of RBC - Total RBC count, Haemocytometer

Enumeration of WBC - Total WBC count, Haemocytometer

Estimation of Haemoglobin - Collection of Blood sample, Haemoglobin estimation

Bleeding and clotting time - Blood sample collection, Time calculation

PHYTOCHEMICAL ANALYSIS

Preparation of plant extract (Soxhlet's Method) - Preparing different solvent extracts- Ethanol extract, Methanol extract, Aqueous extract, Petroleum ether extract and Chloroform extract.

Qualitative analysis of Secondary metabolites from different solvent extracts - Tannins, Alkaloids, Flavanoids, Steroids, Carbohydrates, Protein, Terpenoids and Phenol.

Comparison and estimation of Antioxidants in Ethanolic, Methanolic and Aqueous extract. - Vitamin-C, Catalase

Comparison and estimation of Metabolites in Ethanolic, Methanolic and Aqueous extract. - Tannins and Phenols

DEMONSTRATION

PCR, RAPD

Text Books :

Principles and Techniques of Practical Biochemistry | Edition:4 | - | WilsonJohn Walker(-)

Course Title	:HOSPITAL MANAGEMENT	Course Code	: 3EA
Semester	: III	Course Group	: EL3
Teaching Scheme in Hrs (L:T:P) : 4:0:0		Credits	: 4
Map Code	:C(THEORY CONCEPTS)	Total Contact Hours	: 60
CIA	:25 Marks	SEE	: 75 Marks
Programme: MSC-BC			

Course outcome: (Cos)

No.	Course Outcome (Cos): After completion of this course, the students will be able to	POs & PSOs	Cl. Ses	CL
CO1	Understand the study of concept of hospital, classification and its functions.	PSO 1	12	U
CO2	Understand the study of operationthearte and its features	PSO 2	12	U
CO3	Illustrate the study of facilities and functions of Intensive care unit.	PSO 2	12	U & R
CO4	Understand the need and importance of cost effective sustainable health care through demand generation and enhanced quality care.	PSO 3	12	U
CO5	Remember the basic principles and methods for the assessment of health needs of a community and plan for health programs.	PSO3	8	R
CO6	Understand the handling and disposal requirements for hospital waste management.	PSO 3	4	U

UNIT-I (LECTURE HOURS: 12)

Hospital and its Function

Care of Sick and Injured - Care, Diagnosis, Treatment, Medical and Nursing care
Education and Training for Nurses, Physicians - Training and Experience, Lab technology, Workshop environment
Promotion of Health - Preventive Medicine, Medical staff, Health Department
Concept of Hospital
Service Organisation - Time Cycle, Recreation and environment,Adult education
Definitions of Hospital - World health organization, Dorlands definition, Blackiston New Gold Definition
Changing Concept of Hospital - Trusteeship Period, Physician Period, Administration and Team Period
Classification of Hospital

Ownership - Public Hospital, Voluntary Hospital, Private Hospital
Directory of Hospital - General Hospital, Rural Hospital, Specialized Hospital, Teaching Hospital, Isolation Hospital
System of Medicine - Ayurveda, Siddha, Unani, Allopathy and Homeopathy

UNIT-II (LECTURE HOURS: 12)

Operation Theatre
Location - Complex workshop, Preparation room, Exit area
Zoning - Protective zone, Inner zone, Innermost zone, Disposal zone
Policies and Procedures - Functions, Duties, Checking operating room readliness, Care and disposal of tissuses
Features of Operation Theatre
Size - Optimum size, Vinyl sheet, OT walls
Features - Lighting, Head lamps, Flooring
Facilities - Compressed air, Ventilator, Monitoring equipment
Intensive Care Unit
Location - Centralized place, Emergency department, Operating room
Facilities - Privacy, Medical gas outlets, Nurses station
Funtions - Centralized area, Monitor the data, Patient care

UNIT-III (LECTURE HOURS: 12)

Hospital Information system
Introduction - Dynamic department, Outpatient, Store information online
Evolution of HIS - Insurance centric health care delivery system, clean slate, HIS
Computerization - Integrated system, Online real time system, Patient oriented system
Clinical Information system
Introduction - Registration, Admission, Security and identity management
Administrative information system - Account title file, Financial management, Data entry
Human Resources - Payroll, Purchasing, E- Forms
Health care delivery system
Introduction - Hitherto health, Longer life span, Increased Public awareness
Human rights - WHO, Integrated delivery system, Tele medicine
Health care cost and Information Technology - Two inflammatory factors, Problems, Principle role, Management

UNIT-IV (LECTURE HOURS: 12)

National Health Programme related to communicable diseases
Introduction - National Health Programs, P olicy and Implementation, Features, Advantages and Disadvantages
Tuberculosis - DOTS, Objectives
AIDS - Human immunodeficiency virus, Blood transfusions, Hypodermic needles, National Health Programs
National Health Programme related to Non- Communicable diseases
Cancer - Origin, Causes, Suggestions, Signs and Symptoms, Causes, National Health Programs
Diabetes - High blood sugar, Genesis, Objectives, Signs and Symptoms, Causes, National Health Programs, Treatment
Alcoholism and habilitation - Alcoholism effects, National Health Programs, Rehabilitation
Reproductive and Child Health Programme
Introduction - UIP, ORT, MCH

Health Programme - Family Planning, Maternal Health, Child Health, Adolescent health, Child Survival and Safe motherhood Programme, Highlights

Advantages - Immunization, Child and women benefits, Health benefits, Programme, Reporting, Effective maternal and health care

UNIT-V (LECTURE HOURS: 12)

Hospital Waste Management
Introduction - Definition, Biomedical waste
Categorization of hospital waste - Infectious waste, Hazardous waste, Radioactive waste, General waste
Health impacts of biomedical waste - Potential health hazards, Persons at risk
Handling and safe disposal of biomedical waste - Segregation, Poly bags collection, Autoclaving, Incineration
Occupational Health & safety Practices - Usage of protective equipment, Emergency measures
Laws and Policies regarding Biomedical waste management - Rules and Guidelines of WHO, Central pollution control board (CPCB)

Text Books :

Hospital Information System | Edition:1 | Excel Book Private Ltd | S PORKODI(2008)

Reference Books :

Hospital Management | Edition:1 | APH Publishing Corporation | Mohammed Akbar Ali Khan(1999)

Course Title : BIOSTATISTICS AND RESEARCH METHODOLOGY	Course Code : 43A
Semester :IV	Course Group : M - XII
Teaching Scheme in Hrs (L:T:P) : 4:0:0	Credits :4
Map Code: C(THEORY – CONCEPT)	Total Contact Hours: 60
CIA: 25 Marks	SEE # :75 Marks
Programme: M.SC-BC	# - Semester End Exam

No	Course Outcome (Cos): After completion of this course, the students will be able to	PSOs	Cl.Ses	BLOOM'S TAXONOMY LEVEL
CO1	Understand the basic concept of data analysis and statistical computing.	PSOs	12	U
CO2	Understand data collection method	PSOs	12	U
CO3	Collect data relating discrete and continuous random to variable which will examined and calculate descriptive0020statistics from known database	PSOs	12	U
CO4	Differentiate the specificity and sensibility each statistical techniques.	PSOs	12	U
CO5	Apply hypothesis testing via some of the statistical distribution define some concepts about hypothesis testing . Update the independent of random variables like t-Test, F- test, chisquare and ANOVA classification	PSOs	6	U
CO6	Understand the various research method and report writing.	PSOs	6	U

UNIT-I (LECTURE HOURS: 12)

Introduction to Statistics

Selected Statistical terms - Variables, Constants, Data, Population

Sample, Parameter, Notations used in Statistics - Related problems

Nature of Measurement and Types of variables Nature of Measurement and Types of variables

Data Collection

Collection of data - Related problems

Data collection and types - Related problems

Classification and Tabulation of Data

Bar diagram, Pie diagram, Frequency polygon and Cumulative polygon - Relaed Problems

Difference between Histogram and Frequency polygon. - graph

Activity

1 - preparation of chart work in pie diagram and bar diagram

2 - Quiz on different ways of data collection

UNIT-II (LECTURE HOURS: 12)

Measures of Central Tendency

Introduction - Definition and objectives and types of averages

Arithmetic Mean - Calculation of arithmetic mean for discrete and continuous data.

Median - Calculation of Median, merits & demerits

Mode - Calculation of Mode for discrete and continuous data series, Comparison of Mean, Median and mode - Relationship between mean, median & mode.

Correlation

Calculation of correlation coefficient - Introduction Significance for correlation coefficient and coefficient of variation

Regression

Regression and calculation of Regression equation - Introduction, Equation of X on Y and Y on X.

Activity

1 - Usage of regression analysis to draw derive line equation for colorimetric experiments.

2 - Group Discussion on relationship between mean, median and mode standard deviation.

UNIT-III (LECTURE HOURS: 12)

Null Hypothesis

P.Value - Related Problems

Significant level - related problems

Confidence Interval - Related Problems

Type I and type II error - Related problems

T-test and F-test

t' distribution , 't' test and F-test - Related problems

Chi square Test

Chi square test(gene frequency analysis)Degrees of freedoms - assumption Continuity correlation - Related Problem

Calculation of chi square test - Related problems

Analysis of variance

One way ANOVA - Related problems

Two way ANOVA - Related problems

Null Hypothesis, MANOVA - Related problems

Activity

1 - Testing of Significance: A special type of fertilizer was used in 4 Agricultural fields A, B, C and D. Test whether the difference in mean yields of 4 Agricultural fields is significant or not?

2 - Group discussion on difference between one way and two ways ANOVA, Distribution, Binomial, Poisson, Normal.

UNIT-IV (LECTURE HOURS: 12)

Research

Introduction - The design of any research project, Scientific and Systemic literature search, To discover answers

Types & classification of research - Diagnostic research, descriptive research, exploratory research

Explanatory research ethics - Explanatory or evaluative motive, Respect for persons, Beneficence, Justice

Topology for literature search

Scientific methods - Introduction, Methodology- the study of the methods, Minimize the influence of the researchers

Components of scientific methods - Formulate hypothesis Design experiment Test hypothesis / Collect data Interpret / Analyze results Publish finding Research question / Problem Background / Observation

Formulation of research paper - identifying in literature Formulating a Research Question, Formulating Hypothesis Aims and Objectives

Research design

Explanatory Types of research design - Descriptive research research, Theory testing and theory construction

Formation of hypothesis - The linguistic expression, Prediction that will be tested by research

Synopsis writing - Start With a Hook, Introduction of Characters, Construct the Body of Your Synopsis

Activity

1 - Powerpoint presentation on different components and writing of Dissertation/Thesis

2 - Group Discussion on formulation of research paper/ Journal

UNIT-V (LECTURE HOURS: 12)

Data collection techniques

Sampling - Tool for converting data into information, Experiments, Surveys, Sample size and sample error

Observation - Gathering data by watching behavior, events Helps to watch for the results of behaviors or interaction

Questionnaire and bibliometrics - Standard bibliometrics methods, Applying Bibliometrics, Designing for Metrics

Data analysis and interpretation

Geographical and graphical presentation of data - Applied as tools, Automated graph, Animation, Diagrammatic methods

Statistical analysis - Quantitative approach., Descriptive Statistics, Inferential statistics

Tools of argument - Softwares, packages ,Installing packages, Loading packages

Research reporting

Style and writing of report - Reporting Descriptive (Summary) Statistics, Summarizing Statistical Test Outcomes in Figures

References and bibliography - Statistical Methodology, Retrospective Space-Time Scan Statistic, Year

Activity

1 - Prepare a Questionnaire for collecting clinical Data of patient for Research purpose

2 - Demonstration on statistical tools in MS Excel and SPSS

Formation of report - Informative Presentation of Tables, Graphs and Statistics

Text Books :

Statistical methods | Edition:30 | Sultan Chand & Sons Educational Publishers | Dr S.P.Gupta(2001)

Reference Books :

Research Methodology methods and Techniques | Edition:2 | New Age Publications | Kothari CR(2004)

Course Title : LAB IN IMMUNOLOGY AND R-DNA TECHNOLOGY	Course Code : 43P
Semester :IV	Course Group : MP IV
Teaching Scheme in Hrs (P) : 5	Credits : 2
Map Code: H (PRACTICAL - EXPERIMENTS)	Total Contact Hours: 75
CIA: 40 Marks	SEE # : 60 Marks
Programme: MSC-BC	# - Semester End Exam

List of Experiments

UNIT - I

r DNA Technology

Plasmid DNA isolation - Procedure, Principle, Reagent Preparation Result.

Genomic DNA isolation - Procedure, Principle, Reagent Preparation Result.

Estimation of RNA from Liver and Serum by Orcinol method - Procedure, Principle, Reagent Preparation Result.

Agarose gel electrophoresis of DNA /RNA and MW determination - Procedure, Principle, Reagent Preparation Result.

Estimation of DNA from Liver and Serum by Diphenyl amine method - Procedure, Principle, Reagent Preparation Result.

Restriction analysis of DNA - Procedure, Principle, Reagent Preparation Result.

Visit to animal cell culture lab. - Handling of animals, procedure.

Handling of animals. Immunization and raising anti sera - Demonstartion

Text Books :

Essentials Of Practical Biochemistry | Edition:1 | CBS Publishers and Distributors | Srivastava(-)

Principles and Techniques of Practical Biochemistry | Edition:4 | - | John Walker. AND Keith Wilson (-)

Course Title : LAB IN RESEARCH TECHNIQUES	Course Code : 43Q
Semester :III	Course Group : MP V
Teaching Scheme in Hrs (P) : 5	Credits : 2
Map Code: H (PRACTICAL - EXPERIMENTS)	Total Contact Hours: 75
CIA: 40 Marks	SEE # : 60 Marks
Programme: MSC-BC	# - Semester End Exam

List of Experiments

UNIT - I

HAEMATOLOGY

Enumeration of RBC - Total RBC count, Haemocytometer

Enumeration of WBC - Total WBC count, Haemocytometer

Estimation of Haemoglobin - Collection of Blood sample, Haemoglobin estimation

Bleeding and clotting time - Blood sample collection, Time calculation

PHYTOCHEMICAL ANALYSIS

Preparation of plant extract (Soxhlet's Method) - Preparing different solvent extracts- Ethanol extract, Methanol extract, Aqueous extract, Petroleum ether extract and Chloroform extract.

Qualitative analysis of Secondary metabolites from different solvent extracts - Tannins, Alkaloids, Flavanoids, Steroids, Carbohydrates, Protein, Terpenoids and Phenol.

Comparison and estimation of Antioxidants in Ethanolic, Methanolic and Aqueous extract. - Vitamin-C, Catalase

Comparison and estimation of Metabolites in Ethanolic, Methanolic and Aqueous extract. - Tannins and Phenols

DEMONSTRATION

PCR, RAPD -

Text Books :

Principles and Techniques of Practical Biochemistry | Edition:4 | - | WilsonJohn Walker(-)