

SHRI GOVIND GURU UNIVERSITY
Programme: B.Sc. (Biochemistry) Semester: VI
Syllabus with effect from: June-2018

Paper Code: C – 1

Title of Paper: Immunology

Unit – I

Introduction to Immunology

Introduction to infection, sources of infection, methods of transmission of infection, Microbial pathogenicity

Immunity – innate and acquired immune response

Complements properties & function, complements pathway.

Lymphocytes - primary & secondary lymphoid organ

Unit – II

Serological Reaction

Antigen & antibody - Essential feature of antigen, Biology classes of antigens.

Antibody (immunoglobulin) - structure, properties & types,

Introduction & general feature of antigen - antibody reaction, measurement of antigen & antibody.

Precipitation reaction, application of precipitation reaction in disease and diagnosis, agglutination reaction, application of agglutination reaction.

Complement fixation test, Immunofluorescence, Radioimmunoassay, ELISA.

AIDS

Unit – III

MHC & Anti-Body Diversity

Major histocompatibility complex- organization of class I, II and III and their functions.

Molecular basis of antibody diversity.

Immunology of transplantation - classification of transplantation, allograft reaction, mechanism of allograft rejection.

Immunology of malignancy, tumour antigens, immune response in malignancy, Cancer.

Unit – IV

Hypersensitivity & Vaccination.

Hypersensitivity: types I, II, III & IV.

Auto immunity -introduction, mechanism of autoimmunization, name of

Various autoimmune diseases, Rheumatoid arthritis in Detail.

Vaccines & Vaccination: - types of immunization - passive & active, Routes of administration, Vaccination schedule.

Reference Books:

- Immunology by Kubey.
- Medical microbiology by Anantnarayan.
- Immunology by Roit, Male, 6th Edn.

SHRI GOVIND GURU UNIVERSITY

Programme: B. Sc.(Biochemistry) Semester: VI
Syllabus with effect from: June-2018

Paper Code: C – 2

Title of Paper: Microbiology and Fermentation Technology

Unit – I

Beneficial Microbiology

Difference b/w prokaryotes and eukaryotes.

Microbial cell wall –cell wall of gram + ve and – ve bacteria and its composition, acid fast and non-acid fast bacteria.

Synthesis of Precursor of peptidoglycan layer.

Synthesis of peptidoglycan layer

Role of antibiotics on cell wall biosynthesis.

Classification of bacteria, (Whitaker's classification and modern classification). Microbial diversity

Unit – II

Fermentation of Primary & Secondary Metabolites

Introduction to fermentation process

Batch and continuous culture system.

Production of Alcohol,

Wine,

Vinegar,

Antibiotics (penicillin and streptomycin)

Unit – III

Isolation & Preservation of Industrial Important Microorganism

Isolation of industrial important Microorganism

Primary and Secondary Screening, enrichment technique

Preservation of Industrial important microbes

Different technique of preservation –low temperature storage on agar slopes, storage under liquid nitrogen and lyophilization.

Quality control of preserved stock culture

Microbial culture collection centre.

Unit – IV

Processing & Fermentation of Milk

Types of milk and biochemical constituents

Microbial testing for milk

Production of milk products-yoghurt types and process, cheese types and process, khafir, kumiss.

Probiotics introduction and industrial importance.

ReferenceBooks:

- Microbiology by Peizar, Chan, Kreig. Tata Mc Graw Hill edition.
- Basic Microbiology by Power &Daginawala.
- Principle of fermentation technology by Stanburry&Whitakar.
- Practical Microbiology by Siorckin&Cullimore

SHRI GOVIND GURU UNIVERSITY

Programme: B. Sc.(Biochemistry) Semester: VI
Syllabus with effect from: June-2018

Paper Code: C – 3

Title of Paper: Hormone Biochemistry

Unit – 1

Introduction - History, endocrine glands, and hormones as chemical messengers, stimulus for hormone release: change in homeostasis, sensory stimulus and others, Hypothalamic Hormones: CRH, TRH, GnRH, PRL/PRIH, GHRH/GHRIH. Pituitary Hormones - Anterior Pituitary hormones- Growth hormone, Prolactin, POMC peptide family, LH, FSH, TSH; Posterior Pituitary : Vasopressin, Oxytocin.

Unit – 2

Endocrine disorders : Gigantism, Acromegaly, dwarfs, pigmies; Pathophysiology: Diabetes insipidus. Thyroid Hormone (include biosynthesis) Goiter, Graves disease,

Hormones regulating Ca²⁺ Homeostasis: PTH, Vit D, Calcitonin .Pathophysiology : Rickets, Osteomalacia, Osteoporosis.

Unit – 3

Pancreatic Hormones: Insulin, Glucagon, Diabetes type I & II .

GI tract Hormones : Gastrin , Secretin, CCK, GIP, Ghrelin. Hormones of Adrenal Cortex:

Aldosterone (renin angiotensin system) & cortisol. Pathophysiology: Addisons disease, Conn's syndrome, Cushings syndrome. Hormones of Adrenal Medulla, Epinephrine & norepinephrine.

Unit – 4

Reproductive Hormones: Male & female Sex hormones. Interplay of hormones during Reproductive cycle, Pregnancy, Parturition, & Lactation. Oral Contraception.

Other organs with endocrine function: Heart (ANP), Kidney(erythropoietin), Liver(Angiotensinogen, IGF-1), Adipose tissue(Leptin, adiponectin). Pathophysiology : Obesity.

Reference Books:

1. Nelson, D.L. and Cox, M.M.(2005). Lehninger Principles of Biochemistry, W.H. Freeman & Com
2. Widmaier, E.P., Raff, H. and Strang, K.T.(2008). Vander, Sherman, Luciano's Human Physiology, McGraw- Hill Higher Education.
3. Darnell, J., Lodish, H. and Baltimore, D.(2008). Molecular Cell Biology, Scientific

Syllabus with effect from: June-2018

Paper Code: C – 4

Title of Paper: Membrane Biology

Unit – 1

Introduction: A historical perspective of different models of membranes , their characteristics with experimental basis of the model (Langmuir trough experiment, freeze fracture technique, X- ray diffraction). Composition of Biomembranes : Lipids, proteins(Integral, peripheral& lipid anchored) & Carbohydrates. Hydrophathy plots & membrane Topology . Composition variation between membranes (Prokaryotic / Eukaryotic / neuronal, Membranes / Sub cellular compartments).

Unit – 2

Model Membrane Systems : Monolayers, Planar bilayer & Liposomes (synthesis and drug targeting tool) . Isolation & purification of membrane and membrane proteins, use of detergents, density gradient centrifugation etc., Criteria of membrane purification & enzyme markers. . Membrane Structures: Polymorphic structures of amphiphilic molecules(soaps, detergents ,lipids) in aqueous solutions : Micelles & Bilayers. Thermodynamic forces and other factors affecting the formation of different structures. Critical packing parameter. Asymmetry in Membranes: Lipid and Protein Lateral and Transverse Asymmetry. Macro and micro domains in membranes, Specialized features of plasma membrane : Lipid rafts, Membrane Skeleton : Role in maintaining cell structure, and membrane asymmetry. Gates and fences model. RBC membrane as a model.

Unit – 3

Membrane Dynamics: Lateral diffusion, Transverse / Flip Flop diffusion & rotational motion of lipids and proteins. Techniques used to study different motion of molecules in membranes: FRAP, FRET. Translational diffusion coefficient. Phase Transition studies of lipid bilayer. Transition temperature. Membrane fluidity. Factors affecting membrane fluidity : Composition, Temperature, salt /water stress, Anesthetics, Age, pH, Nutrition etc. Homeoviscous adaptation. Membrane fusion.

Unit – 4

Membrane transport: Study of different transport systems ; their structure, thermodynamics (free energy change involved, electro chemical potential, membrane potential , Nerst equation) , kinetics regulators, Inhibitors / blockers biochemical function and significance. Simple diffusion , Facilitated diffusion : Passive transport (Glucose transporter , anion transporter) ; Active transport (P type ATPases V type ATPases , F type ATPases , Na⁺ / H⁺ symport systems) . ABC family of transporters (MDR ATPase family, CFTR). Transport processes driven by light (Bacteriorhodopsin, halorhodopsin). Group translocation. Specialized membrane Pores :Porins in Gram –ve bacterial membranes (E.coli OmpF, OmpC, LamB)

Reference Books:

- Nelson, D.L. and Cox, M. M.(2005). Lehninger Principles of Biochemistry, W.H. Freeman & Com.
- Voet, D. and Voet, J.G.(2004) Biochemistry, John Wiley & Sons, Inc.
- Darnell, J., Lodish, H. and Baltimore, D.(2008). Molecular Cell Biology, Scientific American Books. Paper 17-BCHP-508: Membrane Biology

SHRI GOVIND GURU UNIVERSITY
Programme: B. Sc.(Biochemistry) Semester: VI
Syllabus with effect from: June-2018

Paper Code: E – 1

Title of Paper: Environmental Toxicology

Unit – I

Ecosystems: Wetland & Aquatic ecosystems – Water, Types of wetlands, Marine wetland ecosystems, Floodlands, Swamp & marsh ecosystems, Bog ecosystems, Aquatic ecosystems

Inter-relationships of ecosystems

Habitats & Niches: Habitats, Niches – Determining niches, Exclusion principle; Species coexistence – Size ratios

Niche overlap, Fundamental & raised niches, Resource partitioning, Character displacement, Interspecific competition

Trophic Levels: Autotrophs – Photoautotrophs, Chemoautotrophs; Decomposers – First floor, Dead plant matter

Herbivores & Carnivores, Omnivores, Food chains, Food webs, Pyramids of numbers, Pyramids of biomass, Pyramids of energy

Unit – II

Abiotic Transformations: Photochemistry, Oxidation, Reduction, Hydrolysis and Some other Abiotic Reactions

Biotransformations: Transformations by Microorganisms, Transformations in Animals and Higher Plants and Comparative Metabolism

Biotoxins: The Alkaloids, Toxic Glycosides, Plant Phenols, Amino Acids, Peptides and Proteins and Lactone Mycotoxins

Unit – III

Toxicological Chemistry

Toxicology of Some Inorganic Compounds: Nonmetallic Elements, Heavy Elements, The Metalloids, Transition Elements and Radioactive elements

Toxicology of Some Organic Compounds: DDT, DDE, Chlorinated Alicyclics, Polychlorinated Biphenyls, Phthalate Esters Chlorophenols and Esters

The role of environment in carcinogenesis, multi stage nature of carcinogenesis process, Selection of biomarker in event of toxic exposure.

Unit – IV

Genetic Toxicology: UVB and UVC induced DNA damage, DNA damage due to heavy metals and organic compounds.

Epigenetic changes, due to due to heavy metal (Cr, Pb, Cd, As, Hg) exposure, vinyl chloride, ethyl nitroso urea, Global DNA Hyper-methylation/Hypo-methylation due to heavy metal (Cr, Pb, Cd, metalloid As, Hg) exposure and Polycyclic aromatic hydrocarbon.

Apoptosis due to toxic exposure of metalloid As, Cd, Pd and pesticides.

Reference Books:

- *Ecology - Principles and Applications* by J.L. Chapman & M.J. Reiss. (2008) (2nd Ed.) Cambridge University Press, U.K. (ISBN: 978-0-521-68920-5)
- *Ecology and Environment* by P.D. Sharma. (2010). (10th Ed.) Rastogi Publications, Meerut (India). (ISBN: 978-81-7133-905-1)

- *Elements of Ecology* by Thomas Smith & Robert Smith. (2007) (6th Ed.) Dorling Kindersley Press. (South Asia). (ISBN: 81-317-1557-4)
- *Fundamentals of Ecology* by Eugene Odum & Gray Barrett. (2009) (5th Ed.) Cengage Learning & Nelson Education Press. (ISBN: 978-81-315-0020-0)
- B. K. Sharma. *Environmental Chemistry*. Goel Publishing House Meerut. ISBN: 81-8283-012-5.
- Donald G. Crosby. (1998) *Environmental Toxicology and Chemistry*. Oxford University Press.
- Jasra, OP. (2002) *Environmental Biochemistry*. ISBN: 81-7625-336-7.
- Maiti, SK. *Handbook of Methods in Environmental Studies*. Vols. 1 & 2. ABD Publishers.
- Pradyot Patnaik. *Handbook of Environmental Analysis Chemical Pollutants in Air, Water, Soil and Solid Wastes*. Lewis Publishers. ISBN: 0-87371-989-1.
- Stanley EM. *Toxicological Chemistry and Biochemistry*. Lewis Publishers.

SHRI GOVIND GURU UNIVERSITY
Programme: B. Sc.(Biochemistry) Semester: V
Syllabus with effect from: June-2018

Paper Code: E – 2

Title of Paper: Genetics

Unit – I

Fundamentals of Genetics:

Introduction, Significance of genetics in agriculture, society and evolution; Mendel's principle of inheritance (Experimental material, Laws formulated with reference to Mono- and Di-hybrid crosses, Test cross, Back cross) and Applications using Punnett square and Probability method; Mendel's principle in Human genetics (Pedigrees and Genetic counseling). Concept of pseudo-alleles, Co-dominance, Incomplete dominance, Pleiotropy, Penetrance, Expressivity (Example of each).

Unit – II

Interaction of Genes and Sex determination

Epitaxis: Duplicate gene action (15:1), Complementary gene action (9:7), Supplementary gene action (9:3:4), Inhibitory gene action (13:3), Masking gene action (12:3:1), Polymeric gene action (9:6:1), Additive gene action (1:4:6:4:1), Molecular basis for gene interaction

Sex determination

Introduction (Chromosome type and number), Mechanisms of Sex determination (Environmental Chromosomal and genic), Sex determination in animals (Drosophila, Reptiles and Mammals,) and Plants; Dosage compensation of x-linked gene

Unit – III

Linkage and Crossing over:

Introduction, Chromosome theory of Linkage, Coupling and Repulsion phase, Types of Linkage, Linkage groups and Linkage maps; Crossing over - Introduction, Theories on the mechanism of crossing over and Types of Crossing over.

Maternal effects and extra-chromosomal inheritance:

Maternal effects in snails, plastid inheritance in *Mirabilis jalapa* and male sterility in plants

Unit –IV

Chromosomal aberrations: {a} Alterations in chromosome number - Ploidy-Aneuploidy and Euploidy, Polyploidy and its significance in plants; Genetic disorders, Alteration in chromosome structure - Deletions, duplications, inversions and translocations, {b} Quantitative genetics, Polygenic inheritance, Gene and genotype frequency, Hardy-Weinberg law and its significance

Reference Books:

- Concept of Genetics 7th Edition, (2003) by William S.Klug&Michael R. Cummings. Pearson Education. ISBN: 81-7808-884-3.
- Fundamentals of Genetics. (2004), B.D. Singh, Kalyani Publishers. (ISBN: 81-272-1331-4).
- General Genetics by M. Sr& R. W. Owen., W. H. Freeman & Company, Sanfrancisco.
- Genes (2000), 7th Ed., Lewin B, Oxford Univ. Press, Oxford.
- Genetics – its concepts & implications .Anna C. Pai& Helen M. Roberts., Prentic – Hall Inc. Engle cliffs, New Jersey. USA
- Genetics: Analysis of Genes and Genomes, 6th Ed. By Daniel L. Hartl, Elizabeth W. Jones, Bartlett Publishers (ISBN 0-7637-1511-5)

- Genetics by Strickberger M. W.. Third Edition. Macmillan Publishing co. New York. Robert Weaber & Philip W. Hedrick. Basic Genetics, Second Edition. W. M. C. Brown Publishers Dubuque Iowa.
- Genetics (2000), P.S. Verma and V.K. Agarwal, . S. Chand and Company. (ISBN:81-219- 0262-2), New Delhi.
- Genetics. P. K. Gupta, Rastogi Publications. ISBN: 81-7133-779-1. Shivaji Road Meerut, India.
- Principles of Genetics (2001) Edmund W. Sinnott, L. C. Dunn & T. Dobzhansky,. McGraw Hill Book company Inc. New York, USA.
- Principles of Genetics by Gardener, John Wiley & Sons, New York, USA, (ISBN 9971-51-346-3).
- University Botany-2 (2003), S.M. Reddy, New Age International Publishers, New Delhi (ISBN 81-224-1477-X)