DEPARTMENT OF ZOOLOGY

K.M.C.P.G. STUDIES (Autonomous), PUDUCHERRY

M.Sc ZOOLOGY Ist- YEAR SYLLABUS

CELL AND MOLECULAR BIOLOGY (ZOHT17207)

Unit – I: Cell and Cell Structures:-

Structure and functions of Plasma Membrane (active, passive, facilitated diffusion, uniport, antiport, symport). Mitochondria, Endoplasmic reticulum and Golgi Complex.Cell Communication- Quorum sensing- Tight Junctions, Gap junctions, Desmosomes, Plasmodesmata.

Unit – II: Cell division and Cell Cycle:-

Mitosis, Meiosis, Cell cycle and control mechanism of cell division.Cell secretion, Cell signalling and transduction: The basic elements of cell signalling systems, extracellular messengers and their receptors.

Unit- III: Protein synthesis:-

Replication of Prokaryotic DNA: Enzymes involved, mechanism and inhibitors of replication.Transcription: Mechanism and inhibitors of transcription. Post transcriptional modifications of RNA. Translation: Mechanism, Post translational modification of proteins, inhibitors of translation.

Unit – IV: DNA repair and Cancer:-

DNA Repair Mechanism: DNA damage, Base excision repair, Mismatch repair, SOS system-phages- Recombination. Cancer Biology: Protooncogenes, oncogenes, tumor suppressor genes and Apoptosis.

Text Books/Course Book

1. De Robertis. E.D.F. and De Robertis. E.M.F. 2001. Cells and Molecular Biology, B.I Publications Pvt Ltd, India.
2. Powar.C.B 2002. Cell Biology.Himalaya Publishing House.
3. Verma.P.S. and Agarwal. 2004. Text book of Cell Biology.S. Chand Ltd.

Reference Books

4.Lewin's GENES X, Volume 10.2011. Oxford University Press, New York.

5. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments.John Wiley & Sons.

6. Avers. C.J., 1986. Cell Biology.Addison-Wesley Publishing Company.

7. Lodish, H., BerkA .,Matsudaira, P., Kaiser, C.A., Krieger, M., Scott, M.P., Zipursky, S.L.and Darnell, J. 2004. Molecular Cell Biology. W.H. Freeman & Co., New York.

8.Keith Wilson, John Walker.2010.Principles and Techniques of Biochemistry and Molecular Biology.Cambridge University Press.

GENETICS AND EVOLUTION

Unit- I: Basics of Genetics:-

Mendels law of inheritance, chromosomal theory of inheritance- dominance, co-dominance and incomplete dominance-pleiotropism- lethal and sublethal genes-genetic interactions- epistasis-mechanism of epistasis. Heritability- inbreeding depression and heterosis.Population genetics – Hardy-Weinberg equilibrium - causes of allele frequency – natural selection, mutation, migration and genetic drift.

Unit- II: Chromosome structure – Genetic disorders

Histone, non histone proteins –DNA- nucleosome morphology-heterochromatin, euchromatin, Chromosomal rearrangement.Inborn errors of metabolism-one gene-one enzyme hypothesis, Chromosomal basis of genetic disorder- PKU- Alkaptoneuria, Galactosemia. Genetic counselling – ethics and principles, Human genomic project.

Unit – III: Concepts of evolution:-

Theories of organic evolution, Adaptive radiation and modification- isolating mechanism, Speciation- allopatric and sympatric speciation – convergent evolution-sexual selection and gene flow- co-evolution

Unit – IV: Origin and evolution of gene:-

Molecular evolution- amino acids and nuclear substitutions - assessment of molecular variation causes of variation, Origin of new genes and proteins, gene duplication and divergence.

Text Books/Course Book

1. Klug W.S. and Cummings M.R. 2004.Concepts of Genetics,– Prentice Hall.
2.Gupta.P.K.2008. Molecular Biology and Genetic Engineering.Deep and Deep Publications.
3.Verma.P.S. and Agarwal. 2012.Genetics.S.Chand Ltd.

Reference Books

4. Pierce B.A .2001. Genetics: a Conceptual Approach,– Freeman
5. Hartle D.L. and Jones E.W. 2010. Genetics: Analysis of Genes and Genomes,– Jones and Bartlett
5. D. Peter Snustad, Michael J. Simmons.2003. Principles of Genetics,– John Wiley & Sons
6. Griffith AF et al., 2003. An introduction to Genetic Analysis, - Freeman6. The Darwinian Tourist: Viewing the World Through Evolutionary Eyes, Wills C – Oxford Univ. Press

BIOMOLECULES AND STRUCTURAL BIOLOGY(ZOHT17209)

Unit – I: Proteins and Nucleic acids: Chemical bonds – Biological importance of biomolecules Amino acids – structure , classification - uncommon amino acids; Proteins - structure (primary, secondary, tertiary and quaternary), classification, properties – protein denaturation and folding – chaperons – Prion. Nucleic acids – structure, base composition of DNA, double helix, A, B and Z forms of DNA, super coiled DNA, types of RNA.

Unit – II: Carbohydratesand lipids: Structure and classification (mono, di and polysaccharides), properties: glycoconjucates (proteoglycans, glycoproteins, glycolipids). Lipids – structure and classification (simple, derived and conjugated).

Unit – III: Laws of Thermodynamics: Concepts of free energy in biology – Redox potentials – high energy phosphate bonds. Enzymes – classification, nomenclature, Kinetics, effect of pH, temperature and substrates; enzyme inhibitors.

Unit – IV: Metabolism: Glycogenesis, Glycogenolysis, Gluconeogenesis. Glycolysis – Embden - Meyerhoff pathway, Citric acid cycle, oxidative phosporylation, hexose monophosphate shunt; Lipids – biosynthesis and oxidation of fatty acids – energetics.

Text Books/Course Book

1. Jain.J.L. 2013. Biochemistry.S.Chand Publication.
2. Ambika Shanmugam.2012. Fundamentals of Biochemistry for Medical Students: Indian Edition.Lippincott Williams & Wilkins.
3. Voet, D. and J.G. Voet.2010. Biochemistry John Wiley & Sons.
4. Freifelder, D. 1996. Physical Biochemistry W.H. Freeman & Co.
5. Segal, I.H. 1972. Biochemical calculations John Wiley and Sons.

Reference Books

7. Creighton, T.E. 2010. Protein Structure and Molecular Properties W.H. Freeman & Co.
8. Freifelder, D. 2008. Essentials of Molecular Biology.
9. Wilson, K. and K.H. Goulding. 2011. A Biologists Guide to Principals and Techniques of Practical Biochemistry.
10. Cooper, T.G. 2006.Tools in Biochemistry .
11. Hawk, 2002. Practical Physiological Chemistry
12. Garret, R.H. and C.M. Grisham.2004. Biochemistry. Saunders College Publishers.
13. Jeremy M. Berg, John L. Tymoczko, Lubert Stryer.2010.Biochemistry.W. H. Freeman.
14. David L. Nelson, Michael M. Cox.2017. Lehninger Principles of Biochemistry.W. H. Freeman.

MOLECULAR ENDOCRINOLOGY (ZOHT17210)

Unit-I: Scope of Molecular Endocrinology:-
Classification of hormones: Peptide, Steroid and Amines.
Mechanism of hormone action:Cellular hormone receptors – membrane, cytosolic and nuclear receptors. G-protein – structure and signal transduction mechanism; Second messengers (cAMP, cGMP, DAG, IP3 and Calmodulin).

Unit-II: Neuro Endocrinology:-
Hypothalamo – hypophyseal gonadal axis, Feedback regulation – Positive and Negative. Structure, functional relationship between Adenohypophyseal hormones and Neurohypophyseal hormones; Indolamine , Endorphin and Enkephalin.

Unit-III : Hormones and Metabolism:-
Structure, function and regulation of Thyroid hormones, catecholamine, Corticosteroid and Pancreatic hormones, Role of hormones in carbohydrate and lipid metabolism;
Role of hormones in mineral homeostasis. Renin Angiotensin System, Gastrointestinal hormones.

Unit-IV: Hormones and Reproduction:-
Structure and functional relationship of Sex steroid hormones - Androgen, Estrogen and Progesterone; Reproductive cycles in mammals (Estrous and Menstrual cycles). Hormones of Pregnancy, Parturition and Lactation; Contraception.

Text Books/Course Book

1. Haris, G.W. and B.T. Donovan. 1968. The Pituitory Gland. S. Chand and Co.,

2. Bentley, P.J. 1998. Comparative vertebrate endocrinology, Second Edition, Cambridge University Press. Cambridge.

3. Mac Hadley. 1992. Endocrinology, 3rd Edition. Prentice - Hall Inc. A Simon & Schuster ompany, Englewood Cliffs, New Jersey. USA.

4. Ingleton, P.M. and J.T. Bangara. 1986. Fundamentals of comparative vertebrate endocrinology, Kluwer Academic Publishers.

5. Turner, C.D. and J.T. Bangara. 1986. General endocrinology. Saunders International Student edition. Toppan Company Limited. Tokyo.

Reference Books

6. Barrington, E.J.W. 1985. An introduction to general and comparative endocrinology. Claredon Press Oxford.

7. Mac E.Hadley, 1997. Endocrinology. Pearson Education, Indian Reprint. 8.Hormones, 2nd Ed. Anthony W. Norman and Gerald Litwack. Academic press, New York.

PUBLIC HEALTH AND HYGIENE (ZOHT17211)

Unit-I : Communicable diseases and remedial measures:-
Food and Water borne diseases - cholera, polio, jaundice and remedial measures. Air borne diseases - Chicken pox, influenza, tuberculosis and remedial measures.

Unit-II : Non Communicable diseases and remedial measures:-
Vector borne diseases – mechanism of transmission – malaria, filaria, chickunguniya, dengue. Contact diseases -leprosy, scabies. Inherited disorders of blood -haemophilia, sickle cell anemia. Sexually Transmitted Diseases –Syphilis, gonorrhoea, AIDS and remedial measures.

Unit-III : Environmental health:-
Pollution –Air, water and e-waste, Industrial wastes, Solid Waste management; Modern gadgets and human health; Water quality – sentinal organisms - coliform groups.

Unit-IV : Human epidemics:-
Carcinogen, carcinogenesis – Radiation hazards- Metabolic disorders (Obesity, Diabetes) and Life style associated diseases in man (Alcoholism and Drug abuse) Heart Diseases- Hypertension; Occupational health Hazards.

Text Books/Course Book

1. Sharma, P.D, 1995. Ecology and Environment. Rastogi Publication, Meerut.
2. Wyler, D.J, 1990.Modern parasite Biology. W.H. Freeman and Company, New York.
3. Gupta, P.K, and V. Ramprakash, 1985. Advance in Toxicology and Environmental Health. Jagmender Book GENCY, New Delhi.
4.William Hobson, 2006. Theory and practice of Public Health. Oxford Medical Publishers.

Reference Books

5. Roger. Detels et al., 2009. Oxford Textbook of Public Health, Oxford University Press
6. Mcgraw Hill, 2010. Public Health and Preventive Medicines.

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M.Sc ZOOLOGY IInd- YEAR SYLLABUS

BIOLOGICAL TECHNIQUES AND BIOINFORMATICS (ZOHT16419)

Unit – I: Microscopy:-
Microscopy – Light, Phase Contrast, Fluorescence and Electron - principle, structure and application
Histology ,histochemical and immunochemical techniques;
Radiochemical – types, uses of tracer technique, RIA, Autoradiography.

Unit-II: Chromatography:-
Molecular separation by Chromatography (GLC and HPLC), Electrophoresis (PAGE and Agarose) and centrifugation(High Speed & Ultracentrifugation)
Quantification of molecules and trace elements – Spectrophotometer(UV –Visible) Eliza, Fluorimeter, Flame photometer.
DNA Sequencing, Blotting, PCR, Microarray.

Unit-III: Biostatistics:-
Collection of data; Diagrammatic and Graphical representations; Measures of central tendency and dispersal; Probability distributions (Binomial,Poisson and normal); Sampling distribution; Parametric and non parametric statistics; Confidence Interval; Standard errors; levels of significance; regression and correlation; t-test; ANOVA, Chi square test. Evaluation of biodiversity indices; Shannon-Weiner index, Dominance index.

Unit-IV: Bioinformatics:-
Introduction- Biological database- types, tools, Internet basics; Database management system; Sequence alignments (basis-dot matrix-multiple sequence) & web site designing; Phylogenetic analysis; Genomics, Proteomics; Molecular modeling and drug designing; Preparation of a manuscript for research.

Text Books:

1. A.Gurumani, 2004. An Introduction to Biostatistics –, MJP Publishers,.
2. D.Srinivasa Rao – Biotech Pharma, 2010. Bioinformatics .

Reference Books

3. Wilson and Walker, Practical biochemistry- Cambridge Low Price Edition.
4. Zar 1974. Biostatistical Analysis.
5. David, 2001. Mount Bioinformatics-Sequence and Genome Analysis- –CSHL.

6. Upadhay and Upadhay, 2009. Biophysical chemistry- principles and techniques. Himalaya publishing House.

ENVIRONMENTAL EDUCATION (ZOSC16423)

Unit-I: Introduction to Environment: Ecosystem – structure, function, types, trophic levels; natural resources, renewable and non-renewable energy resources; soil and water conservation, rain water harvesting; sustainable development; role of information technology in environment, value education.

Unit-II: Environmental pollution: Definition, causes, effects and control measures of air, water and noise; solid waste management and bioremediation – urban and industrial; environment and human health.

Unit – III: Biodiversity: levels of biodiversity, hot spots, values, threats, endangered and extinct species, red data book; biodiversity conservation; IUCN, WWF, IBWL, BNHS.

Unit –IV: Environmental technologies, policies - national and international; agencies, programmes-UNEP, UNDP; legislations in environmental protection and public awareness.

Text books

1. A Text book of Environmental studies, ErachBharuacha, Orient Blackswan,2013.
2. Environmental Biology, Verma, P.S. and Agarwal, V.K. S.Chand Publishers, 2000.
3. Principles of Environmental Sciences, William, P. Cunningham and Mary Cunningham, Tat McGraw Hill, 2011.
4. Environmental Biology, K.C.Agrawal, Agrobotanical Pub. 1996.

Reference Books

1. Chapmann,J.L and Reiss,M.J. 1995. Ecology Principles and applicaion.Cambridge Univ. Press
2. Environmental issues in India- Mahesh Rangarajan. Pearson Longman, 2007
3. Ecology- Principles and Applications. 2nd Edn. – J.L. Chapman and M.J. Reiss. Cambridge University Press.
4. Biodiversity – K.C. Agarwal. Agrobotanical Pub. 1996.
5. Environmental Science Andrew R.W. Jackson and Julie M. Jackson. Pearson Longman, 1996
6. Environmental Laws on Wild Life. P.R. Trivedi and U.K. Singh. Commonwealth Pub., 1996.