

3RD YEAR
SEMESTER-V
HP-301C
Paper-9 (Theory)
Total Mark = 100 (IA = 40 + ESE = 60) Credit = 04

Unit-I (Molecular Biology-I)

1. Nucleic acid: Chemical composition of DNA, RNA and DNA structure, detailed account of double stranded DNA, B-DNA, Z-DNA.
2. DNA the genetic material (Experimental proof-Griffith and Harshey and Chase Experiments).
3. Replication: Semi-conservative model of DNA replication.
4. Prokaryotic DNA replication, replication origin, role of primase, DNA polymerases, helicase, topoisomerase, gyrase, ligase, and the mechanism of replication, leading strand and lagging strand synthesis. Functions of DNA polymerases-I, exonuclease activity.
5. Telomere, telomerase and mode of action.

Unit-II (Molecular Biology-II)

1. Transcription: Types of RNA, characteristics of prokaryotic and eukaryotic promoters, Coding region and noncoding region of genes, subunits of prokaryotic RNA polymerase and their functions, eukaryotic RNA polymerase
2. Transcription, initiation, elongation and termination (rho dependent and rho independent mechanism).
3. Post-transcriptional processing of mRNA – capping, poly A tailing and splicing.
4. Translation: t RNA structure, Genetic code, degeneracy of genetic code, Wobble hypothesis. Mechanism of translation.
5. Regulation genes expression and operon concept, regulation of Lac operon and Tryptophan operon.

Unit-III (Human Genetics-I)

1. Chromosomal organization – chromosomal packaging, role of histones and other proteins.
2. Concept of gene and genome sizes. Gene structure: structural organization of prokaryotic and eukaryotic genes, repetitive DNA, DNA fingerprint
3. Regulatory elements of eukaryotic genes, (proximal or internal including promoter, operator, activator and enhancers).
4. Eukaryotic transcription factors – structure and function- concise account of helix turn helix proteins, helix loop helix proteins, helix turn beta, zinc finger protein; mode of action.
5. Epigenetic modifications – DNA and chromosomal proteins.-methylation acetylation, micro RNA.

Unit-IV (Human Genetics-II)

1. Mendelian genetics- Mendel's experiments, monohybrid crosses, principles of dominance, dihybrid crosses, incomplete dominance, co-dominance. Gene polymorphism, Pedigree analysis,
2. Karyotyping, polyploidy, aneuploidy
3. Inborn errors of biochemical metabolism Inborn errors of carbohydrate metabolism: glycogen storage disease, essential pentosuria, fructosuria, galactosemia, inborn errors of protein and amino acid metabolism: phenyl ketonuria, alkeptonuria, albinism, cystinuria, hypertyrosinemias, homocystinuria, inborn errors of lipid metabolism: Gaucher's disease, Fabry's disease, Taysach's disease, Niemann pick disease Human Genetical Disorders –autosomal (Phenylketonuria, albinism), sex-linked (haemophilia, red green colour blindness), diseases with abnormal chromosome numbers and examples.
4. Hardy Wein-berg principle and population genetics. Genetic drift and genetic shift.
5. Monogenic and polygenic disorders.

Paper-10A (Theory)

HP-302C

Total Mark = 50 (IA = 10 + ESE = 40) Credit = 02

Unit-I (Cell Signaling)

1. Signaling and receptors, Properties of cell signaling.
2. Signalling through G-Protein Coupled Receptors(GPCR), tyrosine kinase; second messenger- cAMP & phospholipid, Calcium Ion Signals, electrical signaling.
3. Different signal pathways viz. Pi3K AKT, HagdeHog, Wnt, Notch, TGF beta, Jak stat etc.
4. Nuclear receptors & steroid Hormones.

Unit-II (Cell cycle and Apoptosis)

1. Mammalian cell cycle, phases
2. Regulation of cell cycle- check points, role of different factors and proteins.
3. Apoptosis – mechanism- extrinsic and intrinsic/mitochondrial pathways
4. Autophagy and necrosis - mechanism.

Paper-10B (Practical)
HP-302C
Total Mark = 50 (IA = 10 + ESE = 40) Credit = 02

Sl. No	Practicals	Marks
1.		
2.		
3.		
4.		
5.	Laboratory Note book	
5.	<i>Viva voce</i>	
TOTAL		40

CONTENTS:

1. Cell cycle chart study
2. Signaling pathways chart study
3. Mitosis and meiosis chart study
4. Karyotyping and chromosomal anomaly chart study.
5. DNA isolation from bacteria/blood/any suitable source
6. Agarose electrophoresis of DNA
7. DNA estimation
8. Pedigree analysis study

Paper-11 (Theory)
HP-303C
Total Mark = 100 (IA = 40 + ESE = 60) Credit = 04

Unit-I (Immunology-I)

1. Immune system, Innate and acquired immunity - their components, functions of T cells, B cells, neutrophil, basophil, eosinophil, NK cells, RE cells, TLR receptors
2. Primary and secondary lymphoid organs
3. Antigen, Immunogen, Epitope, Hapten, Paratope,
4. Complement components of classical and alternative pathways, their activation, and physiological function of complement system, complement deficiencies.

5. Unit-II (Immunology-II)

1. Humoral immunity –Structure, Classification of antibodies, functions.
2. General structure of IgG antibody, monoclonal and polyclonal antibody,

3. Clonal selection theory of antibody production, generation of effector and memory T cell,
4. Class I & II MHC molecules, structure and functions, antigen presentation, T and B cell cooperation in antibody production.

Unit-III (Immunology-III)

1. Antigen antibody interaction.
2. T cell, B cell ontogeny and activation
3. Inflammation, mediators
4. Hypersensitivity Type-I and Type-II.

Unit-IV (Immunology-IV)

1. Clonal selection theory of antibody production.
2. Cell mediated immunity - role of T-cytotoxic cell (CTL) and TH in Cell mediated immunity.
3. Types of HLA, Graft rejection
4. Primary and secondary immune responses,
5. Vaccination: Passive and active immunization, types and uses of vaccine, adjuvants, DNA vaccine.

Paper-12A (Theory)

HP-304C

Total Mark = 50 (IA = 20 + ESE = 30) Credit = 02

Unit-I (Molecular physiological basis of cancer-I)

1. Properties of cancer cells, concept of oncogenes and proto-oncogenes, suppressor gene.
2. Genetic and epigenetic causes of cancer
3. Classification of cancer on the basis of origin
4. Altered metabolic and physiological changes in cancer cells.
5. Molecular and chromosomal changes in cancer: Mutation: Spontaneous and induced mutation, mechanism of transition and transversion, chemical and physical agents inducing mutation, Ames's test, Types- DNA: Structural - Point mutation-deletion, insertion, Frame shift; Functional - Non-sense, mis-sense, silent, null mutation; Chromosomal: i) Structural-Inversion, translocation, deletion, duplication. ii) Number - Euploidy, aneuploidy, Polyploidy.

Unit-II (Molecular physiological basis of cancer-II)

1. Repair mechanism of Mutation: direct repair, excision repair, transcriptional excision repair, mismatch repair, UVr A, B and C mechanism, and SOS repair system.
2. Factors inducing cancer, cancer stem cells.
3. Cancer metastasis.

4. Cancer specific abnormalities in different cell signaling pathways.
5. Concept of chemotherapy and immunotherapy.

Paper-12B (Practical)

HP-304C

Total Mark = 50 (IA = 20 + ESE = 30) Credit = 02

Sl. No	Practicals	Marks
1.		
2.		
3.		
4.		
5.	Laboratory Note book	
5.	<i>Viva voce</i>	
TOTAL		40

CONTENTS:

1. Blood group determination.
2. Ouchterlony double diffusion assay.
3. Bacterial culture in nutrient agar plate (by streak and spread method).
4. Bacteria culture in nutrient broth (LB media).
5. Study of bacterial growth curve taking O.D. at different time point.
6. Different sterilization methods.
7. Single colony isolation.
8. Gram staining of bacteria.

SEMESTER-VI

Paper-13 (Theory)

HP-305C

Total Mark = 100 (IA = 40 + ESE = 60) Credit = 04

Unit-I (Nervous System-I)

1. Structural organization of different parts of brain and spinal cord. Nerve roots.
2. Brain ventricle concept, CSF composition, formation, circulation and functions.
Blood Brain Barrier, Lumbar puncture, Cerebral circulation-course, factors affecting.
cranial nerves-functions
3. Somato-sensory system: Ascending (sensory) tracts-carrying touch, pain, temperature sensation. Referred pain. Pain inhibiting system, opioids.
4. Motor system: Descending tracts (pyramidal and extra pyramidal systems), Upper motor and lower motor neurons and their lesions, Babinski sign.