

PG DIPLOMA IN IMMUNOTECHNIQUES

(Non-Semester)

(With effect from the academic year 2013-14)

Eligibility for the Course

Candidates for admission to PG Diploma In Environmental Health & Hygiene could possess a Bachelors degree in Zoology, Botany, Chemistry, Biochemistry, Microbiology, Biotechnology/Environmental/ Animal/plant Food sciences, Dietetics & Nutrition, Bioinformatics, BE in Chemical Engineering & Biotechnology; B.Tech in Biotechnology & Bioinformatics/Nanotechnology; BDS; MBBS; B.Sc in Agri/Agri Biotechnology;B.V.Sc., B.F.Sc., .Pharm and BPT.

Duration of the Course

One year PG Diploma in Immunotechniques diploma course non-semester for One Year duration

Examination

All the theory paper are of 3hours duration each for maximum of 100 marks with passing minimum of 50 marks Practical examinations are also for 3 hours duration for a maximum of 100 marks and passing minimum of 50 marks.

Question Paper Pattern

Maximum marks: 100

Time: 3 hours

Part A (5 x 3 = 15)

Five short answer questions (One question from each unit)

Part B (5 x 8 = 40)

Paragraph questions (Total questions 8, out of which answers are to be given for any five questions;

Part C (3x 15 = 45)

Total questions 5, out of which answers are to be given for any Three questions;

S.No	Theory & Practicals	Maximum Marks	Minimum Marks
1.	Immunology	100	50
2.	Immunotechniques	100	50
3.	Human Genetics	100	50
4.	Molecular Diagnostics	100	50
P1	Practical – I : Immunotechniques	100	50
P2	Practical – II: Molecular Diagnostics	100	50

PAPER 1: IMMUNOLOGY

UNIT – I: LYMPHOID ORGANS, CELLS AND ANTIGENS

History of immunology - Types of immunity: Innate and acquired -Lymphoid organs: primary & secondary – Hematopoiesis- Cells: T, B, APCs, NK etc., – Antigens and immunogens – Characteristics of ideal antigens - haptens and adjuvants.

UNIT – II: ANTIBODY AND COMPLEMENT

Antibody types – Domain structure and biological properties – Antibody diversity: genes and mechanisms - clonal selection – Complement pathways – Immune response to pathogens.

UNIT – III: BIOLOGY OF LYMPHOCYTES, MHC & TCR

Thymic selection - T and B cell differentiation – TcR repertoire selection and cloning – MHC: genes, polymorphism and role in immunity – Mechanism of allograft rejection – Prevention of graft rejection – HLA typing: serology & PCR methods- Cytokines in immune response.

UNIT – IV: HYPERSENSITIVITY, AUTOIMMUNITY& TUMOR IMMUNOLOGY

Hypersensitivity: types – Clinical aspects of type I, Type II, III and IV - Autoimmune diseases – Tumor antigens: types, effector mechanisms against tumors and immunodiagnosis- Immunological disorders: Primary & secondary.

UNIT – V: INFECTION & IMMUNITY

Immunity to bacterial, viral, and protozoan pathogens – Cell and humoral immunity – Host strategies of defense – Evasive strategies by pathogens: adaptations such as mutation (escape mutants) and molecular mimicry- PAMPS.

REFERENCE:

1. Benjamini E, Coico R and G. Sunskise (2008) Immunology a short course. IV edn. (Chapters 1–13) Wiley – Liss publication, NY.
2. Roitt, I (2006). Essential Immunology, IV edn. Blackwell Sci NY.
3. Kuby, J (2005) immunology, III edn, WH Freeman &Co, NY.

PAPER - III: IMMUNOTECHNIQUES

UNIT-I: IMMUNOSEROLOGY

Bloodgroup antigens- antigen antibody interactions – agglutination assays – precipitation assays – Coombs’ test. Immunodiffusion- Radial Immunodiffusion: single and double (SRID & ODD) – immunoelectrophoresis – rocket electrophoresis – counter current immunoelectrophoresis – IEF.

UNIT-II: ELISA, ELISPOT AND RIA

IF – ELISA – RIA - Principles of ELISA – types- direct, indirect and sandwich – clinical diagnostic applications – Cell ELISA - ELISpot assay – cytokine testing- other applications- Detection of HIV &TB by Western blotting

UNIT-III: TOOLS AND TECHNIQUE

Principles, methodology and application of LTT- RIST – RAST –immunofluorescence – principles – types – AO/PI and EB/AO staining- FITC/FDA labeling- immunohistochemical staining-IF Microscopy - FAC Scan.

UNIT- IV: IMMUNOTECHNOLOGY

MAb - Rab Mab - HAMA - HACA – Abzymes - Plantibodies - Ab fragments.

UNIT-V: VACCINOLOGY

Vaccines - Vaccination methods- History of Vaccine development -Types –Production - Modern methods; epitope vaccines– CTLvaccines- clonedvaccines– vaccinogenomics -Vaccine designing-immunoinformatics: Tepitope, PatentBLAST etc.

REFERENCE:

1. Benjamini E, Coico R and G. Sunskise (2008) Immunology a short course. IV edn. (Chapters 1–13) Wiley – Liss publication, NY.
2. Roitt, I (2006). Essential Immunology, IV edn. Blackwell Sci NY.
3. Kuby, J (2005) immunology, III edn, WH Freeman &Co, NY.

PAPER-III: HUMAN GENETICS AND DISORDERS

UNIT-I: HUMAN GENOME OVER VIEW

History and development of human genetics; organization of the human genome- Genes and chromosome- structure, function and inheritance- Repetitive DNA in human genome & its significance - Alu and SINE repeats- organization of centromeres and telomeres- telomers & aging-Microsatellites & VNTRs.

UNIT-II: CELL AND CHROMOSOMAL ANALYSIS

Methods for genetic studies –chromosomal analysis- biochemical analysis- Somatic cell genetics: somatic cell hybrids, radiation hybrids - FISH, fibre FISH, mFISH -Tissue culture techniques: long-term and shorts-term cultures- lymphoblastoid cell lines- T cell & cancer cell culture- applications.

UNIT-III: HUMAN GENOMIC TECHNIQUES

Human genome mapping – genetic mapping, physical mapping-restriction fragment length polymorphism- pulse field gel electrophoresis- yeast artificial chromosomes- bacterial artificial chromosomes- expressed sequence tags- microsatellites and single nucleotide polymorphisms- HUGO & Human Genome Mapping- implications & applications.

UNIT-IV: MOLECULAR METHODS

Identification and isolation of disease genes – positional cloning, functional cloning- DNA and cDNA microarrays- Cancer genomics- pre-natal diagnosis- chorionic villus sampling, amniocentesis - Pre-implantation diagnosis – Principles of Genetic counseling- Ethical aspects of gene testing.

UNIT-V: HUMAN IMMUNODEFICIENCY DISEASES

Asplenia AGamma, CGD, MHC I&II, Hyper IgM, HIV SCID

REFERENCES:

1. Strachan, T. and A.P. Read. 2004. Human Molecular Genetics. 3rd Edition. Garland Science, UK.
2. Daniel, L. Hartl and Elizabeth. W. Jones. 2000. Genetics Analysis of Genes and Genomes, 5th Edition. , USA.

PAPER - IV. MOLECULAR DIAGNOSTICS

UNIT-I: MICROBIAL & VIRAL DIAGNOSTICS

Major microbial pathogen types: bacteria and viruses – Detection of infectious agents and molecular epidemiology: M. tb, HCV & HIV – Conventional Vs Molecular diagnostics: merits and demerits – Biological warfare: *Bacillus anthracis*, H5N1- Epidemics of chikengunya-Quarantin methods.

UNIT II: MOLECULAR DIAGNOSTIS OF DISEASES

Gene polymorphism: candidate genes approach – Metabolic and genetic disorders: DNA analysis in Duchene Muscular Dystrophy –Sickle cell anemia and beta thalassemia-retinoblastoma- cystic fibrosis

UNIT III: CANCER DIAGNOSTICS

Cancer diagnostics: Types of oncogenes – Molecular diagnostics of cancer markers-Tumor imaging and staging–Tumor suppression: mode of action and mutation in p53 –BRCA genes–Telomeres and Cancers- Leukemias: Microarray based diagnostics.

UNIT IV: FOETAL DIAGNOSTICS:

Prenatal molecular diagnosis: CVS and amniocentesis – preimplantation test -Medico legal, social, ethical and legal aspects of molecular diagnostics-Sex selective abortion-MTP-Medico legal aspects-Foetal diagnostitics: prospects.

UNIT V: CYTOGENETIC DIAGNOSITICS

Karyotyping and chromosomal banding– Molecular diagnosis of syndromes - Klinefelter, Downs' and Turners'- Molecular cytogenetics: FISH, Fiber FISH and m-FISH-Clinical applications.

REFERENCES:

1. Strachan, T. and A.P. Read. 2004. Human Molecular Genetics. 3rd Edition. Garland Science, UK.
2. A Practical Guide to Clinical Virology. 2nd Ed. L.R. Haaheim., J.R. Pattison. R.J.Whitley. John Wiley & Sons, 1994.
3. Biomedical Methods Hand Book– John M. Walkser, Ralph Raplay. Humana Press, 2005.

PAPER-V: PRACTICALS – I IMMUNOTECHNIQUES

1. Bleeding techniques and serum separation.
2. Immunization protocols
3. Dissection of chick & wild rat for lymphoid organs (Demo).
4. Immunodiffusion techniques
5. Immunoelectrophoresis techniques.
6. Fraction of T & B sub-populations from peripheral blood.
7. Microlymphocytotoxicity assay (ALS titration assay). (Demo)
8. Immunofluorescence–two color (AO/PI). (Demo)
9. Haemagglutination titration assay.
10. ELISA (HIV, TB)-DEMO.

PAPER - VI: PRACTICALS – II MOLECULAR DIAGNOSTICS

1. Bacterial DNA extraction.
2. Serodiagnostics for microbial & viral pathogens.
3. HIV detection by RT-PCR.
4. PCR diagnosis of Mycobacterium tuberculosis.
5. PCR–RFLP for pathogens.
6. DNA Fingerprinting.
7. Western blotting.
8. mRNA extraction and cDNA synthesis.
9. Immunofluorescent technique.