DETAILED SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR IN ONCOPATHOLOGY IN MEDICAL EDUCATION

CATEGORY NO.687/2025

(TOTAL - 100 MARKS)

General Pathology / Basic sciences / Recent advances

(Total Marks 20)

- Basic anatomy, physiology and immunophenotype of normal histologic tissues.
- Basic cell biology and carcinogenesis
- Growth factors, Signal transduction pathway, Integrins, Warburg effect Angiogenesis in malignancies
- Protooncogenes and Tumor Suppressor Genes in Malignancies
- P53 gene, Role of P53 in haematological malignancies
- Cellular and molecular hallmarks of cancer
- Genetic instability and cancer, Epigenetic changes in cancer, Epigenetic control of gene expression in cancer
- Microbial carcinogens, Viral carcinogenesis (DNA/RNA) / Oncogenic viruses, Chemical carcinogens
- HPV types, role in carcinogenesis, diagnostic methods, vaccination
- Intratumoral heterogeneity and its importance, Tumour heterogeneity in cancer and its impact on precision oncology
- What is epithelial-mesenchymal transition? What are its molecular pathways and significance in malignancy?
- Pathogenesis of vascular spread of tumour
- Tumour microenvironment
- Notch and WNT signalling pathways, TRIM28
- Precancerous states, Inherited cancer syndromes
- Immunobiology of cancer, Tumour immunity
- Tumour agnostic therapeutic targets in solid tumours
- CAR-T cell therapies in cancer
- What are tumour markers? Describe its role in diagnosis and prognosis of neoplasms, Serum tumour markers, Serum markers in multiple myeloma

- Paraneoplastic syndrome
- Applications of proteomics in cancer
- Methylation study in cancer
- Biobanking and its applications
- Role of digital pathology in oncopathology
- Artificial intelligence (AI) in diagnosis of cancer
- Circulating tumour DNA and role in cancer
- PD-L1 past, present and future, PD-L1 testing in breast and lung cancer
- Tumour mutation burden
- Immunotherapy - role of pathologist
- External quality assurance in surgical pathology, EQAS in haematology, EQAS in cytology, EQAS in histopathology
- Genetic tumour syndromes, genetic counselling in oncology practice
- Cancer prevention and control in India
- BRAF mutations in cancers
- EGFR
- c-KIT mutation
- DICER-related tumour disposition syndrome.
- BRCA genetic mutation and cancer, Breast cancer predisposition syndrome
- MSI/Mismatch repair deficiency – implication & evaluation (Colonic adenocarcinoma & Endometrial adenocarcinoma)
- JAK2 mutations & role in haematological malignancies
- Homologous recombination deficiency & its detection in cancer
- Immunohistochemistry principles, basics, methods and quality assurance
- ISH for EBER. Technique and detection range
- Research methodology
- Burden of cancer in India and National Cancer Registry Programme.

Systemic pathology

(Total Marks 60)__

Modules: refer below for mark split

Surgical Pathology: (for all organ systems)

- **Grossing protocols** of all surgical specimens and guidelines for handling all specimens, and protocols for obtaining tissues for ancillary methods
- **Minimum data set reporting** of surgical specimens based on CAP guidelines, pathological staging of tumours
- **Frozen section**: principles, technique, stains, artifacts and indications and reporting, Sentinel lymph node evaluation
- Knowledge of evidence based guidelines and principles
- AJCC/TNM staging of cancer

(10 marks)

Organ systems:

- Pathogenesis and diagnostic approach and work up of benign and neoplastic diseases of **Head and neck**, **WHO classification of tumours** of Head & neck, including recent advances.
- Pathogenesis and diagnostic approach and work up of benign and neoplastic diseases of **Breast**, **WHO classification of tumours** of breast including recent advances. Testing predictive and prognostic biomarkers in breast (ER, PR, Her2, Ki67).
- Pathogenesis and diagnostic approach and work up of benign and neoplastic diseases of **Skin**, **WHO classification of tumours** including recent advances

(10 marks)

- Pathogenesis and diagnostic approach and work up of benign and neoplastic diseases of **Gastrointestinal tract**, **WHO classification of tumours** of GIT including recent advances.
- Pathogenesis and diagnostic approach and work up of benign and neoplastic diseases of **Endocrine organs**, in **WHO classification of tumours** including recent advances
- Pathogenesis and diagnostic approach and work up of benign and neoplastic diseases of **Lung and mediastinum**, **WHO classification of tumours** of Thorax including recent advances **(10 marks)**

- Pathogenesis and diagnostic approach and work up of benign and neoplastic diseases of **Female genital system**, **WHO classification of tumours** of FGT including recent advances.
- Pathogenesis and diagnostic approach and work up of benign and neoplastic diseases of **Male genital system**, **WHO classification of tumours** of MGT including recent advances.

- Pathogenesis and diagnostic approach and work up of benign and neoplastic diseases of **Urinary tract**, **WHO classification of tumours** including recent advances

(10 marks)

- Pathogenesis and diagnostic approach and work up of benign and neoplastic diseases of **Soft tissues and bone** , **WHO classification** of soft tissue and bone tumours including recent advances
- Pathogenesis and diagnostic approach and work up of benign and neoplastic diseases of **Paediatric malignancies**, **WHO classification of tumours** including recent advances.
- Pathogenesis and diagnostic approach and work up of benign and neoplastic diseases of **Central nervous system**, **WHO classification of tumours** including recent advances

  Pathogenesis and diagnostic approach and work up of benign and neoplastic diseases of eye and orbit **WHO classification of tumours** of eye and orbit including recent advances. **(10 marks)**

- Pathogenesis and diagnostic approach and work up of benign and neoplastic diseases of **Hematolymphoid organs**, **WHO classification of tumours** including recent advances. Major translocations in leukemias and lymphomas and the appropriate testing methods for detection

Cytology:

- Techniques and reporting of superficial and deep aspiration cytology LBC
- Quality assurance program in Cytopathology.
- International standard reporting formats for lesions at different sites (Bethesda, Milan, Paris systems, WHO, Yokohama etc.)

(10 marks)

Laboratory techniques

(Total Marks 20)

Modules:

Histopathology, Haematopathology, Cytopathology – (10 marks)

Molecular techniques – (10 marks)

Histopathology:

- Types of fixatives, reagents in tissue processing, routine stains and histochemical stains
- Staining and quality control of Hematoxylin and eosin, Papanicolaou and Giemsa stains
- Staining, standardisation and quality control of Histochemical stains (including reticulin, Periodic acid Schiff, Perls Stain, Ziel Neelson stain, Gomory methanamine silver, Elastic Van Geison, Masson Trichrome stain, myeloperoxidase, Perls Stain, Nonspecific Esterase and Toluidine blue stain and Congo Red stain).
- Tissue processing techniques and quality control.
- Parts, working and quality assurance of light and fluorescent microscopes, tissue processor, microtome, cryostat, immunohistochemistry staining set-up (manual and automated), flow-cytometer, PCR and nucleic acid sequencers.
- Immunohistochemistry principles, procedure, interpretation and troubleshooting. Standardization and validation of newer antibodies and quality assurance in IHC lab.

Haematopathology:

- Peripheral smears preparation, staining and interpretation
- Bone marrow aspiration: technique, staining and interpretation
- Principles, quality control and interpretation of data from automated cell counters
- Flowcytometry definition, principle, technique, application & interpretation. Role in immunophenotyping of leukaemia, MRD testing, Role in MDS, Role in myeloma MRD, Role in solid tumours
- Bone marrow transplantation.
- HLA and Transplant immunology

Cytopathology:

- Performing Fine needle aspiration (FNA), Conventional and LBC pap smear preparation and reporting
- Applications of LBC in exfoliative cytology/HPV co-testing
    - Effusion cytology and cell block.
    - Staining procedures in cytology.
    - Processing all types of cytology specimens
    - Staining and interpretation of immunohistochemistry

- Quality control and bio-safety and waste disposal issues in a laboratory.
- Quality assurance in laboratory medicine
- Laboratory accreditation
- Safety in laboratory practices **(10 marks)**

Molecular techniques:

- FISH: Principles and applications in the era of precision oncology, Forms of in situ hybridization, eg, fluorescence, chromogenic, dual; principle, application, interpretation
- Role of FISH in acute leukaemia, Role of FISH in multiple myeloma, Role of FISH in solid tumours
- Sample collection, storage and Preparation techniques: Outline preparative methods for DNA/RNA from various sample types and explain rationale of each step
- Methods for quantifying nucleic acids
- To assess nucleic acid quality using spectrophotometry, electrophoresis, and PCR
- Gel electrophoresis, including capillary electrophoresis, for size analysis and Sanger sequencing.
- PCR Methods: principles of PCR, including RT-PCR, allele-specific PCR, real-time PCR, and quantitative PCR, interpretation
- Extraction of Nucleic acids from blood, bone marrow and cytology specimens.
- Extraction of nucleic acids from Formalin fixed paraffin embedded tissues.
- Digital PCR and its application and, in broad terms, the statistical underpinning
- Real-time PCR: Describe and compare at least three real-time detection formats of PCR, ie, dye binding, hydrolysis probes, and hybridization probes
- Non-PCR methods for nucleic acid analysis
- Southern blot and Northern blot analyses

- Microarrays: applications, including determining gene copy number, gene expression, and single-nucleotide polymorphism detection; different microarray formats, eg, by probe type or one-color versus two-color – their advantages and limitations
- Sanger sequencing: how the Sanger sequencing reaction works, including the detection of reaction products; Recognize and analyze common chromatogram patterns, such as heterozygous bases and insertion-deletions
- Preparative methods for karyotyping; its applications, interpretation
- Major testing methods for methylation analysis
- MSI testing, POLE mutation testing
- Next generation Sequencing and its application in diagnostic pathology, Next generation sequencing methods, Applications of NGS in oncopathology
- Applications of laser capture microdissection in molecular pathology

(10 marks)

NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper