

Branch - **BIOTECHNOLOGY**

MAJOR ELECTIVE COURSE – I MOLECULAR DIAGNOSTICS

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10 × 1 = 10)

Question No.	Question	K Level	CO
1	Which of the following statements is TRUE regarding SNPs and microarray-based gene expression analysis? (i) SNPs are insertions of large DNA segments in the genome (ii) SNPs represent single base pair variations in DNA sequence (iii) Microarrays can only detect protein expression levels (iv) Microarrays are used to amplify DNA fragments	K3	CO1
2	Which technique is primarily used to detect DNA methylation patterns in genomic DNA? (i) Flow cytometry (ii) Bisulfite sequencing (iii) Immunohistochemistry (IHC) (iv) Fluorescence in situ hybridization (FISH)	K3	CO1
3	Which molecular diagnostic technique is most commonly used for detecting gene mutations in neurodegenerative and metabolic diseases? (i) ELISA (ii) PCR (iii) Gram stain. (iv) Western blot	K3	CO2
4	In a case study of a patient with a suspected autoimmune disorder, which biomarker is most commonly analysed using molecular techniques? (i) Haemoglobin level (ii) Autoantibodies (iii) Blood glucose level (iv) Serum cholesterol	K3	CO2
5	Which of the following is considered a key advantage of liquid biopsy in cancer detection? (i) Requires large tissue sample (ii) Invasive procedure with high risk (iii) Allows real-time monitoring of tumour dynamics (iv) Cannot detect genetic mutations	K4	CO3
6	Which of the following best describes the role of circulating tumour DNA (ctDNA) in cancer management? (i) It is used only for histopathological analysis (ii) It helps in detecting tumour-specific genetic alterations in blood (iii) It replaces all imaging techniques (iv) It is not useful in monitoring treatment response	K4	CO3
7	Which of the following is a major advantage of microfluidics and lab-on-chip technology in molecular diagnostics? (i) Requires large sample volume (ii) High reagent consumption (iii) Rapid analysis with minimal sample volume (iv) Limited automation capability	K5	CO4
8	In AI-driven image analysis in pathology and radiomics, machine learning algorithms are primarily used to: (i) Replace all laboratory technicians (ii) Extract quantitative features from medical images for diagnosis and prognosis (iii) Increase sample contamination (iv) Reduce image resolution	K5	CO4

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9	molecular assay in a diagnostic laboratory? (i) To develop a new assay (ii) To confirm that the assay performs according to established specifications (iii) To reduce laboratory costs (iv) To replace quality control procedures	K5	CO5
10	Which of the following best represents an ethical issue in molecular genetic testing? (i) Increasing automation of laboratories (ii) Maintaining patient confidentiality of genetic information (iii) Improving assay sensitivity (iv) Standardization of laboratory protocols	K5	CO5

SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks

(5 × 7 = 35)

Question No.	Question	K Level	CO
11.a.	Explain in detail about reverse transcriptase PCR and its application.	K3	CO1
	(OR)		
11.b.	Discuss about microarray implementation in gene expression analysis.		
12.a.	Enumerate in detail about neurodegenerative disease by molecular diagnosis.	K3	CO2
	(OR)		
12.b.	Explain about Endocrine disorders diagnosis by molecular diagnostics methods.		
13.a.	Enumerate about Cancer biomarkers and their importance.	K4	CO3
	(OR)		
13.b.	Explain in detail about Liquid biopsies in cancer detection.		
14.a.	Discuss on AI and ML in molecular diagnostics.	K5	CO4
	(OR)		
14.b.	Explain about Multi-omics Data and its implementation in forensic reports.		
15.a.	Discuss the importance of Genetic Counselling in molecular Diagnostics.	K5	CO5
	(OR)		
15.b.	Explain about Quality assurance in the molecular diagnostic laboratory.		

SECTION - C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks

(3 × 10 = 30)

Question No.	Question	K Level	CO
16.	Enumerate about the DNA sequencing by NGS as a diagnostic tool.	K3	CO1
17.	Explain about Molecular diagnostics in metabolic diseases and autoimmune disorders.	K3	CO2
18.	Discuss in detail the importance of proteins as biomarkers.	K4	CO3
19.	Enumerate the AI-Driven Image Analysis in Pathology & Radiomics.	K5	CO4
20.	Discuss the importance of Quality control in a molecular diagnostic laboratory.	K5	CO5

Z-Z-Z

END