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BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – M.Sc.(MLT)-2025
Course Name – Medical Molecular Biology & Biotechnology
Course Code - MMTC02001
(Semester II)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Identify the enzyme responsible for replicating DNA:
a) RNA polymerase b) DNA ligase
c) DNA polymerase d) Helicase

(ii) In DNA electrophoresis, which direction do DNA fragments move in the gel?
a) Towards the positive electrode (anode) b) Towards the negative electrode (cathode)
c) They do not move d) They move randomly

(iii) Identify the condition is tested for using the Guthrie test in newborn screening?
a) Cystic fibrosis b) Phenylketonuria (PKU)
c) Sickle cell disease d) Down syndrome

(iv) How does ethidium bromide facilitate visualization of DNA bands in the gel?
a) It binds to DNA and emits fluorescence under UV light b) It breaks DNA into smaller fragments
c) It speeds up DNA migration d) It changes the color of the gel

(v) Name FISH stand for in molecular biology?
a) Fluorescent In Situ Haplotype b) Fluorescent In Situ Hybridization
c) Fluorescent Investigation of Single Haplotypes d) Fluorescent Isolation of Specific Homologs

(vi) Choose the method used in proteomics to identify and quantify proteins in a sample:
a) Mass spectrometry b) Polymerase chain reaction (PCR)
c) Microarray analysis d) Gel electrophoresis

(vii) In SEM sample preapartion to make sample conductive which material is used
a) Gold Sputter coating b) Electrospinning
c) Hydrolysis d) Lithography

(viii) Choose the term that describes the metabolic profile of an organism under a specific set of conditions:
a) Metabolome b) Proteome

c) Transcriptome
d) Genome

(ix) RDTs for HIV typically detect:

a) Antibodies
b) Viral RNA
c) CD4 T cells
d) HIV antigens

(x) List the feature distinguishes apoptosis from necrosis at the cellular level?

a) Cell shrinkage with membrane blebbing and DNA fragmentation into organized fragments
b) Random cell swelling and membrane rupture that triggers inflammation
c) Formation of a cleavage furrow and chromosome segregation
d) Uncontrolled DNA replication prior to cell death

(xi) Select the role of topoisomerase during DNA replication?

a) To synthesize RNA primers needed to start DNA synthesis
b) To join Okazaki fragments by forming phosphodiester bonds
c) To relieve torsional strain ahead of the replication fork by cutting and rejoining DNA
d) To add nucleotides to the 3` end of the growing DNA strand.

(xii) Identify the protein acts as a key tumor suppressor by inducing cell-cycle arrest or apoptosis in response to DNA damage?

a) Cyclin D
b) p53
c) DNA polymerase β
d) Caspase-3

(xiii) A severe ischemic injury leads to ATP depletion in cells. Identify pathway of cell death is most likely to occur and why?

a) Apoptosis, because it requires energy
b) Necrosis, because it occurs independently of ATP
c) Apoptosis, due to mitochondrial cytochrome c release
d) Autophagy, due to lysosomal activation

(xiv) A pathologist observes a cell swelling, and inflammation in tissue sections. Identify the cell types from the following

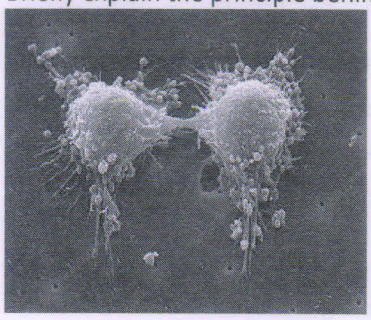
a) Programmed cell death
b) Ganglion
c) Karyolysis
d) Pyknosis

(xv) In extrinsic pathway the ER stress is induced by

a) Caspase 3
b) Caspase 9
c) Cytochrome c
d) Bcl-2 family

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Explain the role of cyclins-CDK complex in cell cycle progression. (3)
3. Elaborate the significance of the denaturation step in PCR? (3)
4. Briefly explain the principle behind flow cytometry. (3)
5.  (3)

Infer the possible characteristics features from SEM micrographs.

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6. Differentiate between Telomers and Telomerase (3)

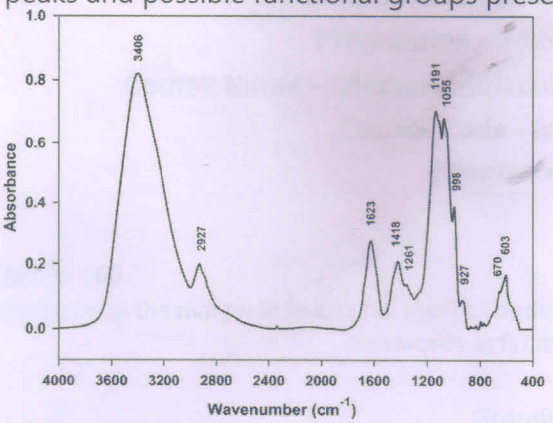
OR

Evaluate the various role of RNA polymerase in Transcription (3)

Group-C

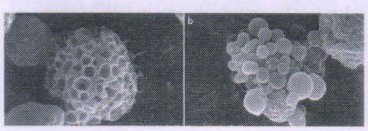
(Long Answer Type Questions) 5 x 6=30

7. Write a short note on Albinism (5)
8. Explain the Post-translational modfication of Proteins (5)
9. FTIR spectrum of a compound. Interpret the spectrum, identifying the major peaks and possible functional groups present. (5)



10. P53 regulates cell cycle and act as an inhibitor in cell cycle check points-Justify the statement. (5)
11. Explain different types necrotic pathways and its associated factors in cell death mechanism. (5)
12. Signify the implications of CDKs and P53 in cell cycle arrest. (5)

OR



(5)

Interpret the basic characteristics features of the above images clinically.

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