

M.Sc. ZOOLOGY
FOURTH SEMESTER
CELL AND MOLECULAR BIOLOGY-III
MSZ-401 A

**SET
A**

[USE OMR SHEET FOR OBJECTIVE PART]

Duration: 3 hrs.

Full Marks: 70

Time: 30 mins.

(Objective)

Marks: 20

Choose the correct answer from the following:

1 × 20 = 20

- The binding of ligands to many GPCRs leads to.....
 - Decrease in concentration of certain intracellular signal molecules called second messengers
 - Increase in concentration of certain intracellular signal molecules called second messengers
 - Decrease in concentration of certain extracellular signal molecules called first messengers
 - Increase in concentration of certain extracellular signal molecules called first messengers
- What family of receptors mediates the biologic actions of a wide variety of ligands, including insulin and other growth factors?
 - Thyroid hormone Receptors
 - Receptor Tyrosine Kinases
 - Receptor activin family
 - Protein kinase Receptors
- Which of the following are intracellular second messengers?
 - Acetylcholine
 - Glycine
 - IP₃
 - Glutamate
- Which of the following statements is false about a ligand-gated ion channel receptor?
 - They are present in the cell membrane
 - They consist of five glycoproteins
 - Differences in membrane potential affect whether the channel receptors are open or close
 - Neurotransmitters can act as the chemical messengers for these channels
- The drug colchicine promotes microtubule.....
 - Disassembly
 - Assembly
 - Acidification
 - Condensation
- Apoptosis can't kill which of the following?
 - Cell infected with viruses
 - Cell with DNA damage
 - Cancer cells
 - Immune cells
- Changes in intracellular substances during aging includes:
 - Increased cross linkages of collagen
 - Loss of elasticity in elastic tissues
 - Loss of resilience in connective tissue
 - All of above
- Mutation in which cell organelle leads to defect in energy production and formation of ROS?
 - Nucleus
 - Mitochondria
 - Golgi body
 - Rough ER

9. Cancer is often the result of activation oftoand the inactivation ofgenes.
- Oncogenes, tumor-suppressor genes, proto-oncogenes
 - Proto-oncogenes, oncogenes, tumor-suppressor genes
 - Oncogenes, proto-oncogenes, tumor-suppressor genes
 - Proto-suppressor genes, suppressors, oncogenes
10. Oncogenes are the cancer causing genes in the cell but they do not express usually. This is because of the presence of:
- Proto oncogene
 - Tumour Promoter gene
 - Tumour suppressor gene
 - Transposons
11. The gene responsible for apoptosis in *C.elegans* is.....
- Caspase-8
 - CED-3
 - TNF
 - FAD
12. Which catalytic activity within the spliceosome is responsible for cutting and rejoining RNA during splicing?
- Ligase
 - Helicase
 - Phosphatase
 - RNAse
13. Which of the following is incorrect about a microarray?
- It is a slide attached with a high density array of immobilized DNA oligomers representing the entire genome of the species under study
 - Array of immobilized DNA oligomers cannot be cDNA
 - Each oligomer is spotted on the slide and serve as a probe
 - It is the most commonly used global expression gene profiling method
14. Which technique was primarily used to sequence the human genome during the Human Genome Project?
- Southern blotting
 - Polymerase Chain Reaction (PCR)
 - Sanger sequencing
 - Western blotting
15. Which of the following statements about plasmids as vectors is true?
- Plasmids are only found in eukaryotic cells
 - Plasmids are typically circular DNA molecules found in bacteria
 - Plasmids cannot replicate independently of the host cell
 - Plasmids are larger than the bacterial chromosome
16. What is the advantage of using RT-PCR over traditional PCR?
- RT-PCR can amplify RNA directly without the need for reverse transcription
 - RT-PCR has high sensitivity and specificity
 - RT-PCR allows for the detection of RNA expression levels
 - RT-PCR is faster and cheaper
17. In DNA microarrays, what does the term "probe" refer to?
- The DNA sample being analyzed
 - The fluorescent dye used to label DNA
 - The DNA sequence immobilized on the microarray slide
 - The enzyme used in DNA amplification

18. Which enzyme is responsible for cutting DNA at specific sequences, creating blunt or sticky ends?
- a. DNA polymerase
 - b. DNA ligase
 - c. Restriction endonuclease
 - d. Reverse transcriptase
19. What is the shotgun method in gene isolation?
- a. A method for amplifying specific DNA sequences
 - b. A technique for identifying gene mutations
 - c. A random sequencing approach used to assemble entire genomes
 - d. A method for purifying proteins from cell extracts
20. Which technique is commonly used for gene isolation?
- a. Polymerase Chain Reaction (PCR)
 - b. Southern blotting
 - c. Northern blotting
 - d. Gel electrophoresis
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(Descriptive)

Time : 2 hr. 30 mins.

Marks : 50

[Answer question no.1 & any four (4) from the rest]

1. Write in detail about different types of DNA modifying enzymes. What are the characteristics of a good vector? 8+2=10
2. Give an account of the structure of G-Protein Coupled Receptors and its mechanism of action. 10
3. Write a note on the assembly and disassembly of Microtubule with suitable diagrams. 10
4. What do you mean by apoptosis? Explain the intrinsic pathway of apoptosis with proper diagram. 2+8=10
5. Differentiate malignant tumor with benign tumor. Explain the development of cancer cell with proper illustrations. 4+6=10
6. Describe the working mechanism of *any one* of the following:
a) DNA microarray b) PCR 6+4=10
Write a note on the applications of flow cytometry.
7. Describe the step-by-step process involved in splicing isolated genes in recombinant DNA technology, highlighting the key molecular techniques and enzymes utilized. 10
8. What were the key scientific goals of the Human Genome Project? What are the steps involved in DNA cloning, starting from the isolation of DNA fragments of interest to the insertion of these fragments into cloning vectors. 4+6=10

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