

**Ph.D. COMMON ENTRANCE TEST JANUARY 2024**

**MOLECULAR MEDICINE**

**PART B**

Roll No:

**Duration: 60 minutes**

**Maximum Marks: 45**

**Instructions:**

1. This entrance test question paper is not to be taken out of the examination hall
2. Part B Question paper consists of Section A and Section B
3. Section A consists of 25 MCQs carrying 1 Mark each. Put a tick (✓) mark against the correct answer in the box given.
4. Section B consists of Descriptive questions carrying 5 marks each. Restrict your answer to 500 words. Additional plain sheets have been attached to the question paper to answer Section B

**SECTION – A**

**Answer the following by ticking (✓) against the correct answer in the box given: 25 X 1 = 25**

1. What is the primary purpose of a phylogenetic tree in bioinformatics?
  - a. Predicting protein structures
  - b. Analyzing gene expression
  - c. Studying evolutionary relationships
  - d. Identifying functional domains in proteins
  
2. What is the primary function of Krebs cycle?
  - a. ATP synthesis
  - b. Carbon fixation
  - c. Electron transport
  - d. Nutrient Breakdown
  
3. Which process involves the transfer of genetic material between bacterial cells through direct cell-to-cell contact?
  - a. Conjugation
  - b. Transformation
  - c. Transduction
  - d. Replication

4. What is the function of Microbial flagella?
- a. Photosynthesis
  - b. Motility
  - c. Cell division
  - d. DNA replication
5. What is the significance of the microbiome in human health?
- a. Energy production
  - b. Nutrient absorption
  - c. Microbial diversity
  - d. Disease prevention
6. Which of the following statistical tests is used to compare the means of two independent groups?
- a. t-test
  - b. Chi-square test
  - c. ANOVA
  - d. Paired t-test
7. Apoptosis plays a role in cancer by:
- a. Promoting uncontrolled cell growth
  - b. Inhibiting DNA repair mechanisms
  - c. Controlling cell growth and preventing tumor development
  - d. Enhancing tumor angiogenesis
8. Interactions between cancerous cells and normal cells primarily involve:
- a. Suppression of tumor growth by normal cells
  - b. Activation of oncogenes in normal cells
  - c. Immune responses and tumor microenvironment alterations
  - d. Induction of apoptosis in normal cells
9. Dysregulation of the cell cycle in cancer leads to:
- a. Controlled cell growth and differentiation
  - b. Uncontrolled cell proliferation and impaired cell cycle checkpoints
  - c. Enhanced DNA repair mechanisms
  - d. Reduced cell apoptosis

- 10.** The tumor microenvironment includes:
- a. Only tumor cells
  - b. Only blood vessels
  - c. Stromal cells, blood vessels, and extracellular matrix
  - d. Cancer cells and normal cells only
- 11.** What distinguishes cancer cells from normal cells?
- a. Limited cell division
  - b. Altered metabolism
  - c. Controlled growth signals
  - d. Intact DNA repair mechanisms
- 12.** Gap junctions facilitate communication between cells by:
- a. Directly linking the cytoplasm of adjacent cell
  - b. Modulating cell adhesion
  - c. Regulating neurotransmission
  - d. Controlling hormonal release
- 13.** Hematopoiesis refers to:
- a. Regulation of cell communication
  - b. Regulation of blood cell formation
  - c. Cellular transportation mechanisms
  - d. Intercellular signaling pathways
- 14.** Light-mediated signaling in plants involves the utilization of:
- a. Chemical messengers for intercellular communication
  - b. G-protein coupled receptors
  - c. Chlorophyll and other photoreceptors
  - d. Second messengers like cAMP
- 15.** Which statement accurately represents the role of second messengers in cell signaling?
- a. Second messengers directly bind to DNA to initiate gene expression
  - b. They amplify and transmit signals initiated by cell surface receptors
  - c. Second messengers act as hormone transporters in the bloodstream
  - d. They regulate the cell cycle by directly controlling protein synthesis
- 16.** Bacterial chemotaxis primarily refers to:
- a. The movement of bacteria toward light sources
  - b. Bacteria responding to chemical gradients in their environment
  - c. Reproduction of bacteria in response to changes in temperature
  - d. Bacteria's ability to change shape in response to mechanical stimuli

17. The interaction between cell surface receptors and hormones primarily occurs at the:

- a. Extracellular matrix
- b. Cytosol of the cell
- c. Plasma membrane
- d. Nucleus of the cell

18. To which of the following options do individual respondents, focus groups, and panels of respondents belong?

- a. Primary data sources
- b. Secondary data sources
- c. Itemised data sources
- d. Pointed data sources

19. .... are insoluble in water.

- a. Sugar
- b. Salt
- c. Fats
- d. Ethanol

20. \_\_\_\_\_ are enzymes capable of introducing transient single-strand or double-strand breaks into the DNA.

- a. Topoisomerases
- b. Ligases
- c. Primases
- d. Helicases

21. If mRNA codon is 5'-AUG-3', then the tRNA anticodon will be \_\_\_\_\_.

- a. 5'-UAC-3'
- b. 5'-GUA-3'
- c. 3'-CAU-5'
- d. 3'-UAC-5'

22. Nucleosome consists of histone proteins \_\_\_\_\_.

- a. H1, H2, H3, H4
- b. H1, H2A, H2B, H4
- c. H2A, H2B, H3, H4
- d. H1, H2A, H2B, H3

23. Chiasma formation occurs in \_\_\_\_\_ stage of Prophase I during Meiosis.

- a. Leptotene
- b. Pachytene
- c. Zygotene

d. Diplotene

24. Which type of immunity involves the production of antibodies by the immune system?

- a. Cellular immunity
- b. Innate immunity
- c. Passive immunity
- d. Humoral immunity

25. What does the term "BLAST" stand for in the context of bioinformatics?

- a. Basic Local Alignment Search Tool
- b. Biological Sequence Annotation and Search Tool
- c. Bioinformatics Learning and Analysis Support Tool
- d. Base Level Alignment and Sorting Toolkit

26. Which of the following is the general formula of Carbohydrates?

- a.  $(C_4H_2O)_n$
- b.  $(C_6H_2O)_n$
- c.  $(CH_2O)_n$
- d.  $(C_2H_2O)_n COOH$

27. Authenticity of a research finding is its:

- a. Originality
- b. Validity
- c. Objectivity
- d. All of the above

28. Which of the following is the simplest form of carbohydrates?

- a. Carboxyl groups
- b. Aldehyde and Ketone groups
- c. Alcohol and Carboxyl groups
- d. Hydroxyl groups and Hydrogen groups

29. Metastasis refers to:

- a. The primary tumor site
- b. The spread of cancer cells to distant organs
- c. The initial stage of cancer development
- d. In situ carcinoma formation

30. Which of the following is not a naturally occurring stem cell?

- a. Embryonic Stem cells
- b. Hematopoietic Stem cells
- c. Mesenchymal stem cells
- d. induced pluripotent stem cells

**SECTION – B**

Answer any four of the following:

5 X 4 = 20

1. Discuss the principles of biomolecule separation using organic solvents based on polarity.
2. Explain how gap junctions function in enabling direct intercellular communication and the significance of this communication method.
3. Describe the tumor microenvironment and its influence on cancer development and progression.
4. Classify Stem cells and elaborate on Embryonic Stem cells.
5. Elaborate the Central dogma in detail. Add a note on antisense technology.
6. Enlist the various research ethics and explain any two in detail.

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