

PH 511.3

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St Aloysius College (Autonomous)

Mangaluru

Semester III - P.G. Examination- M.Sc. Biochemistry

November - 2024

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MANGALORE-575 003

MOLECULAR BIOLOGY

Max Marks: 70

Time: 3 Hours

(10x2=20)

I. Answer any TEN of the following:

1. Which enzyme is responsible for creating RNA primers in DNA replication?
How?
2. Can you name the enzymes responsible for relieving the supercoiling in DNA.
3. Explain the role of the Shine-Dalgarno sequence in prokaryotic gene expression.
4. Indicate how DNA amplification could be advantageous for an eukaryotic organism.
5. Explain the structural features of the helix-turn-helix (HTH) motif and how it binds to DNA.
6. Describe the role of sigma factors in prokaryotic transcription initiation.
7. Name the two main structural components of a riboswitch.
8. Discuss the conditions under which the arabinose operon is activated and repressed.
9. What is Wobble hypothesis? What is its significance?
10. Explain why the genetic code is often described as degenerate.
11. Can you name some key cellular and molecular changes associated with aging?
12. How does the availability of amino acids in a cell influence translation regulation?

II. Answer any SIX of the following:

(6x5=30)

13. Analyze the significance of the DnaA protein in initiating prokaryotic DNA replication.
14. How does semi-conservative replication differ from other modes of replication?
15. Summarise the key steps involved in polyadenylation.
16. Summarise the mechanisms of chromatin remodeling and their effects on gene expression.
17. Describe the role of CAP protein in lac operon.
18. How does the ribosome distinguish between the start codon and other codons in mRNA during translation initiation in prokaryotes?

Contd...2

19. Describe the role of tumor suppressor genes, such as p53, in cell cycle regulation.
20. Analyse how does the intrinsic (mitochondrial) pathway of apoptosis differ from the extrinsic (death receptor) pathway in terms of initiation and signaling?

III. Answer any TWO of the following:

(2×10=20)

21. Compare and contrast the rolling circle mode of replication with the linear mode of replication in terms of efficiency.
22. Describe the two mechanisms by which the trp operon can be repressed.
23. Describe the difference between replication inhibitors that target bacterial DNA replication and those that target eukaryotic DNA replication with examples.
24. Describe the role of ribosomes in protein synthesis and how translational inhibitors affect their function.

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Semester III- P.G. Examination- M.Sc. Biochemistry

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NITROGEN METABOLISM AND PLANT BIOCHEMISTRY

Time: 3 Hours

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Max Marks: 70

(10x2=20)

I. Answer any TEN of the following:

1. What is the role of ATP in nitrogenase function?
2. Analyse the benefits of degradation of amino acids.
3. Describe the role of transamination in amino acid biosynthesis and its significance in nitrogen metabolism.
4. Discuss why early detection and dietary intervention are essential in managing PKU.
5. Name the main protease enzymes involved in protein degradation in eukaryotic cells.
6. Explain the concept of salvage pathways in nucleotide metabolism and their significance.
7. What is C4 pathway of photosynthesis? Which plants have C4 pathway?
8. What is ferredoxin? What is its role in light dependent reactions?
9. What is seed dormancy? List some common factors that can induce seed dormancy?
10. What is photoperiodism in plants, and why is it important for their growth and development?
11. What are some common signs of water stress in plants, and how do they differ from symptoms of temperature stress?
12. What are the key components involved in bacterial two-component systems?

II. Answer any SIX of the following:

(6x5=30)

13. How does the breakdown of heme contribute to the formation of bilirubin in the liver?
14. Explain the significance of nitrate assimilation in plants and its role in amino acid synthesis.
15. Analyse the mechanisms by which glycoproteins are degraded within the cell or extracellular matrix.
16. How does 5-fluorouridine disrupt nucleotide synthesis and incorporation into RNA?
17. With the help of a labelled diagram describe the structure of a chloroplast.
18. Discuss photosynthesis in purple bacteria.

Contd...2

19. Explain how the pressure flow hypothesis describes the mechanism of photoassimilate translocation in the phloem.
20. Given a scenario where a plant is exposed to a bacterial infection, describe the potential physiological and molecular responses the plant might initiate.

III. Answer any TWO of the following:

(2x10=20)

21. Explain the biosynthesis of any two neurotransmitters. Add a note how amino acids act as precursors for synthesis.
22. How is tyrosine synthesized from shikimate pathway.
23. Describe the Calvin Cycle. Add a note on the regulation of Calvin Cycle.
24. Develop a model or flowchart illustrating the entire process of water transport from the soil to the leaves in plants, incorporating key concepts like root pressure, capillarity, and transpiration pull.

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Semester III- P.G. Examination- M.Sc. Biochemistry
November - 2024

CELLULAR BIOCHEMISTRY

ST. ALOYSIUS COLLEGE
PG. DEPARTMENT
MANGALORE-575 003

Time: 3 Hours

Max Marks: 70

(10x2=20)

- I. Answer any TEN of the following:**
1. Which are the key phases of an action potential in a neuron?
 2. Compare and contrast the Fluid Mosaic Model and the Lipid Bilayer Model of cell membranes.
 3. What is the primary function of receptor-mediated endocytosis in a cell, and how does it differ from other forms of endocytosis?
 4. What are membrane domains, and why are they important in cell biology?
 5. How does the cytoskeleton contribute to maintaining cell shape and integrity in plant cells?
 6. Recall the name of the organelle that stores calcium ions in muscle cells.
 7. Define chemo taxis.
 8. Name the cellular structure in bacteria that plays a key role in sensing changes in the concentration of specific chemicals.
 9. Name the second messenger produced from phosphatidylinositol bisphosphate (PIP₂) in response to certain cell surface receptor activation.
 10. Identify the specialized junctions that allow direct cell-to-cell communication, facilitating the passage of ions and small molecules between adjacent cells.
 11. What is the name of the process by which cells reduce their sensitivity to a particular signaling molecule over time?
 12. What are the main downstream effectors of G-proteins in GPCR signaling?

II. Answer any SIX of the following: (6x5=30)

13. Explain how the selectivity of potassium ion channels is achieved. What structural features contribute to their specificity for potassium ions?
14. Differentiate between simple diffusion and facilitated diffusion in terms of the molecules involved, the role of transport proteins, and the energy requirements.
15. Describe the composition of biological membranes, including the major lipid and protein components.
16. Explain the major steps involved in muscle contractions.
17. Discuss the mechanism quorum sensing.
18. Write a note on cellular junctions.
19. Explain the signaling mechanism of receptor tyrosine kinases.

Contd...2

20. Explain the process of phototransduction in rod cells. How does the absorption of light lead to changes in membrane potential?

III. Answer any TWO of the following:

(2x10=20)

21. Examine the role of transport proteins in cellular homeostasis, focusing on the Na⁺ K⁺ ATPase. Elaborate its mechanism of action.
22. Explain the various types of muscle with its functions.
23. Explain the process of protein sorting and targeting in cell.
24. Compare and contrast the roles of secondary messengers and primary messengers in cell signaling. How do they differ in terms of function and mechanism?

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