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ST ALOYSIUS COLLEGE (AUTONOMOUS) MANGALURU  
SEMESTER III - PG EXAMINATION - M.Sc. BIOCHEMISTRY  
NOVEMBER/DECEMBER - 2023

MOLECULAR BIOLOGY  
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MANGALORE-575 003

Time : 3 Hours

Max. Marks : 70

I. Answer any TEN sub-divisions of the following:

(10x2=20)

1. What is the basic structure of a eukaryotic chromosome, and where is DNA replication initiated?
2. What is the rolling circle mode of replication?
3. Explain the role of the Shine-Dalgarno sequence in prokaryotic gene expression.
4. What are house keeping genes? Give one example.
5. Describe the role of sigma factors in prokaryotic transcription initiation.
6. Explain the structural features of the helix-turn-helix (HTH) motif and how it binds to DNA.
7. List the different types of histone modifications.
8. Discuss how the Tryptophan operon controls the synthesis of tryptophan in response to cellular needs.
9. What is the first event in eukaryotic translation?
10. Name the elongation factors of translation in eukaryotes. Add primary roles of each of them.
11. How does the availability of amino acids in a cell influence translation regulation?
12. Describe the role of caspases in the execution of apoptosis.

II. Answer any SIX of the following:

(6x5=30)

13. Analyze the significance of the DnaA protein in initiating prokaryotic DNA replication.
14. Explain why the Central Dogma is essential for understanding the flow of genetic information in cells.

15. Discuss how alternative splicing contributes to the generation of multiple protein isoforms from a single gene.
16. Analyze the mechanisms by which CAP protein and glucose regulate the expression of the arabinose operon.
17. Describe the roles of the promoter, operator, and structural genes in an operon.
18. Explain why PTMs are crucial for regulating protein function and activity.
19. How does oxidative stress contribute to cellular damage and senescence during the aging process?
20. Compare and contrast Meiosis I and Meiosis II in terms of their outcomes and the events that occur in each division.

III. Answer any TWO of the following:

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(2x10=20)

21. Compare and contrast the mechanisms of action of topoisomerase inhibitors and nucleoside analogs as replication inhibitors with examples.
22. Describe the steps involved in processing of mRNA in eukaryotes.
23. Compare and contrast the rolling circle mode and linear modes of replication in terms of efficiency.
24. Describe the role of ribosomes in protein synthesis and how translational inhibitors affect their function.

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ST ALOYSIUS COLLEGE (AUTONOMOUS) MANGALURU  
SEMESTER III - PG EXAMINATION - M.Sc. BIOCHEMISTRY  
NOVEMBER /DECEMBER - 2023  
NITROGEN METABOLISM AND PLANT BIOCHEMISTRY

Time : 3 Hours

Max. Marks : 70

**I. Answer any TEN sub-divisions of the following:****(10x2=20)**

1. What role do nitrifying bacteria play in the nitrogen cycle?
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. What are proteoglycans and glycoproteins and how do they differ in terms of structure and function?
5. Name the precursors required for the biosynthesis of both NAD and FAD.
6. How does the de novo synthesis of purine nucleotides differ from the salvage pathway?
7. Which hormones are associated with the development of crown gall? What is their role?
8. What is bacterial rhodopsin? State the primary function of bacterial rhodopsin in certain types of bacteria.
9. What is the Hill reaction? What were the key findings or conclusions drawn from it?
10. Can you name the two forms of phytochromes and explain how they interconvert?
11. What are two-component systems in bacteria and plants, and what is their primary function?
12. What are some common signs of water stress in plants, and how do they differ from symptoms of temperature stress?

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

13. Analyze the biosynthesis pathways of epinephrine and histamine, highlighting key intermediates and functional importance of neurotransmitters.



14. Describe the sequence of reactions involved in sulphate assimilation and how it leads to formation of cysteine.
15. How does 5-fluorouridine disrupt nucleotide synthesis and incorporation into RNA?
16. Describe the pathophysiology of phenylketonuria (PKU) and its consequences if left untreated.
17. If you were to select a hormone for exogenous application to overcome seed dormancy, which hormone would you choose. Explain the underlying mechanism by which it breaks dormancy?
18. Differentiate between oxygenic and anoxygenic photosynthesis with relevant examples.
19. How does the phloem sap composition change as photoassimilates are transported from leaves to other parts of the plant?
20. Explain how plant pathogens, such as fungi or bacteria, can infect plant tissues and evade the plant's defenses.

**III. Answer any TWO of the following:**

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(2x10=20)

21. Analyze the metabolic pathways involved in heme synthesis and its regulation.
22. Describe the process of glycosaminoglycan chain elongation and sulfation in proteoglycan biosynthesis.
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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ST ALOYSIUS COLLEGE (AUTONOMOUS) MANGALURU  
SEMESTER III - PG EXAMINATION - M.Sc. BIOCHEMISTRY  
NOVEMBER/DECEMBER - 2023

CELLULAR BIOCHEMISTRY  
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Time : 3 Hours

Max. Marks : 70

I. Answer any TEN sub-divisions of the following: (10x2=20)

1. What are caveolae, and how do they differ from lipid rafts?
2. Compare and contrast the Fluid Mosaic Model and the Lipid Bilayer Model of cell membranes.
3. Explain the difference between simple diffusion and facilitated diffusion.
4. Which are the key phases of an action potential in a neuron?
5. How does the cytoskeleton contribute to maintaining cell shape and integrity in plant cells?
6. Name the cellular organelle responsible for sorting and modifying proteins before they reach their final destinations.
7. What is the term for the specialized junctions that allow direct communication between adjacent animal cells?
8. Name the enzyme responsible for rapidly regenerating ATP during muscle contraction.
9. In the context of GPCR signaling, how does the activation of a G-protein lead to the production of intracellular second messengers?
10. Can you explain how secondary messengers amplify signals in cell signaling pathways?
11. What is the term for the initial molecule that binds to a receptor and initiates a signaling cascade?
12. Identify the signalling pathway that utilizes signaling molecules to exert their effects over short distances, often involving adjacent cells.

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

13. Describe the composition of biological membranes, including the major lipid and protein components.

14. Compare and contrast endocytosis and exocytosis in terms of their mechanisms and roles in cellular transport.
15. Explain how the selectivity of potassium ion channels is achieved. What structural features contribute to their specificity for potassium ions?
16. Explain the mechanism of quorum sensing.
17. Explain the structure and function of Chloroplast.
18. Explain about cellular junctions.
19. Explain the concept of ligand-receptor binding specificity in cell signaling. How does the affinity between ligands and receptors contribute to signaling specificity?
20. Explain the mechanism of visual cycle.

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III. Answer any TWO of the following:

(2x10=20)

21. Examine the role of transport proteins in cellular homeostasis, focusing on the Na<sup>+</sup> K<sup>+</sup> ATPase. Elaborate its mechanism of action.
22. Explain the various types of muscle with its functions.
23. Explain how bacterial chemotaxis allows bacteria to respond to changes in environmental conditions. How do signal transduction pathways lead to changes in flagellar rotation?
24. Explain the role of intra cellular signalling molecules in MAP kinase pathway.

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