

PH 511.3

St Aloysius College (Autonomous)
Mangaluru
Semester III - P.G. Examination - M.Sc. Biochemistry
November - 2019

Reg. No:

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Time: 3 Hours

MOLECULAR BIOLOGY
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Max. Marks: 70

I. Answer any TEN of the following:

(10×2=20)

1. How is fidelity of DNA replication maintained?
2. Enlist the inhibitors of DNA replication with their targets.
3. Distinguish between introns and exons.
4. Define housekeeping genes and regulatory genes.
5. What is protein motif? Mention any two protein motifs involved in DNA-protein interactions.
6. Distinguish between transcription activator and repressor with an example for each.
7. What is meant by promoter? Give its consensus sequence.
8. State the histone code hypothesis.
9. Write general features of genetic code.
10. Distinguish between prokaryotic and eukaryotic ribosomes.
11. What are riboswitches?
12. What is RNA editing?

II. Answer any SIX of the following:

(6×5=30)

13. Discuss on nearest neighbour base frequency analysis and its significance.
14. Explain the loop-rolling circle model of DNA replication.
15. Describe the transcription initiation in prokaryotes.
16. What is attenuation control? Explain with trp operon as an example.
17. Explain the chromatin remodelling during gene expression.
18. Write a note on contributions of Nirenberg and Khorana in deciphering genetic code.
19. How is cell cycle regulated?
20. Compare initiation of translation in prokaryotes and eukaryotes.

III. Answer any TWO of the following:

(2×10=20)

21. Explain, how is DNA replication proved as semi-conservative mode of replication in bacteria? What are okazaki fragments?
22. Describe the transcription process mediated by RNA polymerase II. Add a note on splicing of mRNA primary transcript introns.
23. What is meant by operon? Justify, lac operon is regulated positively and negatively.
24. Explain the events of prokaryotic translation process. What is the role of aminoacyl-tRNA synthetases in translation accuracy?

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

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NITROGEN METABOLISM AND PLANT BIOCHEMISTRY

Time: 3 hrs.

ST. ALOYSIUS COLLEGE

Max Marks: 70

I. Answer any **TEN** of the following **(10×2=20)**

1. How does deamination differ from transamination? Give an example for each.
2. List out the similarities and differences between diazotrophs and symbionts.
3. Justify, 'uridylyltransferase the single enzyme catalyzes two reactions'.
4. How do tetrahydrobiopterin and tetrahydrofolate functionally differ from each other?
5. Why is glycine synthase also known as glycine cleavage enzyme?
6. Write the reaction steps for the formation of bilirubin from heme.
7. What is meant by reducing power? List out the different sources of reducing equivalents.
8. State the Hill reaction and its significance.
9. Define seed dormancy and mention the hormones that influence seed dormancy.
10. What is meant by transpiration? Mention the importance.
11. Give the functional significance of stomatal movement.
12. Name any four plant pathogens and disease induced by these pathogens.

II. Answer any **SIX** of the following **(6×5=30)**

13. Justify, 'Dinitrogenase reductase modification regulates the biological nitrogen fixation'.
14. Discuss biosynthesis and biological importance of polyamines.
15. Explain the biosynthesis of nicotinamide adenine dinucleotide and its importance.
16. Describe the ubiquitin proteasome pathway of protein degradation.
17. Write a note on physiological functions of auxins and Gibberlins.
18. Explain the structure, mechanism of action and functional significance of phytochromes.
19. What is water potential? Describe the water transport in plants.
20. What are secondary metabolites? Discuss the types and functions of secondary metabolites.

III. Answer any **TWO** of the following **(2×10=20)**

21. Describe the chorismate pathway for the synthesis of phenylalanine.
22. Write short notes on
 - a) Gout
 - b) Porphyria
 - c) Alkaptonuria
 - d) Lysch-nyhan syndrome
23. Discuss different biotic stresses plants are exposed to and the mechanisms of stress-resistance or tolerance.
24. Explain photophosphorylation. Add a note on CAM metabolism.

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MOLECULAR GENETICS

Time: 3 Hours

Max. Marks: 70

I. Answer any TEN of the following:**(10×2=20)**

1. What is codominance? Give an example.
2. Define map unit.
3. What is epistasis? Give an example.
4. What is C-value paradox?
5. What are LINES and SINES?
6. What is meant by Linkage map?
7. What is Ames Test? Mention its significance.
8. What is genetic crossing over? Where does it occur?
9. What is karyotype? Mention different groups in human karyotype.
10. What are transposons? Give two examples.
11. Justify how Zebra fish can be a model for genetic studies.
12. What are multiple alleles? Give example.

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II. Answer any SIX of the following:**(6×5=30)**

13. What is sex linked inheritance? Explain with an example.
14. Explain extra-chromosomal inheritance in four O'clock plant.
15. What is Hardy Weinberg equilibrium? Describe the factors changing allelic frequency.
16. Write a note on ploidy and its genetic implications.
17. Explain the concepts of 'Random Genetic drift' and 'Co evolution'.
18. What is chromosome banding? How it is useful in clinical genetics?
19. Describe the lytic cycle of bacteriophage.
20. Write an account on lethal and conditional mutants.

III. Answer any TWO of the following:**(2×10=20)**

21. Write a detailed account on DNA repair mechanisms.
22. Explain the structural organization of eukaryotic nucleosome.
23. Describe the process of transformation and transduction in bacterial cell.
24. Give an account of the mechanisms of speciation.

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(10×2=20)

I. Answer any TEN of the following:

1. Differentiate between 80s and 70s ribosomes.
2. What is Wobble hypothesis? What is its significance?
3. What is a prokaryotic promoter? What are its components?
4. What are okazaki fragments?
5. What are topoisomerases? What is their role?
6. Consider the following segment of DNA
5' GCTTCCCAA 3'
3' CGAAGGGTT 5'
Assume that the top strand is the template strand used by RNA polymerase.
Draw the RNA transcribed and label its 5' and 3' ends.
7. What is the role of sigma factor.
8. "The genetic code is not strictly universal". Justify
9. What are riboswitches?
10. What are initiation and termination codons? What is an open reading frame?
11. Compare polycistronic and monocistronic mRNA.
12. What is the direction of DNA and RNA replication?

II. Answer any SIX of the following:

(6×5=30)

13. Write a note on hormones affecting gene expression.
14. Explain the semi-conservative model of DNA replication.
15. What is end-replication problem of linear DNA? How telomerase solves the end- replication problem?
16. Explain the Rho-dependent and Rho-independent mechanism of transcription termination.
17. What are the functions of the following enzymes
 - i) RNA polymerase II
 - ii) DNA ligase
 - iii) DNA polymerase I
18. What is the operon concept? Explain Lac operon.
19. What is the role of histone modification in the regulation of gene expression.
20. Explain the role of miRNA in gene silencing.

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(2x10=20)

III. Answer any TWO of the following:

- 21 Write briefly on any two of the following
 - a) Abortive cycling
 - b) Attenuation control in Trp operon
 - c) Programmed cell death
- 22 Describe the different stages of protein synthesis in E.coli?
- 23 Give an account of cell cycle and its regulation.
- 24 Describe in detail, the post-transcriptional modification of eukaryotic mRNA.

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NITROGEN METABOLISM AND PLANT BIOCHEMISTRY

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I. Answer any TEN of the following:

(10×2=20)

1. Give the pathway for conversion of Proline to Glutamate.
2. What are ketogenic and glucogenic amino acids? Give one example each.
3. What are the excretion products of homo degradation pathway?
4. What is the physiological role of phosphocreatine?
5. What is hyper homocysteinemia? Name one pathology associated with it.
6. What are polyamines? Give an example.
7. How is serine converted to glycine?
8. What are the functions of chloroplast?
9. What are glycoproteins? How are they different from proteoglycans?
10. What is phototropism?
11. What is the role of phenolics in plants?
12. What is the mode of action of methotrexate?

II. Answer any SIX of the following:

(6×5=30)

13. What is Gout? How is it treated?
14. Discuss on any two pathogen induced diseases in plants.
15. Describe water transport in plants.
16. Give the pathway of symbiotic nitrogen fixation.
17. Explain the lysosomal pathway of protein degradation in cells.
18. "Photorespiration is a useful process" – Justify.
19. Describe the C4 pathway of CO₂ fixation. What is CAM pathway?
20. How are ribonucleotides converted to deoxy ribonucleotides?

III. Answer any TWO of the following:

(2×10=20)

21. Give an account of the catabolism of purines and pyrimidines.
22. Explain the biosynthesis, physiological effects and mechanism of action of auxins and cytokinins.
23. Describe the Z-scheme of photosynthetic electron flow. Explain photophosphorylation.
24. Explain the inborn errors of amino acid metabolism.

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I. Answer any TEN of the following:

(10×2=20)

1. What is genomic imprinting?
2. What is crossing over? What is its significance?
3. What is Allopatry?
4. What is maternal inheritance? Give an example.
5. What is SOS repair?
6. What is the significance of plasmid in genetic transfer?
7. What is chromosome banding?
8. What is random genetic drift?
9. What is polyploidy? Give an example.
10. What is codominance? Give an example.
11. What is Pedigree analysis?
12. What are mutagens? Name any two chemical mutagens.

II. Answer any SIX of the following:

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13. Explain epistasis with examples.
14. What is Hardy Weinberg equilibrium? Explain.
15. What are Polytene chromosomes? How are they useful in genetic studies?
16. Write a note on the types of recombination.
17. What are transposons? Explain mechanism of transposition.
18. Write a note on centromere and Telomere.
19. Ames test is used for detecting mutagens. Explain.
20. Write a note on any two models used for genetic studies.

III. Answer any TWO of the following:

(2×10=20)

21. Give an account on the Mendelian principles with examples.
22. Describe structure of the eukaryotic chromosomes.
23. Discuss the different types of DNA repair mechanism.
24. What is mutation? Describe the different types of mutations, causes and detection.

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MOLECULAR BIOLOGY

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I. Answer any TEN of the following:**(10×2=20)**

1. Define central dogma of molecular biology. How is it modified?
2. Distinguish between promoters and enhancers.
3. Name the functions of introns.
4. 5'AATTGCACTAGGATCGGCTCTTATCGCGAT3' is the sequence of nucleotides in coding strand of the DNA. Write the sequence of nucleotides you would expect in mRNA.
5. What is fidelity of replication?
6. State histone code hypothesis.
7. What is Wobble hypothesis?
8. What are PEST sequences? Mention their significance.
9. What are Leucine Zippers? What is their role?
10. What is decatenation?
11. Name any two replication inhibitors.
12. How housekeeping genes are different from regulatory genes?

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II. Answer any SIX of the following:**(6×5=30)**

13. Write an account on nearest neighbor base frequency analysis.
14. Discuss on mRNA mediated gene silencing.
15. Give a note on the initiation of mRNA transcription in eukaryotes.
16. Elaborate on the termination of transcription in prokaryotes.
17. How Lac operon is regulated? Explain.
18. Enlist the general features of genetic code.
19. Describe the contribution of Nirenberg and Khorana in deciphering the genetic code.
20. Discuss about programmed cell death.

III. Answer any TWO of the following:**(2×10=20)**

21. Explain in detail about the molecular aspects of meiosis.
22. Describe the transcriptional control in tryptophan operon. Add a note on riboswitches.
23. Write a detailed account on the co-transcriptional and post transcriptional modifications of RNA.
24. Discuss in detail about the initiation, elongation and termination of translation in prokaryotes.

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I. Answer any TEN of the following:

(10×2=20)

1. What are ketogenic and glucogenic amino acids? Give one example each.
2. What is the metabolic defect in phenylketonuria?
3. Give the energetic of nitrogen fixation.
4. What is Hill reaction?
5. What is ethylene? What is its action in plants?
6. What is meant by photoperiodism? Give an example.
7. Name the abiotic stressors in plants.
8. Distinguish between glycoproteins and proteoglycans.
9. How are nucleotides converted to deoxynucleotides?
10. What is the role of light harvesting antenna complex?
11. Give two examples of nitrogenous compounds of secondary metabolism. What is their role?
12. What are polyamines? Give an example and mention its role.

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II. Answer any SIX of the following:

(6×5=30)

13. Explain the role of nitrogenase enzyme in nitrogen fixation.
14. Give a schematic pathway for the biosynthesis of Tryptophan from shikimic acid.
15. Give an account of the Ubiquitin-Proteasome pathway for the degradation of proteins.
16. Explain the purine salvage pathway. What is the importance of this pathway?
17. What is photorespiration? Is it a wasteful process or useful process? Explain.
18. What are phytochromes? Explain their role with an example.
19. Distinguish between Gout and Lesch-Nyhan syndrome. How are they treated?
20. How is water split during photosynthesis?

III. Answer any TWO of the following:

(2×10=20)

21. Discuss the flow of electrons through photosystems I and II. How is this coupled to photophosphorylation?
22. Discuss mechanism of water transport in plants.
23. Give the denovo biosynthetic pathway for the following
a) Glutathione b) NAD⁺ c) Epinephrine from Tyrosine.
24. Explain the pyrimidine denovo biosynthesis and degradation pathway.

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I. Answer any TEN of the following:**(10×2=20)**

1. Define incomplete dominance with suitable example.
2. What is meant by purity of gametes?
3. Explain the type of cross, resulting in genotype ratio of 1:2:1.
4. Which of the following does not obey Mendel's law and why?
a) Independent assortment b) Linkage c) Dominance d) Recessive traits
5. What is crossing over? Name the stages of cell division during which it occurs.
6. What is c-value paradox?
7. A mother of blood group O has a group O child. What is the blood group of the father?
8. What is xeroderma pigmentosum? Explain its cause.
9. Explain the repair mechanism involved in mis-match repair.
10. What is chromosomal inversion? Explain the two types of inversion.
11. What are orthologous genes? Explain with examples.
12. Explain the various symbolic representations in a pedigree chart.

II. Answer any SIX of the following:**(6×5=30)**

13. What is extrachromosomal inheritance? Explain the concept of cytoplasmic male sterility.
14. Explain Epistasis with an example.
15. What is Hardy Weinberg equilibrium? What are the factors that affect it?
16. Explain Transduction as a mode of genetic transfer in bacteria.
17. Zebra fish as a model for genetics. Explain.
18. What is Karyotyping? Comment on its significance.
19. What is speciation? What are the factors influencing speciation?
20. What is Ames test? Explain.

III. Answer any TWO of the following:**(2×10=20)**

21. Explain the following:
a) Sex-linked inheritance b) Transposons
22. Explain the structure of Eukaryotic chromosome, its nucleosome organization and chromatin fibre arrangement.
23. Discuss chromosomal abnormalities and the genetic implications.
24. What are mutations? Explain the causes and types.
