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Reg. No. : .....

Name : .....

Second Semester M.Sc. Degree Examination, November 2021

Botany

BO 223 : CELL BIOLOGY, GENETICS AND EVOLUTION

(2019 Admission Onwards)

Time : 3 Hours Max. Marks : 75

Draw diagrams and illustrate with examples wherever necessary

I. Answer the following questions.

1. What is convergent evolution?
2. "Although mistakes can happen during DNA replication, they are extraordinarily rare. A key reason for this is the proofreading." Explain.
3. State the role of DNA gyrase.
4. How does meiosis contribute to genetic recombination?
5. What is the reason for the high level of background radiation in certain coastal regions of Kollam District, Kerala?
6. Draw a rough sketch of mature eukaryotic mRNA (nucleotide sequence not required), showing all the important features.
7. What is a genetic map?
8. What is the role of cohesins during cell division?
9. Differentiate between genes and alleles.
10. What are homeotic genes?

(10 × 1 = 10 Marks)

P.T.O.

II. Answer the following questions in **not** more than **50** words.

11. (a) What is the difference between allopatric and sympatric speciation?

OR

(b) 'If double crossover occurs at the expected frequency, then coincidence would be 100%, and if double crossover does not occur at all, then coincidence would be 0%,. Explain.

12. (a) Compare TATA Box and Pribnow Box.

OR

(b) Explain the role of microRNAs in the regulation of gene expression.

13. (a) What are inducible operons? Give one example.

OR

(b) What is 'C-value paradox'?

14. (a) What is cistron?

OR

(b) Describe the cause and symptoms of phenylketonuria.

15. (a) What are nucleoporins? Describe their function.

OR

(b) What is Lyonization? What is its significance?

(5 × 2 = 10 Marks)

III. Answer the following questions in **not** more than **150** words.

16. (a) Neo-Darwinism introduced the connection between the units of evolution (genes) with the mechanism of evolution. Explain.

OR

(b) Describe the theory proposed by Weisman on evolution.

17. (a) 'The primary transcription product of most of the genes in eukaryotes, called a precursor of mRNA or pre-mRNA, is not ready to be translated; instead it is processed and modified extensively before translation.' Explain.

OR

(b) What is end replication problem? Explain how it is resolved.

18. (a) Write a comparison of the three nuclear RNA polymerases found in eukaryotes. with regard to their activity.

OR

(b) What is tRNA charging? Describe the process of tRNA charging.

19. (a) What is cell cycle? How is cell cycle regulated?

OR

(b) Describe the common types of structural aberrations of chromosomes.

20. (a) What is tetrad analysis? How is tetrad analysis in *Neurospora* used in genetic studies?

OR

(b) State Hardy-Weinberg equilibrium. What are the conditions for the existence of Hardy-Weinberg equilibrium?

21. (a) Describe the different molecular mechanisms by which cell differentiation is achieved.

OR

(b) Write a brief account on the organization and content of chloroplast genome.

22. (a) What are stem cells? Add a note on the types and uses of stem cells.

OR

(b) What is chromatosome? Describe its composition and organization.

(7 × 5 = 35 Marks)

IV. Answer the following questions in **not** more than **250** words.

23. (a) Write an essay on the different types of DNA repair mechanisms.

OR

(b) Compare and contrast between the structure of B-DNA and Z-DNA.

24. (a) What is cytoskeleton? What is its function? How are they organized?

OR

(b) Most sexual organisms have two sexes, male and female, determined by a diversity of mechanisms. Explain.

(2 × 10 = 20 Marks)
