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Reg. No. : .....

Name : .....

Second Semester M.Sc. Degree Examination, August 2025

Botany

BO 523 : CELL BIOLOGY, GENETICS AND EVOLUTION

(2024 Admission)

Time : 3 Hours Max. Marks : 75

I. Answer the following.

1. What are telomeres, and how do they contribute to chromosome stability and cellular aging?
2. Explain the term cell potency.
3. What are cell cycle checkpoints, and why are they important in regulating the cell cycle?
4. What are gene clusters?
5. Mention reverse transcriptase and its significance.
6. Define dosage compensation.
7. What is Xeroderma pigmentosum, and how is it related to defects in DNA repair mechanisms?
8. What is Hetero chromatinization?
9. State Hardy-Weinberg law.
10. What is bottle neck effect?

(10 × 1 = 10 Marks)

P.T.O.

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

11. (a) Examine the interplay between cyclins, CDKs and CDK-activating kinase (CAK) in regulating the cell cycle?

OR

(b) How can the study of karyotype differentiation be applied to understand evolutionary relationships among species?

12. (a) Write about chloroplast genome organisation.

OR

(b) Write a short note on nucleo-cytoplasmic transport in eukaryotic cells.

13. (a) What is the Law of Independent Assortment, and how does it explain the inheritance of traits in offspring?

OR

(b) Write the Benzer's concept of cistron.

14. (a) Write wobble hypothesis.

OR

(b) Explain the term RNA interference.

15. (a) How isolation leads to speciation?

OR

(b) Write the classical theories of evolution.

(5 × 2 = 10 Marks)

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

16. (a) Write an elaborate note on the numerical variations in chromosomes.

OR

(b) Write the mechanism of ageing.

17. (a) Discuss the translational control of cell differentiation.

OR

(b) Explain in detail the karyotype analysis.

18. (a) Point out the difference in the structure of B and Z type of DNA.

OR

(b) Illustrate the process of site-directed mutagenesis with a suitable example.

19. (a) What is the mechanism of DNA replication in cells, and how do key enzymes like DNA polymerase, helicase, and ligase contribute to this process?

OR

(b) Explain types of mutations.

20. (a) Write about mRNA processing and the steps involved in it.

OR

(b) Explain the genetic control of development in plants, highlighting the roles of key developmental genes in *Arabidopsis thaliana*.

21. (a) Explain the Britten and Davidson model for eukaryotic gene regulation.

OR

(b) What is consanguinity, and how can it affect the inheritance of genetic disorders in offspring?

22. (a) What are the major theories explaining the origin of life on Earth?

OR

(b) What is molecular evolution, and how does it help in understanding evolutionary relationships among organisms?

(7 × 5 = 35 Marks)

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

23. (a) Discuss the types and functions of Cell Adhesion Molecules (CAMs).

OR

(b) Analyse the process of speciation and discuss the various mechanisms through which new species arise.

24. (a) With the help of diagrams or examples, illustrate the three main mechanisms of bacterial recombination and explain how each process facilitates gene transfer in bacteria.

OR

(b) Write an essay on gene regulation in viruses.

(2 × 10 = 20 Marks)
