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Code No. : 7877 **Sub. Code : WZOM 31**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2024.

Third Semester.

Zoology — Core

GENETICS AND EVOLUTION

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (15 × 1 = 15 marks)

Answer ALL questions.

Choose the correct answer :

1. How can environmental factors influence the expected phenotypic ratio?
   (a) By altering the genetic code directly
   (b) By changing the expression of genes
   (c) By causing mutations in alleles
   (d) By affecting allele frequency in the population

2. What is pleiotropy?
   (a) A single gene affecting multiple traits
   (b) Multiple genes affecting a single trait
   (c) A trait influenced by environmental factors
   (d) A mutation in a single gene affecting only one trait

3. ———— is the primary technique used to create somatic cell hybrids?
   (a) Electroporation (b) Cell fusion
   (c) Microinjection (d) Gene editing

4. What defines an acrocentric chromosome?
   (a) Centromere located close to one end
   (b) Centromere located in the center
   (c) Chromosome with multiple centromeres
   (d) Chromosome with multiple telomeres

5. What is the primary purpose of genetic counseling?
   (a) To provide treatment for genetic disorders
   (b) To help individuals understand genetic risks and make informed decisions
   (c) To perform genetic research
   (d) To clone organisms for medical use

6. ———— is the primary goal of eugenics.

(a) To promote genetic diversity

(b) To improve the genetic quality of the human population

(c) To eliminate genetic disorders through random selection

(d) To support unrestricted genetic modifications

7. According to Darwin's theory of natural selection, which of the following is a key mechanism for evolution?

(a) Differential survival and reproduction

(b) Random genetic mutations

(c) Genetic recombination during reproduction

(d) Horizontal gene transfer

8. What is the primary result of genetic recombination?

(a) Creation of identical daughter cells

(b) Reduction in the number of chromosomes

(c) Increase in genetic diversity among offspring

(d) Prevention of genetic mutations

9. What is the primary concept of natural selection?

(a) Genetic drift leads to evolution

(b) Individuals with advantageous traits are more likely to survive and reproduce

(c) All traits are equally likely to be passed on to offspring

(d) Traits are acquired through environmental influences

10. Which of the following methods is commonly used to infer evolutionary relationships in molecular evolution studies?

(a) Fossil analysis

(b) Behavioral observations

(c) DNA sequencing and phylogenetic analysis

(d) Chromosome number comparisons

11. Which type of speciation occurs when a physical barrier divides a population?

(a) Sympatric speciation

(b) Parapatric speciation

(c) Allopatric speciation

(d) Peripatric speciation

12. Which of the following is an example of convergent evolution?

(a) The development of wings in bats and birds

(b) The evolution of different beak shapes in Darwin's finches

(c) The divergence of species due to geographic barriers

(d) The adaptation of different species to different ecological niches

13. Punctuated equilibrium contrasts with which other model of evolution?

(a) Catastrophism (b) Gradualism

(c) Uniformitarianism (d) Lamarckism

14. Which characteristic of the feet is unique to hominines compared to other primates?

(a) Grasping ability

(b) Long toes

(c) Arched feet for bipedal walking

(d) Flat feet

15. Which genetic marker is often used to trace paternal lineage in human evolutionary studies?

(a) Mitochondrial DNA

(b) X chromosome

(c) Y chromosome

(d) Autosomal DNA

PART B — (5 × 4 = 20 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

16. (a) Enumerate the epistatic interactions in genetics.

Or

(b) Define about polygenic inheritance.

17. (a) Distinguish aneuploidy and its potential effects on an organism.

Or

(b) Discuss about sex-linked genes and how they differ from autosomal genes.

18. (a) Articulate about Darwinism and its main components of natural selection.

Or

(b) Illustrate about directional selection and how it affects a population's trait distribution overtime?

19. (a) Conclude a molecular clock and it is used to estimate the timing of evolutionary events?

Or

(b) Discuss the significance in evolutionary biology and provide examples of convergent evolution in different organisms.

20. (a) Estimate the co-evolution and provide an example for how it occurs between species.

Or

(b) Summarize the evolution of humans from early ancestors to modern homo sapiens.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

Each answer should not exceed 600 words.

21. (a) Define genetic lethality and how does it affect inheritance pattern?

Or

(b) Describe genetic and cytological mapping of chromosomes and their significance in genetics.

22. (a) Express the potential effects on genetic function.

Or

(b) Illustrate pedigree analysis and it used to determine the inheritance pattern of genetic traits.

23. (a) Determine the gene pool and gene frequency in population genetics.

Or

(b) Write about random genetic drift and how does it affect allele frequencies in a population?

24. (a) Estimate the methods used for multiple sequence alignment and the role of these alignments in understanding evolutionary relationships.

Or

(b) Compare the contrast allopatric and sympatric speciation.

25. (a) Summarize the geological time scale and its significance in understanding Earth's history.

Or

(b) Compile the primate phylogeny from *Dryopithecus* to *Homo sapien.*

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