BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – B.Sc.(BT)-Hons-2022
Course Name – Genetics
Course Code - BBTC404
(Semester IV)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Indicate the term that refers to both the process of change in genetic material and the resulting organism with a novel phenotype

a) Variation b) Mutation
c) Adaptation d) Recombination

(ii) Predict the ultimate source of all genetic variation and evolution

a) Recombination b) Natural selection
c) Mutation d) Adaptation

(iii) DNA replication machinery can cause spontaneous mutations of addition/deletion type. Infer the cause behind this—

a) Base mismatch b) Looping out of DNA strand
c) Apurinic site d) All of these

(iv) Depurination is a cause of spontaneous mutation. Infer the reason behind depurination —

a) DNA polymerase frequently misplaces purine residues b) Purines are unstable molecules
c) Breakage of sugar-phosphate backbone at the site of a purine d) Glycosidic linkage between sugar and purine base is less stable

(v) Indicate the type of chromosome wherein the centromere is centrally placed—

a) Telocentric b) Acrocentric
c) Metacentric d) None of these

(vi) Telomeric DNA is primarily composed of which repetitive sequence?

a) AGCT b) TTAGGG
c) ATCG d) CGTAAG

(vii) Select the correct statement that describes the C value paradox?

a) Larger genomes tend to have fewer genes b) Larger genomes always correspond to higher organism complexity

c) Organisms with smaller genomes are always less complex
d) Genome size does not correlate with organismal complexity

(viii) Which of the following best describes satellite DNA?

a) DNA that codes for proteins
b) Highly repetitive DNA found in centromeres and telomeres
c) DNA involved in regulating gene expression
d) DNA responsible for mutations

(ix) Select the gene that is located near the pseudoautosomal region on the Y chromosome and plays a pivotal role in testis determination in humans

a) SRY
b) Tfm
c) TDF
d) YLF

(x) Indicate which of the following best defines genetic linkage

a) Independent assortment of genes located on same chromosome.
b) Inheritance of genes located on the same chromosome together.
c) The physical exchange of genetic material between non-homologous chromosomes.
d) The absence of crossing over during meiosis.

(xi) Predict the significance of chiasmata in meiosis

a) They represent sites of DNA replication.
b) They indicate the point of attachment between sister chromatids.
c) They mark the location of genes on a chromosome.
d) They indicate the occurrence of crossing over between homologous chromosomes.

(xii) In a study of a pea plant, researchers have identified two genes, A and B, located on the same chromosome. A dihybrid plant that is heterozygous for both genes (AaBb) is crossed with a homozygous recessive plant (aabb). The following offspring were obtained: 150--AaBb; 150--Aabb; 25--aaBb; 25--aabb. Which of the following are the genotypes of the recombinants?

a) AaBb and aabb
b) AaBb and Aabb
c) aaBb and aabb
d) aaBb and Aabb

(xiii) Indicate the highest recombination frequency that may be seen in a genetic cross if the two genes are on the same chromosome

a) 25 percent
b) 50 percent
c) 75 percent
d) 100 percent

(xiv) Indicate what does Ct value stands for in PCR analysis?

a) Concentration threshold
b) Cycle threshold
c) Critical temperature
d) Cross-linking time

(xv) Identify the statement that best defines maternal effect

a) The influence of the nuclear genotype of the father on offspring phenotype
b) The influence of the nuclear genotype of the mother on offspring phenotype
c) The influence of extranuclear genes on offspring phenotype
d) The influence of the nuclear genotype of both parents on offspring phenotype

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Describe supplementary and complementary gene interaction with suitable examples and gene ratios. (3)
3. Explain briefly about fragile sites. (3)
4. Explain the features and functions of regional centromeres. (3)
5. Write short notes on inbreeding depression in plants (3)
6. Classify lethal genes with suitable examples. (3)

OR

Categorize and explain preformation theory and theory of epigenesis. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Describe the Hardy Weinberg law and list its various assumptions. (5)
8. Explain and illustrate genomic organization and DNA packaging in eukaryotes (5)
9. Infer the reason to consider Drosophila as a model organism for genetic experiments. (5)
10. With the help of a schematic representation, chart out the method for screening of auxotrophic mutants. (5)
11. A geneticist performs a test cross involving genes A, B, and C and obtains the following data: A-B: 18% B-C: 8% A-C: 26%. Is there evidence of interference in this cross? If so, calculate the coefficient of coincidence and the interference value. (5)
12. Explain the concept of inbreeding, providing suitable examples. Summarize its various consequences. (5)

OR

Explain the concept of outbreeding, providing suitable examples. Summarize its various consequences. (5)

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