VCD: 170522 CLASS: FYBT SUB: LIFESCIENCES II- GENETICS

2 ½ Hours Total Marks: 75

N.B:

1. **All questions** are compulsory.
2. Draw **neat labelled diagrams** wherever necessary.
3. Use of **log tables** and **non-programmable calculator** is **allowed**.
4. For **Q 2, Q 3 and Q 4** attempt A and B **OR** C and D.

Q 1 Select the appropriate option for the following questions. 40

1. The alternate form of a gene is _____.
(Alternate type, Recessive character, Dominant character, Allele)
2. _____ is used to determine the inheritance of traits in humans due to inability of controlled mating. (zymogram, chromatogram, pedigree charts, bar diagram)
3. Which of the following statements is true regarding the "law of segregation"?
   a. Law of segregation is the law of purity of genes
   b. Alleles separate from each other during gametogenesis
   c. Segregation of factors is due to the segregation of chromosomes during meiosis
   d. All of the above
4. When the activity of one gene is suppressed by the activity of a non-allelic gene, it is known as _____.
(Pseudo-dominance, Hypostasis, Epistasis, Incomplete dominance)
5. How many phenotypes can occur in the human blood group ABO with alleles I^A, I^B, i? (2, 3, 4, 1)
6. The geometrical arrangement that helps to find out all the possible combinations of male and female gametes is known as _____.
(Bateson Square, Mendel Square, Punnett Square. Mendel's Cube)
7. The phenotypic ratio of dominant epistatic interaction is _____. (9:3:4, 12:3:1, 15:1, 9:7).
8. The enzyme that catalyzes the transposition of an IS element is called_____. (Integrase, Polymerase, Transposase, Transcriptase)
9. _____ can carry out natural transformation.
(*Bacillus subtilis, Escherichia coli, Salmonella typhi, Staphylococcus aureus*)
10. _____ phage can bring about specialised transduction. (P1, λ, M13, MS2)
11. When conjugation is used for mapping of genes the map unit is _____.
(Centimorgan, Micrometer, Minutes,Nanometer)
12. If a bacterium is able to synthesize histidine and Lysine but not able to metabolize lactose then the genotype will be represented as _____.
($his^+ lys^+ lac^+$, $his^- lys^+ lac^+$, $his^+ lys^- lac^-$, $his^+ lys^+ lac^-$)
13. In Griffiths experiment the capsulated and pathogenic strain was denoted as _____ strain. (S, R, P, C)
14. The group of interbreeding organisms in a population is known as _____.
(Aqua population, Mendelian population, Novel population, Darwin population)
15. If 65% of the population has brown eyes, then what is the frequency of people in the population who do not have brown eyes? (65,0.65,35,0.35)
16. The sum of genotype frequencies equals to _____. (0,1,2,3)
17. Which of the following statements is incorrect in case of Hardy-Weinberg law?
   a. This law describes the genetic imbalance within a population.
   b. The population should be randomly mating.
   c. The law shows how Mendelian principle of segregation influences allelic frequency of the population.
   d. The population should be free from mutation.

18. The full form of PAGE is _____.
(Polymerase agar gel electrophoresis, Poly agarose gel electrophoresis, Polyacrylamide gel electrophoresis, Polyactivated agarose gel electrophoresis)

19. _____ is the process by which traits evolve to make the organisms more suited for the immediate environment.
(Natural selection, speciation, DNA isolation, founder effect)

20. Which of the following is a type of genetic drift?
(Peripatric,Allopatric, bottleneck effect, ecological isolation)

Q. 2 A Some dogs bark when trailing, others are silent. The barking trait is due to a dominant gene. Standing ears are dominant to drooping ears. **07**

a. Show the cross between a homozygous standing-eared barker, and a homozygous droopy eared silent trailer.

b. Obtain the phenotype ratio using the ratio method of the F2 generation when the F1 progenies were selfed. (illustrate your answer with suitable crosses)

Q. 2 B Write a note on Multiple Alleles **04**

OR

Q. 2 C Wolves are sometimes observed to have black coats and blue eyes. Assume further that normal coat color (N) is dominant to black (n) and brown eyes (B) are dominant to blue (b). Suppose the alpha male and alpha female of a pack (these are the dominant individuals who do most of the breeding) are black with blue eyes and normal colored with brown eyes, respectively. **07**

a. What would be the F1 offsprings of the above cross?

b. After selfing the F1 progeny, Using ratio method write the expected phenotypic ratios of the offspring. (illustrate your answer with suitable crosses)

Q. 2 D Write a note on Monohybrid cross **04**

Q. 3 A Describe the process of Conjugation in detail. **07**

Q. 3 B Explain the replica plate technique **04**

OR

Q. 3 C Describe the process of generalised transduction in detail. **07**

Q. 3 D Write a note on Composite and Non-composite Transposons. **04**

Q. 4 A Calculate the genotypic and allelic frequencies for a data received from genetic variation in milkweed beetles for a locus that codes for enzyme phosphoglucomutae (PGM). **07**

Genotypes	Number
A^1A^1	04
A^1A^2	41
A^2A^2	84
A^1A^3	25
A^2A^3	88
A^3A^3	32
Total	274

Q. 4 B Explain in brief about 'Speciation'. **04**

OR

Q. 4 C A group of scientists found that there are three alleles at a locus coding for malate dehydrogenase (MDH) in the 'Water flea', *Daphnia magna* living in ponds near Cambridge, England. They were collected from ponds and genotypes were determined by electrophoresis. The following are the genotypes found- **07**

Genotypes	Number
SS	3
SM	8
SF	19
MM	15
MF	37
FF	32
Total	114

a. Calculate the frequencies of M,S and F allele in the population.

b. Determine whether MDH genotypes are in Hardy- Weinberg equilibrium.

Q. 4 D Explain natural selection with the help of an appropriate example. **04**

Q. 5 **Do as directed (Any Two)** **02**

a. **Correct the statement if incorrect:** All test crosses are back crosses and all back crosses are test crosses.

b. Define Transformation

c. Define Minimal medium

d. **Correct and rewrite the following statement**: The unit of study of molecular genetics is an individual.