Total No. of printed pages = 6

63/2 (SEM-3) ZOO 303

2021

(held in 2022)

ZOOLOGY

(Theory Paper)

Paper Code : ZOO-303

(Genetics, Cytogenetics and Genetic Engineering)

Full Marks – 80

Time – Three hours

The figures in the margin indicate full marks for the questions.

1. Answer the following multiple choice questions (all compulsory) : 1×6=6

   (a) When both homozygotes and heterozygotes for the allele show the lethal phenotype, then the allele will be called as

   (i) Dominant allele

   (ii) Essential gene

   (iii) Recessive lethal allele

   (iv) Dominant lethal allele

[Turn over

(b) When the expression of an allele of one gene alter the expression of one or more alleles of a second non-allelic gene, then the phenomenen in called as

(i) Gene interaction

(ii) Epistasis

(iii) Pleiotropic

(iv) Incomplete dominance

(c) The mt DNA encodes the following gene

(i) rRNA

(ii) tRNA

(iii) Cytochromes

(iv) All of the above

(d) Which of the following chromosome have Nucleolar Organizing Region ?

(i) Chromosome 13, 16, 22

(ii) Chromosome 13, 21, 22

(iii) Chromosome 14, 15, 23

(iv) Chromosome 14, 15, 16

(e) Which among these is not true about centromere ?

(i) It is a region of DNA sequence to which spindle fibre attach.

(ii) During cell division, it is responsible for accurate segregation of replicated chromosomes.

(iii) It has specific sequence for all eukaryotes and is not inter-changeable.

(iv) It carries out the same function in all eukaryotes.

(f) When two or more than two genes stay together during inheritance, the tendency is called as

(i) Crossing over

(ii) Penetrance

(iii) Linkage

(iv) Gene interaction.

2. Answer the following questions (all compulsory) : 2×5=10

(a) Write about the significance of different chromosome banding techniques.

(b) What do you mean by Mendelian population and effective population size ?

(c) What are epistatic and hypostatic genes ?

(d) What is a missence mutation ?

(e) Define Linker. What is its drawback ? 1+1=2

3. Answer any six of the following questions : 5×6=30

(a) Illustrate the assembly of a nucleosome and how histones interact with the nucleosomal DNA ? 3+2=5

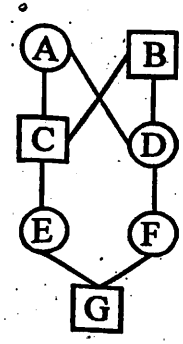
(b) Illustrate the Expressivity of a genotype with a suitable example.

(c) Write about the mechanism of elongation of telomere through telemarase.

(d) Write a short note on Chronic Myelogenous Leukemia. (CML)

(e) Illustrate molecular basis of Incomplete Dominance.

(f) Plot a path diagram for the given pedigree and determine the inbreeding coefficient of the inbred individual G, assuming that ancestor A and B are not inbred



(g) Illustrate how positive and negative assortative mating can influence the genotype and allele frequency of a population.

(h) Describe the mechanism of cDNA library construction.

(i) Write about the evidence that supports the chromosomal theory of inheritance.

4. Answer any *two* of the following long type questions : 10×2=20

(a) What do you mean by genomic imprinting ? Explain the Igf2 and H19 gene reciprocal imprinting. 3+7=10

(b) What do you mean by threshold traits ? Calculate the broad-sense and narrow-sense heritability of the following plant height variance component : $V_A = 5.0$ cm; $V_D = 2.0$ cm; V_i (Epistasis) = 0.4 cm and $V_E = 2.3$ cm.

3+7=10

(c) What is the difference between the transformation and transfection technique ? Describe the different DNA modifying enzymes used in genetic engineering.

3+7=10

5. Answer any *one* of the following very long type questions : 14×1=14

(a) What do you mean by homoplasmy and heteroplasmy ? "The inner membrane of the mitochondrion is derived from the cell membrane of the ancestral eukaryotic cell". Justify the statement with evidence.

4+10=14

(b) What do you mean by Polyploidy ? Illustrate the different types of abberation found in chromosomal structure with suitable examples.

2+12=14