


Name:			
Enrolment No:			
UPES End Semester Examination, May 2024			
Course: GENETICS Program: B. Tech Biotechnology Course Code: HSBT2006 Instructions: Attempt all Questions		Semester: IV Time: 03 hrs MM: 100	
Q.No	Section A MCQs/Short answer questions/True &False	(20x1.5= 30 Marks)	COs
Q	Statement of question (each question carries 1.5 marks)		CO
1.	What is an allele? a) Characteristics of an organism b) Alternate forms of genes c) Homologous chromosomes d) Pair of centrioles	1.5	CO1
2.	Name the phenomenon where two genes have the same expression of the character. a) Pleiotropy b) Phenocopy c) Penetrance d) Expressivity	1.5	CO1
3.	Name the cross by which the law of independent assortment is inferred. a) Dihybrid cross b) Monohybrid cross c) Test cross d) Back cross	1.5	CO1
4.	Which of the following describes the inheritance controlled by cytoplasmic genes? a) Extranuclear inheritance b) Heritability c) Environmental factors d) Complex trait	1.5	CO1
5.	Name the effect which shows the determination of character by the genotype of a female parent. a) Cytoplasmic male sterility b) Probability c) Random mating d) Maternal effect	1.5	CO1
6.	Which of the following ratio shows complementary gene interaction? a) 9:7 b) 15:1 c) 1:2:1 d) 9:3:3:1	1.5	CO2
7.	Compare between "genome and epigenome"?	1.5	CO2
8.	What are piRNAs?	1.5	CO3

9.	Compare between IVF and ICSI.	1.5	C03
10	State "True" or " False" DNA methylation in CpG islands leads to transcriptional silencing of the downstream target gene.	1.5	C02
11	What is epistasis? a) Type of linkage b) Masking or modifying gene effect c) Upper portion of a chromosome d) Group of genes	1.5	C02
12	Which of these genes is responsible for the development of the sex of Drosophila? a) Xce b) Xist c) XIC d) Sxl	1.5	C04
13	Which one of the following has dominant allele in both gene locus? a) Black b) Albino c) Agouti d) White	1.5	C04
14	Barr bodies are found _____ a) In the cytoplasm of female b) In the nuclei of female c) In the cytoplasm of male d) In the nuclei of male	1.5	C04
15	RNA molecules that act as enzymes are referred to as: a) RNA polymerase b) Protein c) Ribozymes d) Splice	1.5	C03
16	You generate a fluorescent probe against a gene that has been deleted. You expose the DNA to the probe and observe it under fluorescent microscope. What will you see? a) Fluorescence will correspond to the gene of interest b) There will be several regions that emit fluorescence c) Most parts of the chromosome emit fluorescence d) Nothing is seen under the fluorescence microscope	1.5	C03
17	Micro RNAs participate in _____ a) posttranslational modification b) posttranscriptional modification c) chromatin remodeling d) gene silencing	1.5	C03
18	Deletion of a region led to over-expression of a gene X. What do you conclude from this observation? a) Part of gene X is mutated b) Promoter of gene X is deleted c) Regulator of gene X is deleted d) No effect on gene X or its regulators	1.5	C03

19	The _____ mouse is lethal. a) Homozygous white b) Homozygous black c) Heterozygous agouti d) Homozygous yellow	1.5	C04
20	Dominant lethal alleles are quickly removed from the pool while the recessive ones remain. a) True b) False	1.5	C04
Section B		(4x5=20 Marks)	C0
Q	Statement of question (each question carries 5 marks)		
1.	(a) With the help of a crossing scheme, give the molecular mechanism that leads to the lethal yellow mutation in wild-type agouti mice. (b) Compare “loss of function” and “gain of function mutations”. Give relevant examples for each.	3+2	C01
2.	(a) Briefly discuss the complementation analysis test. (b) Compare penetrance and expressivity.	4+1	C02
3.	With relevant examples and crossing schemes compare i) Dominant Epistasis ii) Recessive Epistasis	5	C03
4.	Differentiate between the following mentioning the karyotype and listing the phenotypes associated with the syndromes: (a) Down syndrome (b) Turner syndrome	5	C04
Section C		(2x15=30 Marks)	
Q	Statement of question (Case studies) (each question carries 15 marks)		C0
1.	A bacteriophage infects E.coli and transfers its genetic material inside the host cell. Host cells (E.coli) have an innate and adaptive response to curb the consequence of phages' infection. a) Compare “innate” and “adaptive” defense strategies against viral infection in prokaryotes. b) In the context of adaptive immunity, that cleaves the exogenous viral genome, discuss the following three stages: i). Acquisition ii). crRNA biogenesis iii). Interference c) Discuss how a bacterial enzyme differentiates between self and target viral genome before initiating the cleavage. d) What is the function of: i). Cas protein	15 (4+6+3+2)	C03

	ii). Spacers, in this RNA-Guided viral defense mechanism prevalent in prokaryotes		
2.	<p>In relevance to the above diagram, answer the following questions:</p> <ol style="list-style-type: none"> Which sncRNA is regulating the gene expression in this diagram? Label A-F State the functions of C, D, and E Outline the steps involved in the process, shown above. Discuss how exogenous RNA-guided gene expression regulation is different from the one shown here. 	15 (1+6+3+3+2)	C04
	Section D	(2x10=20 Marks)	
Q	Statement of question (each question carries 10 marks)		C0
1.	<ol style="list-style-type: none"> Discuss the mechanisms for histone modifications, as a means to introduce epigenetic alteration in a genome. With the help of relevant examples compare mutations that are “Monosomy” and “Trisomy” in nature. 	5+5	C03
2.	<ol style="list-style-type: none"> What are transposable elements? Briefly describe the elements of a transposon that facilitate its transposition. Give a detailed account of the mechanism of X-chromosome inactivation. Draw a well-labeled diagram for the same. 	5+5	C02