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B.Tech DEGREE EXAMINATION, NOVEMBER 2023

Third Semester

18BTC104T - GENETICS AND CYTOGENETICS

(For the candidates admitted during the academic year 2020 - 2021 & 2021 - 2022)

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks)

Answer **all** Questions

		Marks	BL	CO
1.	In Mirabilis jalapa when homozygous red flowered and white flowered plants are crossed, all F1 plant have pink coloured flowers. By self fertilization of F1, F2 produces red, pink and white flowered plants. What will be the ration of F2? (A) 1:1:1:1 (B) 3:1 (C) 1:2:1 (D) 2:1	1	1	1
2.	Sex determination in turtles in determined by (A) genie sex determination (B) environmenta factor (C) haplodiploidy (D) genic balance	1	1	1
3.	Dominant allele of a gene that masks the effect of another non-allelic gene is called as (A) Hypostatic gene (B) Epistatic gene (C) Complementary gene (D) Duplicate gene	1	2	1
4.	Dominant epistasis ratio with A as epistatic gene 12:3:1 corresponds to ___ (A) A/-B/-:A/-b/b:a/aB/- (B) a/aB/-:a/ab/b:a/ab/- (C) A/AB/-:A/-B/-:a/ab/b (D) A/- -/- : a/a B/-: a/a b/b	1	2	1
5.	The monohybrid phenotypic and genotypic ratio is same in the case of _____ (A) Multiple Allele (B) Codominance (C) Incomplete Dominance (D) Normal dominant recessive relation	1	1	2
6.	Percentage of crossing over is more when (A) genes are located in a different cell (B) genes are not linked (C) linked genes are located close to each other (D) linked genes are located far apart from each other	1	1	2
7.	If the percentage of crossing over between two genes is 10, then the distance between two genes will be (A) 5 cM (B) 10cM (C) 20cM (D) 40cM	1	2	2
8.	If a daughter of a colour blind person marries a normal man then their progenies will be (A) Half of their daughters are colour blind (B) Half of their sons are colour blind (C) All the sons are colour blind (D) All the daughters are colour blind	1	2	2

9.	The pattern of inheritance of colour blindness is (A) Y-Linked (B) X-Linked (C) Autosomal dominant (D) Autosomal recessive	1	1	3
10.	The pattern of sex determination in honeybee is (A) Gametogony (B) Gametic diploidy (C) Female haploidy (D) Haplodiploidy	1	1	3
11.	During meiosis, when does chromatid disjunction occur? (A) Prophase (B) Metaphase (C) Anaphase (D) Telophase	1	2	3
12.	The gene mutation in which the codon for one amino acid is changed (A) Silent Mutation (B) Missense Mutation (C) Nonsence Mutation (D) Synonymous mutation	1	2	3
13.	During transformation when DNA enters the cell which among the following enzymes acts first (A) ligases (B) endonucleases (C) deoxyribonucleases (D) exonucleases	1	1	4
14.	The F^- cell receives Hfr chromosome in a _____ fashion. (A) Circular (B) coiled (C) dimer (D) linear	1	1	4
15.	What is the term used when a phage DNA is integrated into the host genome? (A) Transductant (B) Transformant (C) Prophage (D) Ysogen	1	2	4
16.	What is the frequency of defective phage particles in progeny phage produced? (A) 100 (B) 10-5 (C) 10 -1 (D) 1000	1	2	5
17.	A locus is said to be polymorphic when the frequency of the most common allele is (A) 99 (B) 1 (C) >0.99 (D) 2	1	1	5
18.	The population that is more susceptible to genetic drift is (A) Large population (B) Island population (C) Small Population (D) Outbreeding population	1	1	5
19.	Hardy Weinberg equilibrium states that (A) $p^2+q^2+2pq=1$ (B) $p^2+q^2=1$ (C) $p- q^2+2pq=1$ (D) $p^2+q^2-2pq=1$	1	2	6
20.	Genetic equilibrium occurs in a population due to (A) selection and mutation acting in same direction (B) mutation (C) selection and mutation acting in opposite direction (D) selection	1	2	6

PART - B (5 × 4 = 20 Marks)

Answer **any 5** Questions

		Marks	BL	CO
21.	Brief on Epistasis.	4	3	1
22.	Define law of segregation	4	2	1
23.	What is criss cross pattern of inheritance?	4	1	2
24.	Write a note on codominance with an example	4	2	3

25.	Define Linkage. How many linkage groups are observed in humans.	4	2	4
26.	Write a note on FISH technique.	4	1	4
27.	What is genetic equilibrium and when can it be achieved?	4	3	5

PART - C (5 × 12 = 60 Marks)

Answer **all** Questions

		Marks	BL	CO
28.	(a) Explain the pattern of inheritance of two genes present in non-homologous chromosomes.	12	2	1
	(OR)			
	(b) With a proper example explain the pattern of inheritance of X-linked genes?			
29.	(a) How would you map gene in human to its specific linkage group?	12	4	2
	(OR)			
	(b) Assume that in Drosophila there are three pairs of alleles, +/st , +/e and +/ss. Each mutant allele is recessive to its wild type allele. A cross between females heterozygous at these three loci and wild type males yielded the following progeny:			

Female	Male	Number of progeny
st e ss/ st e ss	st e ss/ y	479
+ + +/ st e ss	+ + +/ y	465
st + +/ st e ss	st + +/ y	6
+ e ss/ st e ss	+ e ss/ y	9
st + ss/ st e ss	st + ss/ y	13
+ e +/ st e ss	+ e +/ y	28

Draw the appropriate linkage map for these data showing the order of the three markers and the map distance for each marked interval. Calculate the coefficient of coincidence for these data and also discuss on the interference.

30.	(a) What is Ploidy? How is it classified ? Explain.	12	3	3
	(OR)			
	(b) What is amniocentesis? How is it performed and used in analyzing mutation?			
31.	(a) Brief on the mapping of gene using generalized transduction.	12	1	4
	(OR)			
	(b) Explain the role of plasmid in mapping of bacterial gene.			
32.	(a) How does random genetic drift and selection significant in determining allele frequency.	12	2	5
	(OR)			
	(b) Out of the 355 Indians, the allele frequencies of I^O, I^A, and I^B blood alleles were 0.65, 0.20, and 0.15, respectively. Calculate the percentage of individuals with O, A, B, and AB type blood			

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