CAREER ENDEAVOUR
Best Institute for IIT-JAM, NET & GATE

CSIR-UGC-NET/JRF LIFE SCIENCES
TEST : GENETICS

Time : 60 Minutes **Date : 11-10-2019**
M.M. : 60

INSTRUCTION:

1. **There are two parts. Part-B contains 10 objective type questions, each question carry 2 marks and Part-C contains 10 objective type questions, each question carry 4 marks.**
2. **There is negative marking, @ 25% will be deducted for each wrong answer.**
3. **Attempt all the questions, use of calculator is not allowed.**

PART-B

1. A cross was made between AABBCCDDEE and aabbccddee. The resultant F1 wereselfed. Applying Mendelian principle, Predict the proportion of phenotype showing all the recessive characters in F2 generation.
   a) 1/64 b) 1/256 c) 1/512 d) 1/1024
2. Blood group type A and B antigen are complex oligosaccharide which differs from H antigen present in type O individuals in Human RBC. Which of the following is true for A and B antigens?
   a) Extra terminal sugar, N-acetyl galactosamine in A antigen and galactose in B antigen respectively
   b) Extra terminal sugar, galactose in A antigen and N-acetyl galactosamine in B antigen respectively
   c) Extra terminal sugar, galactose in both A antigen and B antigen respectively
   d) Extra terminal sugar, glucose in both A antigen and B antigen respectively
3. Cross between two plants of pure bred having yellow cotyledon and green cotyledon produces all yellow cotyledon F1 progeny. However, selfing the F1 results both yellow and green cotyledon plants in F2 generation. What is the probability of plant with yellow cotyledon?
   a) 1/4 b) 3/4 c) 100% d) 4/3
4. Both husband and wife have normal vision though their fathers were colour blind. The probability of their daughter becoming colour blind is
   a) 0% b) 25% c) 50% d) 75%
5. A cross was made between 6-cm and 34-cm height plants, all F1 plants were 20 cm. In the F2 generation, a continuous range of heights was observed, where 3 of 192 F2 progeny were as short as the 6-cm P1 parent. Which of the following is true about the F2 population?
   a) Most of the F2 plants will show 6 cm and 34 cm height
   b) Most of the F2 plants will show 34 cm height.
   c) Most of the F2 plants will show 6 cm height.
   d) Most of the F2 plants will show 20 cm height.

6. QTLs called as Quantitative trait locus is the region of a chromosome which contain
   a) one or more genes which contribute to a quantitative trait.
   b) one or more genes which contribute to a qualitative trait.
   c) only one gene that contribute to a quantitative trait.
   d) many genes but does not associate to any quantitative trait

7. Two highly inbred tobacco plants are crossed. Flower colour is a quantitative trait and control by two genes, each allele having an additive effect. One has red flowers and the other has white flowers. The F1 have pink flowers of intermediate colour. From the selfing of F1 (F1 X F1) a continuous variation in flower colour red, intermediate colour, white was observed in F2 plants. What is the frequency of F2 plants either red or white flower colour?
   a) 1/4 b) 1/8 c) 1/16 d) 1/32

8. Which of the following is NOT a usage for chromosome banding and karyotyping?
   a) Using banding and karyotyping to tell whether someone has blue or brown eyes.
   b) Using banding and karyotyping to tell whether someone has an extra Chromosome 21.
   c) Using banding and karyotyping to see an abnormally shaped chromosome.
   d) Using banding and karyotyping to see the similarities between your genes and a chimpanzee's

9. Dicentric chromatid that has two centromeres is the characteristics of
   a) when single crossing over within the inversion loop of paracentric inversion region of chromosome.
   b) When no crossing over in the inverted arms/loop.
   c) When crossing over within the inversion loop of pericentric inversion of chromosome regions.
   d) None of the above.

10. If non-disjunction occurs in the meiosis-1, which of the following gametes will be formed?
   a) Only two type of gametes, n+1 and n-1 b) Only two type of gametes, n and n-1
   c) Only two type of gametes, n and n+1 d) Gametes of the type, n , n+1 and n-1

PART-C

11. Given is a hypothetical grid of data from somatic cell hybrid experiment of human chromosomes. used in synteny testing to assign genes to their appropriate human chromosomes. Gene products A, B, C, and D are detected from the hybrid cell lines 23, 34, 41. From the given data gene B is located on which chromosome?

Hybrid cell lines	Human chromosomes present								Gene products expressed			
	1	2	3	4	5	6	7	8	A	B	C	D
23									–	+	–	+
34									+	–	–	+
41									+	+	–	+

   a) Chromosome 2 b) Chromosome 3
   c) Chromosome 4 d) Chromosome 6

12. An organism of diploid genome has three genes A, B, and C. True breds of individuals of the genotypes AABBCC and triple recessive mutants are crossed. The F1 AaBbCc was test crossed to its triple recessive mutants. The phenotypes of the F2 progenies are recorded as follows.

Genotypes	**progenies**
AbBbCc	300
aaBbCc	100
aaBbcc	16
AabbCc	14
AbBbcc	65
aabbCc	75
Aabbcc	120
aabbcc	310
Total	1000

What is the gene order and map distance between A to B, and B to C?

a) ABC; 25 and 17 mu respectively
b) BAC; 25 and 17 mu respectively
c) ABC; 17 and 8 mu respectively
d) BAC; 17 and 8 mu respectively

13. If the a and b are two loci of mutant in algae Chlamydomonas. A cross between the two-mating type ab X++ was performed. 100 asci were selected and observed fthe genotype of the spores. It was found the proportion of the ascus with parental ditypes (PD) are equal to the nonparentalditypes (NPD), irrespective of the tetratypes (TT). Which of the conclusion is true for the a and b loci?

a) a and b are linked.
b) a and b are on the different chromosome.
c) a assorts independent to b during the gamete formation.
d) Both b and c

14. Following are the statements regarding R-banding of metaphase chromosome

A) The techniques can be used to identify chromosomes but cannot be used to diagnose chromosomal aberrations in human.
B) It is the reversed of the G-banding
C) It displays a typical chromosome pattern of dark bands -GC rich regions and light bands – AT rich regions.
D) It displays a typical chromosome pattern of dark bands -AT rich regions and light bands – GC rich regions.

Which of the above statements are true?

a) A and B only
b) A, B and C
c) B and C only
d) A and D only

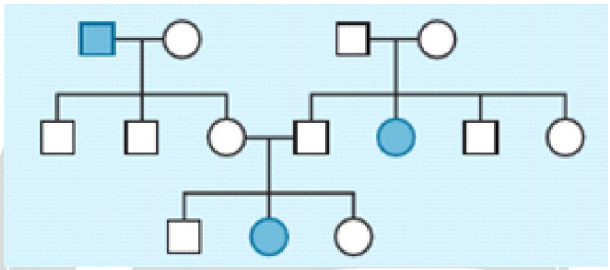
15. Haemophilia, is a recessive X-linked trait in human A population has affected male in the frequency of 2 individuals per 100 males. What is the frequency of the homozygous female affected with haemophilia?

a) 0.02 b) 0.04 c) 0.0004 d) 0.98

16. An insect species is discovered in which the female is heterogametic sex. An X-linked recessive mutation for reduced wing (*rw*) is discovered. A crossed was made between female with reduced wing and male homozygous for the normal wing. What is the probability of the among the 100 F2 progenies obtained from the selfing of F1 individuals,

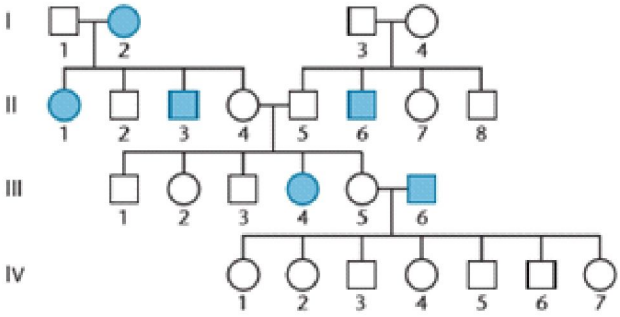
a) 47 normal wing females: 26 normal males: 27 reduced wing males
b) 47 normal wing males: 26 normal females: 27 reduced wing females
c) 47 normal wing males: 53 reduced wing females
d) 47 normal wing males: 53 normal wing females

17. The following is pedigree of a family of three generations suffering from myopia (near sightedness) due to mutation in A^M allele. Determine the inheritance of the traits/ disease in the family and probable genotype of the individuals, II-3 and II-4.



a) Autosomal dominant, A^MA^M and A^MA^m
b) Autosomal dominant, A^MA^m and A^MA^m
c) Autosomal recessive, A^MA^m and A^MA^m
d) Autosomal recessive; A^MA^m and A^mA^m

18. Consider the following pedigree in a family having albinism, an autosomal recessive disorder.



If the allele A and a control the expression of the trait, identify the confirmed carrier individuals in this pedigree.

a) I-1, I-3, I-4, II-4, II-5, III-5
b) I-1, I-3, I-4, II-4, II-5
c) I-1, I-3, II-4, II-5, III-5
d) I-1, I-3, I-4, II-4, II-5, III-5, III-6

19. In *E. coli,* four Hfr strains donate the following genetic markers shown in the order donated:

Strain 1:	Q	W	D	M	T
Strain 2:	A	X	P	T	M
Strain 3:	B	N	C	A	X
Strain 4:	B	Q	W	D	M

All of these Hfr strains are derived from the same F^+ strain. What is the order of these markers on the circular chromosome of the original F^+?

a) Q, W, D, M, T, P, X, A, C, N, B
b) Q, W,D,M, T, P, X, A, N, C, B
c) B, Q, D, M, P,T ,A, X ,N, B, C
d) A, X , P, W, D , M ,B , N, C, Q

20. A cross was performed between two double heterozygous agouti colour mice (AaBb). Allele A codes agouti coat colour, whereas recessive homozygous aa produces black coat colour. Recessive homozygous mutation of another gene, bb, is epistatic to A or a locus and it results albino mice (colourless) regardless of the A locus. What is the probability that the F1 progeny obtained albino colour mice?

a) 9/16
b) 3/16
c) 4/16
d) 7/16

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[ANSWERS]

PART-B

1. (d)	2. (a)	3. (b)	4. (a)	5. (d)	6. (a)	7. (b)
8. (a)	9. (a)	10. (a)				

PART-C

11. (b)	12. (a)	13. (d)	14. (c)	15. (c)	16. (c)	17. (c)
18. (b)	19. (a)	20. (c)				