IIT-JAM BIOTECHNOLOGY - BT
TEST : GENETICS

Time : 45 Minutes

Date : 14-08-2017
M.M. : 50

INSTRUCTION:

1. Attempt all the questions.

2. **Section-A** contains **20** Multiple Choice Questions (MCQ). Each question has 4 choices (a), (b), (c) and (d), for its answer, out of which **ONLY ONE** is correct. From **Q.1 to Q.10** carry **1 Mark** and **Q.11 to Q.20** carries **2 Marks** each.

3. **Section-B** contains **5** Multiple Select Questions(MSQ). Each question has 4 choices (a), (b), (c) and (d) for its answer, out of which **ONE or MORE than ONE** is/are correct. From **Q.21** to **Q.25** carries **2 Marks** each.

4. **Section-C** contains **5** Numerical Answer Type (NAT) questions. **Q.26 to Q. 30** carries **2 Marks** for each NAT type question.

5. In all sections, questions not attempted will result in zero mark. In **Section–A** (MCQ), wrong answer will result in negative marks. For all **1 mark** questions, **1/3 marks** will be deducted for each wrong answer. For all **2 marks** questions, **2/3 marks** will be deducted for each wrong answer. In **Section–B** (MSQ), there is no negative and no partial marking provisions. There is no negative marking in **Section–C** (NAT) as well.

SECTION – A

1. An example of a "testcross" would be:
   (a) an unknown against a homozygous dominant
   (b) an unknown against an unknown
   (c) an unknown against a homozygous recessive
   (d) none of the above

2. If you were conducting a testcross with an unknown individual for one allele and you found the offspring to be 50% one phenotype and 50% the other, what was the genotype of the unknown?
   (a) homozygous dominant
   (b) heterozygous
   (c) homozygous recessive
   (d) can't tell from this information

3. If you crossed two pea plants that were heterozygous for pea shape [smooth (S) dominant to wrinkled (s)] and flower color [purple (P) dominant to white (p)], what genotypic ratio would you expect?
   (a) 9:3:3:1   (b) 1:1:1:1
   (c) 1:2:2:2:2:1:2:2:1:1   (d) None of the above

4. Backcrossing can be used to:
    (a) create an individual that is genetically more like one of its parents
    (b) create a completely unique individual
    (c) create an individual that is more like one of its siblings
    (d) save an endangered species

5. If you were to cross a purple flowered individual with the genotype Pp (purple is dominant to white) with another purple flowered individual with the genotype PP, what phenotype ratio would you expect?
    (a) 100% of the offspring will be purple flowered (1:0)
    (b) 50% will be purple flowered and 50% will be white flowered
    (c) 100% of the offspring will be white flowered (0:1)
    (d) none of the above

6. If you conducted a dihybrid cross for pea color [Green (G) is dominant to yellow (g)] and plant height [Tall (T) is dominant to short (t)], what phenotypic ratio would you expect?
    (a) 9:3:3:1   (b) 1:1:1:1
    (c) 1:2:2:2:2:1:2:2:1:1   (d) None of the above

7. If you cross two ladybugs that have spots and stripes (two co-dominant traits), what would the phenotypic and genotypic ratios be in the offspring (in that order)?
    (a) 1:2:1 and 3:1   (b) 3:1 and 1:2:1
    (c) 3:1 and 3:1   (d) 1:2:1 and 1:2:1

8. If you conduct a testcross with an individual with an unknown genotype that has green peas and purple flowers (Green-G is dominant to yellow-g and purple P is dominant to white-p), what phenotypic ratio would you expect in your offspring if your unknown was heterozygous for green and homozygous for purple?
    (a) 1/2 would be green purple and 1/2 would be yellow purple
    (b) 1/2 would be green purple and 1/2 would be green white
    (c) 1/2 would be green white and 1/2 would be yellow white
    (d) none of the above

9. The Punnett Square was created by Reginald Punnett and will show you:
    (a) the probability of different phenotypes in the next generation
    (b) the phenotypes of the next generation
    (c) the genotypes of the next generation
    (d) all of the above

10. The Principle of Independent Assortment indicates that:
    (a) when gametes are formed, all traits will be inherited independently
    (b) when gametes are formed, unlinked alleles will assort independently
    (c) gametes will contain one copy of each chromosome
    (d) gametes will contain chromosomes that have undergone crossover events

11. Coat color in rabbits is genetically determined. The progeny of two individuals possess 25% white coat color, 25% brown colored and 50% rabbits with white-brown patches. Which of the following is correct?
    (a) both white and brown are recessive alleles
    (b) both white and brown are co-dominant alleles
    (c) allele for patches is dominant over alleles for brown color and white color
    (d) brown allele is dominant over white alleles

12. Different alleles of the same gene occur on
    (a) same chromosomes
    (b) non-sister chromatids of homologous chromosomes
    (c) sister chromatids of non-homologous chromosomes
    (d) non-sister chromatids of non-homologous chromosome

13. Cross between AaBB and aaBB will form
    (a) 1 AaBB :laaBB   (b) All AaBB
    (c) 3AaBB :laaBB   (d) 1 AaBB : 3aaBB

14. Blue eye colour is recessive to brown eye colour. A brown eyed man whose mother was blue eyed marries a blue-eyed woman. The children will be
    (a) both blue eyed and brown eyed 1 : 1   (b) all brown eyed
    (c) all blue eyed   (d) blue eyed and brown eyed 3:1.

15. A man of A-blood group marries women of AB blood group. Which type of progeny would indicate that man is heterozygous A?
    (a) AB   (b) A   (c) O   (d) B

16. When two heterozygous individuals are mated, the percentage of homozygous dominant individuals will be
    (a) 0   (b) 25   (c) 50   (d) 100

17. A child of O-group has B-group father. The genotype of father will be
    (a) $I^\circ I^\circ$ (b) $I^B I^B$ (c) $I^A I^B$ (d) $I^B I^\circ$.

18. The phenotypic ratio of a monohybrid F2 progeny exhibiting incomplete dominance will be
    (a) 3:1   (b) 1:2:1   (c) 9:3:3:1   (d) 1:1:1:1

19. When an F1 individual, heterozygous for 2 characters is crossed with a recessive individual , the phenotypic ratio for the F2 generation would be:
    (a) 9:3:3:1   (b) 1:2:1   (c) 1:7:7:1   (d) 1:1:1:1

20. Pure bred green pea plants with round seeds are crossed with pea plants having green wrinkled seeds. The progeny will be
    (a) 9:3:3:1   (b) Insufficient data   (c) All green round   (d) all green wrinkled

SECTION – B

21. Inbreeding
    (a) increases the rate of mutation
    (b) increases the proportion of homozygous individuals in a population
    (c) never occurs in plants
    (d) all of the above

22. Genetics is the study of
    (a) theultastructure of cells and their functions
    (b) transmission of characters from parents to offspring
    (c) morphological, physiological and cytological differences among individuals
    (d) the genomes of individuals in a population

23. Which of the following is correct with respect to incomplete dominance?
    (a) alleles are partially dominant
    (b) heterozygotes express intermediate phenotypes
    (c) The phenotypic effect of each allele is observed in the heterozygotes
    (d) The genotypic and phenotypic ratios are the same

24. In a heterozygous cell, the recessive allele
    (a) is deleted
    (b) is expressed in minute quantities without any observable effects
    (c) expresses in homozygous condition
    (d) is only partially dominant

25. Early ideas about heredity include
    (a) traits can be masked in some generations
    (b) traits were segregated among progeny
    (c) alleles do not influence each other
    (d) traits are transmitted directly

SECTION – C

26. In a certain breed of dogs, brown fur is dominant over white, brown eyes are dominant over grey and tall height is dominant over short height. A dog homozygous for brown fur, brown eyes and short height, mates with another dog homozygous for white fur, brown eyes and short height. The percentage of F1 generation that will have brown fur, brown eyes and short height will be _____.

27. From the crosses TTYyRr x TtYyrr, what proportion of the offspring would be expected to be
    (a) tall plants with round, yellow seeds
    (b) tall plants with round, green seeds
    (c) dwarf plants with round, green seeds
    (d) tall plants with yellow, wrinkled seeds

28. In cattle, the gene for hornless (H) is dominant to the gene for horned (h), the gene for black (B) is dominant to that of red (b), and the gene for white face (or Hereford spotting) (S) is dominant to that for solid color (s). A cow with the genotype BbHhSs is inseminated by a bull of the genotype bbhhSs. What is the probability of the calf's being:
    (a) a black, hornless cow with Hereford spotting
    (b) a red, horned bull with solid color
    (c) a red, hornless bull with Hereford spotting

29. In a cross PPQQRR x ppqqrr, how many different kinds of F2 genotypes would be expected?   _____.

30. In a local court, a woman is suing a male acquaintance for financial support of her recently born child. If the woman is blood type B, Rh+, and the baby is type O, Rh-, and the man is blood type AB, Rh-, what are her chances of success in the lawsuit? _____

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ANSWER KEY

SECTION – A

1. (c)	**2.** (b)	**3.** (d)	**4.** (a)	**5.** (a)
6. (a)	**7.** (d)	**8.** (d)	**9.** (d)	**10.** (a)
11. (b)	**12.** (b)	**13.** (a)	**14.** (a)	**15.** (d)
16. (b)	**17.** (d)	**18.** (b)	**19.** (d)	**20.** (c)

SECTION – B

21. (a, b)	**22.** (b, c)	**23.** (a, b, d)	**24.** (b, c)
25. (b, d)			

SECTION – C

26. 100%

27. (a) 3/8   (b) 1/8   (c) 0   (d) 3/8

28. (a) 3/32   (b) 1/32   (c) 3/32

29. (27)

30. (0)