

本試題是否可以使用計算機: 可使用, 不可使用 (請命題老師勾選)

Part I (選擇題每題 5 分, 單選; 共 80 分)

If a given population of diploid organisms contains a polymorphic DNA sequence motif that has five alleles in a particular gene (i.e., alleles 1, 2, 3, 4 and 5)

1. How many different genotypes are possible in the population? (a) 15 (b) 25 (c) 32 (d) 5.
2. If all homozygotes are lethal, how many different genotypes are possible in the population? (a) 27 (b) 10 (c) 20 (d) 0.
3. If all genotypes involve alleles 1 or 5 are lethal, how many different genotypes are possible in the population? (a) 13 (b) 30 (c) 0 (d) 23.

A man has a Y-linked disorder and married to a normal healthy woman. Consider the following questions:

4. What is the probability for him having a daughter? (a) 1 (b) 0.5 (c) 0.25 (d) 0.
5. What is the probability for him having an affected daughter? (a) 1 (b) 0.5 (c) 0.25 (d) 0.
6. What is the probability for him having an affected son? (a) 1 (b) 0.5 (c) 0.25 (d) 0.

The F1 from a cross of $AB/AB \times ab/ab$ is test-crossed,

7. how many different genotypes can be generated? (a) 3 (b) 4 (c) 9 (d) 16.
8. If the F1 is backcross to ab/ab , how many different genotypes can be generated? (a) 3 (b) 4 (c) 9 (d) 16.

In a population study, heterozygosity of loci A and B are 0.2 and 0.3, respectively. Consider the following questions:

9. What is the probability that an individual is heterozygote at both loci? (a) 0.5 (b) 0.23 (c) 0.06 (d) 0.44.
10. What is the probability that an individual is at least heterozygote at one locus? (a) 0.5 (b) 0.23 (c) 0.06 (d) 0.44.
11. How many individuals do we need to screen in order to obtain 100 people are heterozygote for at least one locus (a) 227 (b) 200 (c) 252 (d) 278.

A normal chromosome has the gene sequence as $ABCD * EFGH$ where the “*” in between two blocks of genes indicate centromere region. Determine the chromosomal mutation illustrated by each of the following chromosomes.

12. $ABD * EFGH$ (a) deletion (b) duplication (c) inversion (d) translocation.
13. $ABCFE * DGH$ (a) deletion (b) duplication (c) inversion (d) translocation.
14. $ABCD * EFEFGH$ (a) deletion (b) duplication (c) inversion (d) translocation.

(背面仍有題目, 請繼續作答)

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15. $AD * EFBCGH$ (a) deletion (b) duplication (c) inversion (d) translocation.

Insulin deficiency is

16. associated with (a) an increase in the blood levels of long chain fatty acid. (b) an accumulation of ketones which may lead to acidosis and dehydration (c) a decrease in the blood levels of long chain fatty acid. (d) A and B.

Part II (簡答題; 共 20 分)

What is genomic imprinting? Give an example for known human imprinting gene. (10 分)

Briefly explain the following terms (每題 2.5 分)

1. MicroRNA
2. Stem cells
3. Operon
4. DNA methyltransferase