

系所組別： 分子醫學研究所

考試科目： 生命科學

考試日期： 0226，節次： 3

Part I (選擇題每題 4 分，單選；共 80 分)

A woman is a carrier of hemophilia, an X-linked disorder. Consider the following questions:

1. What is the probability for her having a son? (a) 1 (b) 0.5 (c) 0.25 (d) 0.
2. What is the probability for her having an affected son? (a) 1 (b) 0.5 (c) 0.25 (d) 0.
3. What is the probability for her having an affected daughter? (a) 1 (b) 0.5 (c) 0.25 (d) 0

In Guinea pigs rough coat (R) is dominant over smooth coat (r). A rough-coated guinea pig is bred to a smooth one, giving eight rough and seven smooth progeny in the F_1 ,

4. What are the genotype of parents (a) $RR \times rr$ (b) $Rr \times rr$ (c) $RR \times RR$ (d) $rr \times rr$.
5. What are the genotype of the F_1 (a) all RR (b) all rr (c) RR and rr (d) Rr and rr .
6. If one of the rough F_1 offspring mated to its rough parent, what progeny would you expect? (a) all rough (b) all smooth (c) 3/4 rough and 1/4 smooth (d) 1/2 rough and 1/2 smooth.
7. If one of the rough F_1 offspring mated to its smooth parent, what progeny would you expect? (a) all rough (b) all smooth (c) 3/4 rough and 1/4 smooth (d) 1/2 rough and 1/2 smooth.

In a population study, 10000 individuals were typed for the MN locus, an autosomal recessive trait. There are 6400 MM individuals in the population. Consider the following questions:

8. What is the allele frequency for the N alleles? (a) 1 (b) 0.8 (c) 0.2 (d) 0.04.
9. What are the expected numbers of NN individuals in the population? (a) 3600 (b) 5000 (c) 3200 (d) 400.
10. A mutation that causes a truncation of peptide chain by introducing a stop codon into the sequences in the gene product is called (a) Frameshift mutation (b) Silence mutation (c) Nonsense mutation (d) Missense mutation

If a given population of diploid organisms contains three, and only three alleles of a particular gene (i.e., alleles 1, 2, and 3),

11. How many different genotypes are possible in the population? (a) 3 (b) 2 (c) 8 (d) 6.
12. If all homozygotes are lethal, how many different genotypes are possible in the population? (a) 3 (b) 2 (c) 8 (d) 6.

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.

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

(背面仍有題目,請繼續作答)

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15. $ABCD * EFEFGH$ (a) deletion (b) duplication (c) inversion (d) translocation.
16. $AD * EFBCGH$ (a) deletion (b) duplication (c) inversion (d) translocation.
17. Insulin deficiency is associated with (a) an increase in the blood levels of long chain fatty acid. (b) an increase of DNA replication and protein synthesis (c) a decrease in the accumulation of ketones bodies which may lead to acidosis and dehydration (d) a decrease in glycogenolysis.
18. Which of the following is a peptide hormone?
- (a) glucocorticoid
 - (b) estrogen
 - (c) insulin
 - (d) prostaglandin
19. Which of the following metabolic pathway does not require oxygen?
- (a) Glycolysis
 - (b) Oxidative phosphorylation
 - (c) The breakdown of fatty acids to CO_2 and H_2O
 - (d) The Krebs cycle
20. Which of the following diseases is caused by autoimmune dysfunction
- (a) Diabetes
 - (b) Gastric Ulcer
 - (c) Greave's disease
 - (d) Miscarriage

Part II (簡答題每題 10 分；共 20 分)

1. Describe briefly the regulatory mechanism of gene expression in eukaryotic cells?
2. What are the features of a "nucleosome"?