

Part I (選擇題每題 3 分, 單選)

A woman is a carrier of X-linked disorder and married to a normal healthy man. 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 daughter? (a) 1 (b) 0.5 (c) 0.25 (d) 0.
3. What is the probability for her having an affected son? (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 1800 MM individuals in the population. Consider the following questions:

8. What is the allele frequency for the N alleles? (a) 0.5 (b) 0.1 (c) 0.2 (d) 0.04.
9. What are the expected numbers of NN individuals in the population? (a) 360 (b) 100 (c) 3600 (d) 400.
10. Interphase is a period corresponding to the cell cycle phases of (a) mitosis (b) S (c) $G_1 + S + G_2$ (d) $G_1 + S + G_2 + M$.

The F_1 from a cross of $AB/AB \times ab/ab$ is test-crossed, resulting in the following phenotypic ratios:

AB	122
Ab	118
aB	81
ab	79

11. What is the frequency of recombination between genes a and b ? (a) 0.3 (b) 0.4 (c) 0.5 (d) 0.6.

If a given population of diploid organisms contains two alleles at any given locus, the genotyping of two loci A and B can result

12. How many possible haplotypes? (a) 2 (b) 3 (c) 4 (d) 5.

In human the three alleles I^A , I^B , and i constitute a multiple allelic series that determine the ABO blood group system. For the following problems, state whether the child can actually be produced from the marriage.

13. An O child from the marriage of two A individuals? (a) True (b) False (c) Not know (d) Need not be true.
14. An AB child from the marriage of an A to a O? (a) True (b) False (c) Not know (d) Need not be true.
15. An O child from the marriage of an AB to an A? (a) True (b) False (c) Not know (d) Need not be true.
16. An A child from the marriage of an AB to a B? (a) True (b) False (c) Not know (d) Need not be true.

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.

17. ABCFE * DGH (a) deletion (b) duplication (c) inversion (d) translocation.
18. AD * EFBCGH (a) deletion (b) duplication (c) inversion (d) translocation.
19. ABCD * EFEFGH (a) deletion (b) duplication (c) inversion (d) translocation.
20. ABD * EFGH (a) deletion (b) duplication (c) inversion (d) translocation.

Part II (選擇題每題 3 分, 單選)

1. Which of the following does not normally appear in the glomerular filtrate?
(A) glucose
(B) plasma protein
(C) sodium
(D) urea
2. Which of the following is a peptide hormone?
(A) glucocorticoid
(B) estrogen
(C) insulin
(D) prostaglandin
3. 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
4. A major difference between smooth muscle and skeletal muscle is that
(A) myosin is the regulatory protein in smooth muscle
(B) myosin is the regulatory protein in skeletal muscle
(C) skeletal muscle may exhibit spontaneous activity
(D) only skeletal muscle requires increased calcium ion concentration in the cytosol for contraction
5. Carbon dioxide is carried in blood using the following methods except
(A) dissolved in the plasma
(B) bound to hemoglobin
(C) converted to HCO_3^-
(D) bound to albumin
6. If the pituitary gland is removed from a person, which of the following is likely to occur?
(A) The adrenal gland will hypertrophy to increase cortisol production
(B) The adrenal gland will atrophy and plasma cortisol levels will be reduced
(C) The hypothalamus will secrete less CRH

- (D) The person will remain euthyroid
7. Which of the following statements regarding blood clotting is not true?
- (A) Blood clotting requires activation of thrombin
 - (B) Blood clotting is the result of a cascade of enzyme activation
 - (C) Requires the presence of erythrocytes
 - (D) Is an example of positive feedback
8. Which of the following statements regarding cloning is not true?
- (A) Cloning is the reproduction of a living organism from an adult cell
 - (B) The genetic material of "cloned subject" is the same as that of the nuclear donor
 - (C) The genetic material of "cloned subject" is the same as that of the recipient
 - (D) Cloning requires the reset of genetic imprinting
9. Which of the following statements regarding prokaryote and eukaryote is not true?
- (A) The prokaryote does not have nucleus at all
 - (B) The eukaryote retains nucleus during DNA replication
 - (C) The prokaryote translates protein while transcription is still in progress
 - (D) The eukaryote translates the protein after transcription is complete
10. Which of the following statements regarding "prostaglandin" is not true?
- (A) The prostaglandins in our body are produced by prostate gland
 - (B) Prostaglandin causes skin reddish and generates heat in inflammatory tissue
 - (C) Aspirin ceases head ache because it can inhibit prostaglandin production
 - (D) Prostaglandins have very short half-life so they are usually produced and function locally.
11. Which of the following statements regarding regulation of erythrocyte production is not true?
- (A) Erythrocytes are produced in bone marrow
 - (B) Newly synthesized erythrocytes have nucleus
 - (C) Kidney responds to low blood oxygen and secretes erythropoietin that stimulates erythrocyte production.
 - (D) Old erythrocytes are mainly destroyed in kidney
12. Entry of glucose from the blood into tissue cells occurs by
- (A) facilitated diffusion
 - (B) secondary active transport
 - (C) osmosis
 - (D) diffusion
13. Which of the following statements regarding enzymes is true?
- (A) Enzymes increase the activation energy of a reaction
 - (B) Enzymes will generally change the equilibrium concentrations of the products and reactants
 - (C) Enzymes are broken down during chemical reactions they catalyze
 - (D) Enzymes will generally decrease the time required to reach equilibrium