

I. Questions (50%)

1. (A) Define 「central dogma」. Three main steps are included. (5%)
(B) How to control the gene expression in prokaryotes? Please use 「lactose metabolism」 as an example to explain. (10%)
2. Please describe the homeostatic controls over glucose metabolism. What hormones, organs and other elements take part in this metabolism? (10%)
3. How is it possible for proteins to play such a wide variety of roles in the cell? Try to answer this question via protein functions or structures. (10%)
4. (A) How to move bodies by ourselves? (7.5%)
(B) Why do we feel sore in muscle after sport activities, and how to resolve the situation if happens? (7.5%)

I. Multiple choice (Only one best answer for each question) (50%; 2 points/each)

1. What is "alleles"?
(A) alternative molecular form of a gene
(B) alternative molecular form of a chromosome
(C) self-fertilizing, true-breeding homozygotes
(D) self-fertilizing, true-breeding heterozygotes
2. Which of the following is the correct sequence involved in the regulation of organ systems?
(A) stimulus, receptor, integrator, response, effector
(B) stimulus, response, integrator, receptor, effector
(C) stimulus, receptor, integrator, effector, response
(D) stimulus, integrator, receptor, effector, response
(E) stimulus, effector, integrator, receptor, receptor, response
3. Which system produces blood cells?
(A) endocrine (B) skeletal (C) muscular (D) defense (E) integumentary

4. The hypothalamus and pituitary link the activities of the endocrine system and nervous system by:
- (A) neurohormones being secreted in response to the summation of neural messages that enter the hypothalamus
 - (B) shifts in hormonal concentrations being detected by anterior pituitary
 - (C) pheromones being secreted as a response to photoperiodic stimuli
 - (D) the nervous tissue of the anterior lobe of the pituitary sending stimuli to the glandular tissue of the posterior pituitary to produce hormones that will be secreted by the hypothalamus
 - (E) all of the above
5. The secretion of tear, milk, sweat, and oil is a function of what tissue?
- (A) epithelial (B) loose connective (C) lymphoid (D) nervous (E) adipose
6. Lysozyme
- (A) is secreted by endocrine glands in the skin
 - (B) destroy the cell wall of invading bacteria
 - (C) is produced in the lymph nodes and actively disables bacteria
 - (D) has provided to be a very effective defense against viruses
 - (E) is active within the circulatory system
7. The human immunodeficiency virus (HIV-1) primarily destroys which cells?
- (A) B (B) M (C) T1 (D) T4 (E) suppressor T
8. Inflammation
- (A) leads to the release of histamine, which causes capillaries to become "leaky"
 - (B) is accentuated by the administration of antihistamine drugs
 - (C) does not occur during allergic reactions
 - (D) is initiated by the buildup of dead cells and bacteria
 - (E) is not affected by the action of the complement system
9. Which of the following could be called "pathogens"?
- (A) viruses
 - (B) bacteria
 - (C) protozoans
 - (D) B and C only, because they are alive
 - (E) A, B and C

10. Latency in viruses is associated with all but which one of the following?
- (A) replication
 - (B) temperate pathways
 - (C) gene integration
 - (D) lytic cycle
 - (E) retroviruses
11. When they are mature and circulating in the blood, which of the following cells have no nuclei?
- (A) platelets (B) leukocytes (C) erythrocytes
 - (D) A and C only
 - (E) B and C only
12. Blood from the body is first received by the heart in the:
- (A) coronary vein
 - (B) left atrium
 - (C) right ventricle
 - (D) right atrium
 - (E) left ventricle
13. Which of the following dose **not** digest proteins?
- (A) trypsin
 - (B) chymotrypsin
 - (C) aminopeptidase
 - (D) pepsin
 - (E) lipase
14. Bacteria
- (A) have cell walls composed of cellulose
 - (B) reproduce primarily by conjugation
 - (C) have a single chromosome
 - (D) are eukaryotic
 - (E) that stain Gram-negative have thick peptidoglycan cell walls
15. A digestive tract is said to be complete if it
- (A) possesses specialized regions for different digestive tasks
 - (B) Produce acids and contains enzymes
 - (C) is a one-way tube with a mouth and an anus
 - (D) is surrounded by muscle

16. The membrane-bound enzyme system that maintains the resting membrane potential is which of the following pumps?
- (A) sodium-phosphorus
 - (B) sodium-potassium
 - (C) sodium-chloride
 - (D) phosphorus-calcium
 - (E) phosphorus-chlorine
17. Four of the five answers listed below are related by a similar source. Select the **exception**
- (A) prolactin
 - (B) Progesterone
 - (C) Androgen
 - (D) Estrogen
 - (E) Testosterone
18. The element specifically associated with muscle contraction is
- (A) phosphorus
 - (B) potassium
 - (C) calcium
 - (D) sodium
 - (E) chloride
19. The hormone that influences sodium reabsorption in the kidney is
- (A) antidiuretic hormone (ADH)
 - (B) cortisone
 - (C) aldosterone
 - (D) corticotropic hormone
 - (E) adrenalin
20. Fertilization in mammals occurs in the
- (A) ovary
 - (B) uterus
 - (C) vagina
 - (D) oviduct
 - (E) follicle

21. Any DNA sequence that has been amplified in dividing cells is a:
- (A) DNA clone
 - (B) DNA library
 - (C) chunk of foreign DNA
 - (D) gene map
22. How many amino acids are coded for in this mRNA sequence:
CGUUUACACCGUCAC
- (A) three
 - (B) five
 - (C) six
 - (D) seven
 - (E) fifteen
23. During the day, what do plants lose and take up in turn?
- (A) carbon dioxide; water
 - (B) water; oxygen
 - (C) oxygen; water
 - (D) water; carbon dioxide
24. Crossing over occurs most frequently during which stage of cell division?
- (A) telophase of mitosis
 - (B) metaphase II of meiosis
 - (C) prophase II of meiosis
 - (D) prophase I of meiosis
25. Electron transport systems for aerobic reactions are located in the:
- (A) cytoplasm
 - (B) inner mitochondrial membrane
 - (C) outer mitochondrial membrane
 - (D) stroma