

一、單選題 (每題 2 分) ※注意：請於試卷「選擇題作答區」依題號作答。※

1. The difference in lipid and protein composition between the membranes of the endomembrane system is largely determined by \_\_\_\_\_.  
(A) the physical separation of most membranes from each other  
(B) the transportation of membrane among the endomembrane system by small membrane vesicles  
(C) the function of the Golgi apparatus in sorting membrane components  
(D) the modification of the membrane components once they reach their final destination  
(E) the synthesis of lipids and proteins in each of the organelles of the endomembrane system
2. Chromosomes first become visible during which phase of mitosis?  
(A) prometaphase (B) telophase (C) metaphase (D) prophase (E) anaphase
3. A mutation that inactivates the regulatory gene of a repressible operon in an E. coli cell would result in \_\_\_\_\_.  
(A) continuous transcription of the structural gene controlled by that regulator  
(B) complete inhibition of transcription of the structural gene controlled by that regulator  
(C) irreversible binding of the repressor to the operator  
(D) inactivation of RNA polymerase by alteration of its active site  
(E) continuous translation of the mRNA because of alteration of its structure
4. Yeast artificial chromosomes contain which of the following elements?  
(A) centromere only (B) telomeres only (C) origin of replication only  
(D) centromeres and telomeres only (E) centromere, telomeres, and an origin of replication
5. Two species of frogs belonging to the same genus occasionally mate, but the offspring fail to develop and hatch. What is the mechanism for keeping the two frog species separate?  
(A) the postzygotic barrier called hybrid breakdown  
(B) the postzygotic barrier called hybrid inviability  
(C) the prezygotic barrier called hybrid sterility  
(D) gametic isolation  
(E) adaptation
6. At which developmental stage should one be able to first distinguish a diploblastic embryo from a triploblastic embryo?  
(A) fertilization (B) cleavage (C) gastrulation  
(D) coelom formation (E) metamorphosis
7. The lining of the smallest tubules in the kidneys is composed of \_\_\_\_\_.  
(A) connective tissue (B) smooth muscle cells (C) neural tissue  
(D) epithelial tissue (E) adipose tissue

見背面

8. Which sequence of blood flow can be observed in either a reptile or a mammal?
- (A) left ventricle → aorta → lungs → systemic circulation  
(B) right ventricle → pulmonary vein → pulmocutaneous circulation  
(C) pulmonary vein → left atrium → ventricle → pulmonary circuit  
(D) right atrium → pulmonary artery → left atrium → ventricle  
(E) vena cava → right atrium → ventricle → pulmonary circuit
9. Organisms categorized as osmoconformers are most likely \_\_\_\_\_.
- (A) marine (B) found in fresh water lakes and streams  
(C) amphibious (D) found in arid terrestrial environments  
(E) found in terrestrial environments with adequate moisture.
10. When an individual is subject to short-term starvation, most available food is used to provide energy (metabolism) rather than building blocks (growth and repair). Which hormone would be particularly active in times of food shortage?
- (A) epinephrine (B) glucagon (C) oxytocin (D) antidiuretic hormone (E) insulin
11. Most of the noncellular fluid in ejaculated human semen is composed of \_\_\_\_\_.
- (A) the secretions of the seminiferous tubules (B) the secretions of the bulbourethral glands  
(C) the secretions of the seminal vesicles (D) the secretions of the prostate gland  
(E) anticoagulant enzymes
12. From earliest to latest, the overall sequence of early development proceeds as follows:
- (A) ovulation → gastrulation → fertilization  
(B) cleavage → gastrulation → organogenesis  
(C) gastrulation → organogenesis → cleavage  
(D) gastrulation → blastulation → neurulation  
(E) preformation → morphogenesis → neurulation
13. An inhibitory postsynaptic potential (IPSP) occurs in a membrane made more permeable to \_\_\_\_\_.
- (A) ATP (B) sodium ions (C) calcium ions  
(D) potassium ions (E) all neurotransmitter molecules
14. Which system controls smooth and cardiac muscles of the digestive, cardiovascular, and excretory systems?
- (A) central nervous system (B) peripheral nervous system  
(C) sympathetic nervous system (D) parasympathetic nervous system  
(E) autonomic nervous system
15. Which of the following is controlled by the magnitude of a receptor potential?
- (A) the rate of production of an action potential (B) the rate of reaction of the brain  
(C) the rate of response to a sensory neuron (D) perception (E) adaptation

16. Which of the following is **true** about imprinting?
- (A) It is a type of learning that does not involve innate behavior.
  - (B) It happens to many adult animals, but not to their young.
  - (C) It may be triggered by visual or chemical stimuli.
  - (D) It occurs only in birds.
  - (E) It causes behaviors that last for only a short time (the sensitive period).
17. You are interested in studying how organisms react to a gradient of a variety of abiotic conditions and how they coexist in this gradient. The best location in which to conduct such a study is \_\_\_\_\_.
- (A) a grassland
  - (B) an intertidal zone
  - (C) a river
  - (D) tropical forest
  - (E) an eutrophic lake
18. Natural selection has led to the evolution of diverse natural history strategies, which have in common \_\_\_\_\_.
- (A) many offspring per reproductive episode
  - (B) limitation only by density-independent limiting factors
  - (C) adaptation to stable environments
  - (D) maximum lifetime reproductive success
  - (E) relatively large offspring
19. According to the competitive exclusion principle, two species cannot continue to occupy the same \_\_\_\_\_.
- (A) habitat
  - (B) biome
  - (C) territory
  - (D) range
  - (E) niche
20. In general, the total biomass in a terrestrial ecosystem will be greatest for which trophic level?
- (A) producers
  - (B) herbivores
  - (C) primary consumers
  - (D) tertiary consumers
  - (E) secondary consumers

※下列題目請標明題號，依序作答於試卷內「非選擇題作答區」。※

二、名詞解釋 (每題 5 分)

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|---------------|-------------------|
| 1. Altruism   | 2. Cephalization  |
| 3. Metastasis | 4. Transformation |
| 5. Proteomics | 6. Nondisjunction |
| 7. Induction  | 8. Homology       |

三、簡答題 (每題 10 分)

1. 請以細胞減數分裂的特徵，說明孟德爾的二個遺傳定律。
2. 維持體內水分恆定為生物的重要特徵之一，請比較淡水生與海生魚類維持水分恆定的機制之異同。