

- I. 單選題 60 分 (每題 2 分) ※ 注意：請於試卷上「選擇題作答區」依序作答。
1. Which does the following cell secrete histamine that dilates local blood vessels and increases their permeability during inflammation?  
A. Eosinophil  
B. Neutrophil  
C. Basophil  
D. Mast cell
  2. About macrophages (phagocytes), which is the following *not* correct?  
A. They patrol interstitial fluid and engulf pathogens and cellular debris in damaged tissue.  
B. They recognize groups of pathogens by Toll-like receptors  
C. They present antigen with class II MHC to helper T-cells.  
D. They secrete antibodies to neutralize toxin producing by bacteria
  3. Which is the following *not* a part of respiratory membrane in human lung?  
A. A layer of capillary endothelial cells  
B. A layer of smooth muscles  
C. A layer of the basement membrane of alveolar epithelial cells  
D. A layer of alveolar epithelial cells
  4. Compare to herbivores (plant-eating animals), the digestive tract of carnivores (meat-eating animals)  
A. is much shorter  
B. has well developed cecum  
C. has much richer symbiosis microbial in the stomach  
D. has no colon
  5. A defect in the gene encoding for what hormone can cause obesity?  
A. insulin  
B. thyroid  
C. leptin  
D. glucagon
  6. Which part of nephron in human kidney can produce large osmotic gradient between the renal cortex and medulla?  
A. Collecting duct  
B. Proximal tube  
C. Distal tube  
D. Henle loop
  7. Continue to the above. Given that the osmotic gradient in human kidney is 300-1200 mOsm, the most dilute urine produced by human kidney is  
A. Pure water  
B. 1200 mOsm  
C. 750 mOsm  
D. 300 mOsm
  8. The brain area functioning as thermoregulation center is  
A. Brainstem  
B. Cortex  
C. Hypothalamus  
D. Thalamus
  9. Which can the following hormone stimulate absorption of calcium from guts?  
A. Thyroid hormone  
B. Calcitonin  
C. Parathyroid hormone  
D. Vitamin-D

10. Compared to the 4-chambered heart system, which is the following *not* a characteristic in the 3-chambered heart system?
- A. Systemic circulation  
B. Two atria  
C. Pulmonary circulation  
D. Two ventricles
11. Which does the following part of the skin belong to loose connective tissue?
- A. Epidermis  
B. Dermis  
C. Sweat glands  
D. Hair follicles
12. Parkinson's disease is caused by loss of the neurons secreting \_\_\_\_\_. What is in the blank?
- A. GABA  
B. Serotonin  
C. Acetylcholine  
D. Dopamine
13. Which is the following *not* a function of ciliary body in human eye?
- A. Holding the lens in place  
B. Controlling the size of the pupil  
C. Focusing a near object  
D. Adjusting the shape of the lens
14. Which can the following plant hormone stimulate cell division, promotes leaf expansion, and retard leaf senescence?
- A. Cytokines  
B. Ethylene  
C. Gibberellins  
D. Auxins
15. Can plants deploy which of the following substance(s) to defense against feeding herbivores?
- A. Salicylic acid  
B. Heat-shock proteins  
C. Alkaloids and phenolics  
D. Phytoalexins
16. Which is the following *not* a part of a plant stem?
- A. Ground meristem  
B. Pitch  
C. Procambium  
D. Petiole
17. Which is the following *not* a structure resulting from secondary plant growth?
- A. Periderm  
B. Cork  
C. Sapwood  
D. Pitch
18. Which is the following *not* a characteristic of all chordates?
- A. Segmented nervous system  
B. Perorated pharynx  
C. Segmented body wall and tail muscles  
D. Dorsal hollow nerve cord
19. What are the substances containing the maximum number of electrons composed primarily the early Earth's atmosphere as proposed by the Oparin-Haldane hypotheses.
- A. O<sub>2</sub>, CO<sub>2</sub>, N<sub>2</sub>, CH<sub>4</sub>  
B. O<sub>2</sub>, CO<sub>2</sub>, N<sub>2</sub>, H<sub>2</sub>O  
C. H<sub>2</sub>, H<sub>2</sub>O, NH<sub>3</sub>, CH<sub>4</sub>  
D. O<sub>2</sub>, CO<sub>2</sub>, N<sub>2</sub>, NH<sub>3</sub>
20. The biological species concept is applied to only species that
- A. reproduce sexually  
B. reproduce only asexually  
C. lived in the past  
D. are geographically separated populations

21. Regarding autosomal recessive inheritance, which is the following correct?
- A. Individuals who are homozygous for dominant allele are free of symptom and are not carriers
  - B. Individuals who are heterozygous are free of symptom and are not carriers
  - C. Individuals who are heterozygous usually show trait and are carriers
  - D. Individuals who are homozygous for the recessive allele show trait but are not carriers
22. Which is the phase when chromosomes are partitioned in the mitotic cell cycle?
- A. S phase
  - B. G1 phase
  - C. G2 phase
  - D. M phase
23. In photosynthesis, the light-dependent and light-independent reactions are linked by
- A. ADP and H<sub>2</sub>O
  - B. H<sub>2</sub>O and NAD<sup>+</sup>
  - C. ATP and NADPH
  - D. H<sub>2</sub>O and cytochromes
24. What is the ion gradient produced by the electron transfer system that is used by the ATP synthase as energy for converting ADP and Pi to ATP?
- A. H<sup>+</sup>
  - B. Ca<sup>2+</sup>
  - C. Na<sup>+</sup>
  - D. K<sup>+</sup>
25. Continue to the above, the ATP synthase is embedded in the
- A. outer mitochondrial membrane
  - B. inner mitochondrial membrane
  - C. rough endoplasmic reticulum
  - D. smooth endoplasmic reticulum
26. What is the structure that regulates water moving through the spaces between the cells in epithelium?
- A. Tight junction
  - B. Gap junction
  - C. Desmosome
  - D. Anchoring junction
27. Which does the following cytoskeleton protein form the 9+2 complex of microtubules in eukaryotic flagellum?
- A. Actin
  - B. Myosin
  - C. Tubulin
  - D. Kinesin
28. Lipoproteins are large, spherical clumps of protein and lipid molecules that circulate in the blood of mammals. They are like suitcases that move cholesterol, fatty acid remnants, triglycerides, and phospholipids from one place to another in the body. Given your knowledge about insolubility of lipids in water, which of the following lipids would you predict to be in the core of a lipoprotein clump bathed in the plasma?
- A. triglycerides and phospholipids
  - B. cholesterol and phospholipids
  - C. triglycerides and cholesterol
  - D. Triglycerides, cholesterol and phospholipids
29. The major climatic factors governing the distributions of terrestrial biomes are
- A. Wind speed and rainfall
  - B. Rainfall and temperature
  - C. Wind speed and temperature
  - D. Wind speed, rain fall and temperature

30. Why are protists an important part of the global carbon cycle and marine food chains?

- A. They have high species diversity
- B. They are numerically abundant
- C. They have the ability to parasitize humans
- D. They have the ability to undergo asexual reproduction

II. 解釋下列名詞 30分 (每題3分) ※ 注意：請於試卷上「非選擇題作答區」標明題號並依序作答。

1. Cation exchange (in plant roots)
2. Transpiration in plants
3. Transcriptomic
4. Interference RNA (RNAi)
5. Alternative splicing of mRNA
6. Glycolysis
7. Exocytosis
8. Demography
9. Nitrogen fixation
10. Thermal acclimatization in ectotherms

III. 簡答題 10分 ※ 注意：請於試卷上「非選擇題作答區」標明題號並依序作答。

1. Please list 2 factors affecting the speed of the action potential conduction along an axon. (4分)
2. Please list 3 key steps to illustrate how estrogen triggers the responses of the target cells. (6分)

試題隨卷繳回