

請清楚標示題號並依序作答於試卷上

I. 單選題：（每題 2 分，共 42 分） \*請作答於試卷內之「選擇題作答區」

1. Which statement is NOT true in a vascular plant with a heterosporous life cycle?
  - A) Both male and female gametophytes develop within the sporophyte generation.
  - B) Microspores develop into male gametophytes, while megaspores develop into female gametophytes.
  - C) Fertilization results in a diploid zygote that develops into the next sporophyte generation.
  - D) The gametophyte generation is independent and free-living.
2. Which of the following characteristics is NOT shared by both non-vascular and vascular plants?
  - A) Presence of cell walls composed of cellulose
  - B) Sexual reproduction involving gametes
  - C) Dependence on water for sperm transfer
  - D) Embryonic development protected by a multicellular structure
3. Transpiration is the process by which plants lose water primarily through which structures?
  - A) Roots
  - B) Stems
  - C) Leaves
  - D) Flowers
4. An example of convergent evolution is:
  - A) Humans and chimpanzees having five fingers
  - B) Owls and hawks having sharp beaks for hunting
  - C) Dolphins and sharks having streamlined bodies
  - D) Lions and tigers having different prey preferences
5. What is the only type of chemical signal that does not alter the physiology of the animal producing that signal?
  - A) neural
  - B) paracrine
  - C) neuroendocrine
  - D) pheromones
6. Innate immunity \_\_\_\_\_.
  - A) is activated immediately upon infection
  - B) depends on an infected animal's previous exposure to the same pathogen
  - C) is based on recognition of antigens that are specific to different pathogens
  - D) is found only in vertebrate animals
7. Select the pathway that would lead to the activation of cytotoxic T cells.
  - A) B cell contact antigen → helper T cell is activated → clonal selection occurs
  - B) body cell becomes infected with a virus → new viral proteins appear → class I MHC molecule-antigen complex displayed on cell surface
  - C) complement is secreted → B cell contacts antigen → helper T cell activated → cytokines released
  - D) cytotoxic T cells → class II MHC molecule-antigen complex displayed → cytokines released → cell lysis
8. You cut your finger, and after putting pressure on the wound for several minutes, you notice that it is still bleeding profusely. What may be the problem?
  - A) Platelets are not functioning properly, or there are too few to be effective.
  - B) Mast cells are not releasing their chemical messengers.
  - C) There are too many antigens to allow clotting.
  - D) Hemoglobin levels are too high to allow clotting.
9. The large surface area in the gut directly facilitates \_\_\_\_\_.
  - A) secretion
  - B) absorption
  - C) filtration
  - D) temperature regulation
10. The motor (somatic nervous) system can alter the activities of its targets, the skeletal muscle fibers, because \_\_\_\_\_.
  - A) it is electrically coupled by gap junctions to the muscles
  - B) its signals bind to receptor proteins on the muscles
  - C) its signals reach the muscles via the blood
  - D) it is connected to the internal neural network of the muscles

見背面

11. Imagine that a woman is in the final week of her pregnancy. Her doctor gives her an injection of oxytocin. The likely result of this is that the pregnant woman would \_\_\_\_\_.
- A) stop secreting prostaglandins from the placenta
  - B) undergo vigorous contractions of her uterine muscles
  - C) increase the synthesis and secretion of progesterone
  - D) be prevented from lactation
12. The force driving simple diffusion is \_\_\_\_\_, while the energy source for active transport is \_\_\_\_\_.
- A) the concentration gradient; ADP
  - B) the concentration gradient; ATP
  - C) transmembrane pumps; electron transport
  - D) phosphorylated protein carriers; ATP
13. Why is ATP an important molecule in metabolism?
- A) Its hydrolysis provides an input of free energy for exergonic reactions.
  - B) It provides energy coupling between exergonic and endergonic reactions.
  - C) Its terminal phosphate group contains a strong covalent bond that, when hydrolyzed, releases free energy.
  - D) Its terminal phosphate bond has higher energy than the other two phosphate bonds.
14. In liver cells, the inner mitochondrial membranes are about five times the area of the outer mitochondrial membranes. What purpose must this serve?
- A) It allows for an increased rate of glycolysis.
  - B) It allows for an increased rate of the citric acid cycle.
  - C) It increases the surface for oxidative phosphorylation.
  - D) It increases the surface for substrate-level phosphorylation.
15. The beginning of anaphase is indicated by which of the following?
- A) Chromatids lose their kinetochores.
  - B) Cohesin attaches the sister chromatids to each other.
  - C) Cohesin is cleaved enzymatically.
  - D) Spindle microtubules begin to polymerize.
16. Which of the following is a true statement about sexual vs. asexual reproduction?
- A) Asexual reproduction, but not sexual reproduction, is characteristic of plants and fungi.
  - B) In sexual reproduction, individuals transmit half of their nuclear genes to each of their offspring.
  - C) In asexual reproduction, offspring are produced by fertilization without meiosis.
  - D) Asexual reproduction produces only haploid offspring.
17. Which of the following is true of a species that has a chromosome number of  $2n = 16$ ?
- A) The species is diploid with 32 chromosomes per cell.
  - B) The species has 16 sets of chromosomes per cell.
  - C) Each diploid cell has eight homologous pairs.
  - D) A gamete from this species has four chromosomes.
18. Codons are part of the molecular structure of \_\_\_\_\_.
- A) a protein
  - B) mRNA
  - C) tRNA
  - D) rRNA
19. Which viruses have single-stranded RNA that acts as a template for DNA synthesis?
- A) proviruses
  - B) viroids
  - C) bacteriophages
  - D) retroviruses
20. The reason for using Taq polymerase for PCR is that \_\_\_\_\_.
- A) it is heat stable and can withstand the heating step of PCR
  - B) only minute amounts are needed for each cycle of PCR
  - C) it binds more readily than other polymerases to the primers
  - D) it has regions that are complementary to the primers

21. In an open circulatory system, blood is \_\_\_\_\_.

- A) always inside of vessels and is under higher pressure than in closed circulatory systems
- B) not always confined to blood vessels and is under higher pressure than in closed circulatory systems
- C) always inside of vessels and is under lower pressure than in closed circulatory systems
- D) not always confined to blood vessels and is under lower pressure than in closed circulatory systems

II. 解釋名詞：(每題 4 分，共 40 分) ※ 注意：請於試卷內之「非選擇題作答區」標明題號依序作答。

1. Autotroph

2. Endotoxins

3. Gram-negative bacteria

4. Photorespiration

5. Chlorophyll

6. Commensalism

7. G0 phase

8. Action potential

9. Negative feedback

10. Phagocytosis

III. 簡答題：(每題 6 分，共 18 分) ※ 注意：請於試卷內之「非選擇題作答區」標明題號依序作答。

1. How are C3, C4, and CAM plants similar to and different from one another?

2. Compare the similarities and differences between transformation, transduction, and conjugation in prokaryotic cells.

3. What are the differences between primary and secondary growth in plants?

試題隨卷繳回