

題號：38

題號：38

科目：普通生物學(B)

共 3 頁之第 1 頁

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. Which of the following is one of the ways that the membranes of winter wheat are able to remain fluid when it is extremely cold?  
(A) by increasing the percentage of unsaturated phospholipids in the membrane  
(B) by increasing the percentage of cholesterol molecules in the membrane  
(C) by decreasing the number of hydrophobic proteins in the membrane  
(D) by decreasing the number of cytoskeleton proteins  
(E) by using active transport
2. To repair a thymine dimer by nucleotide excision repair, in which order do the necessary enzymes act?  
(A) exonuclease, DNA polymerase III, RNA primase  
(B) helicase, DNA polymerase I, DNA ligase  
(C) DNA ligase, nuclease, helicase  
(D) DNA polymerase I, DNA polymerase III, DNA ligase  
(E) endonuclease, DNA polymerase I, DNA ligase
3. In eukaryotes there are several different types of RNA polymerase. Which type is involved in transcription of mRNA for a globin protein?  
(A) RNA polymerase I      (B) RNA polymerase II      (C) RNA polymerase III  
(D) ligase      (E) primase
4. Genomic imprinting, DNA methylation, and histone acetylation are all examples of \_\_\_\_\_.  
(A) genetic mutation      (B) chromosomal rearrangements      (C) epigenetic phenomena  
(D) karyotypes      (E) translocation
5. What is the enzymatic function of restriction enzymes?  
(A) to add new nucleotides to the growing strand of DNA  
(B) to join nucleotides during replication  
(C) to join nucleotides during transcription  
(D) to cleave nucleic acids at specific sites  
(E) to repair breaks in sugar-phosphate backbones
6. Which of the following are sugar-transporting cells in angiosperms?  
(A) sieve-tube elements      (B) parenchyma cells      (C) collenchyma cells  
(D) sclerenchyma cells      (E) tracheids and vessel elements
7. What is the role of proton pumps in root hair cells?  
(A) establish ATP gradients      (B) acquire minerals from the soil      (C) pressurize xylem transport  
(D) eliminate excess electrons      (E) A and D only
8. Nitrogen fixation is a process that \_\_\_\_\_.  
(A) recycles nitrogen compounds from dead and decaying materials  
(B) converts ammonia to nitrate  
(C) converts nitrogen gas into ammonia  
(D) releases nitrate from amino acids  
(E) B and C

※下頁繼續※

見背面

國立臺灣大學 112 學年度轉學生招生考試試題

題號：38

題號：38

科目：普通生物學(B)

共 3 頁之第 2 頁

9. Where does meiosis occur in flowering plants?  
(A) megasporocyte                      (B) microsporocyte                      (C) endosperm  
(D) pollen tube                          (E) megasporocyte and microsporocyte
10. Plants growing in a partially dark environment will grow toward light in a response called phototropism. Choose the *incorrect* statement regarding phototropism.  
(A) It is caused by a chemical signal.  
(B) One chemical involved is auxin.  
(C) Auxin causes a growth increase on one side of the stem.  
(D) Auxin causes a decrease in growth on the side of the stem exposed to light.  
(E) Removing the apical meristem prevents phototropism.
11. Why is the velocity of blood flow the lowest in capillaries?  
(A) The capillary walls are too thin to maintain the velocity of blood flow in capillaries.  
(B) Capillaries are far from the heart, and blood flow slows as the distance from the heart increases.  
(C) The diastolic blood pressure is too low to deliver blood to the capillaries at a high flow rate.  
(D) The total surface area of the capillaries is larger than the total surface area of the arterioles.  
(E) The systemic capillaries are supplied by the left ventricle, which has a lower cardiac output than the right ventricle.
12. The MHC (major histocompatibility complex) is important in a T cell's ability to \_\_\_\_\_.  
(A) identify specific viruses  
(B) recognize specific parasitic pathogens  
(C) distinguish self from nonself  
(D) identify specific bacterial pathogens  
(E) recognize differences between normal and cancer cells
13. What is the main nitrogenous waste excreted by birds?  
(A) uric acid    (B) urea    (C) nitrate    (D) ammonia    (E) nitrite
14. Prostaglandins are local regulators whose basic structure is derived from \_\_\_\_\_.  
(A) oligosaccharides    (B) fatty acids    (C) steroids    (D) amino acids    (E) nitric oxide
15. Contact of sperm with signal molecules in the coat of an egg causes the sperm to undergo \_\_\_\_\_.  
(A) mitosis    (B) depolarization    (C) apoptosis    (D) vitellogenesis    (E) the acrosomal reaction
16. The blood-brain barrier \_\_\_\_\_.  
(A) is formed by oligodendrocytes  
(B) provides support to the brain tissue  
(C) is formed by tight junctions  
(D) tightly regulates the intracellular environment of the CNS  
(E) uses chemical signals to communicate with the spinal cord

接次頁

※下頁繼續※

題號：38

題號：38

科目：普通生物學(B)

共 3 頁之第 3 頁

17. Which of the following is controlled by the magnitude of the potential of a sensory receptor?
- (A) adaptation
  - (B) perception
  - (C) the rate of reaction of the brain
  - (D) the rate of production of an action potential
  - (E) the rate of response to a sensory neuron
18. Which of the following is *true* about imprinting?
- (A) It occurs only in birds.
  - (B) It may be triggered by visual or chemical stimuli.
  - (C) It happens to many adult animals, but not to their young.
  - (D) It is a type of learning that does not involve innate behavior.
  - (E) It causes behaviors that last for only a short time (the sensitive period).
19. Natural selection involves energetic trade-offs between \_\_\_\_\_.
- (A) choosing how many offspring to produce over the course of a lifetime and how long to live
  - (B) producing large numbers of gametes when employing internal fertilization versus fewer numbers of gametes when employing external fertilization
  - (C) the emigration of individuals when they are no longer reproductively capable or committing suicide
  - (D) increasing the number of individuals produced during each reproductive episode with a corresponding decrease in parental care
  - (E) high survival rates of offspring and the cost of parental care
20. What is the most important role of photosynthetic organisms in an ecosystem?
- (A) converting inorganic compounds into organic compounds
  - (B) absorbing solar radiation
  - (C) producing organic detritus for decomposers
  - (D) dissipating heat
  - (E) recycling energy from other trophic levels

※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 4 分)

1. Antagonistic effect
2. Innate immunity
3. Metastasis
4. Obligate anaerobe
5. Recessive allele

三、簡答題 (每題 10 分)

1. 請比較動物細胞在進行有絲分裂 (Mitosis) 與減數分裂 (Meiosis) 時染色體的變化。
2. 請說明細胞膜上的 G 蛋白偶聯受體 (G protein-coupled receptor) 與受體酪胺酸激酶 (Receptor tyrosine kinase) 進行訊息傳導的機制。
3. 請描述學者赫雪 (Alfred Hershey) 與蔡司 (Martha Chase) 如何利用放射線材料進行實驗，進而確認遺傳物質是由核酸所構成。
4. 嚴重特殊傳染性肺炎 (COVID-19) 的流行加速了訊息 RNA (mRNA) 疫苗的開發，請比較訊息 RNA 疫苗與傳統疫苗的差異與優缺點。

**試題隨卷繳回**