

一、簡答題

1. 請以染色體的特性，來解釋孟德爾的兩大遺傳定律？(10分)
2. 請簡述動作電位是如何跨過神經突觸？(10分)
3. 請說明賀爾蒙系統，是如何以互相拮抗的方式，維持糖 (glucose) 及鈣在血液中濃度的恆定。(10分)
4. 請從演化的觀點，簡述蛋及胚胎的變化對生物由兩棲類演化成爬蟲類與哺乳類過程的重要性。(10分)
5. 名詞解釋：(每題 2 分，共 10 分)
 - A. Primary immune response
 - B. Asexual reproduction
 - C. Autotroph
 - D. Sodium-potassium ATPase pump
 - E. Connective tissues

二、單選題。(每題 2 分，共 20 分) ※請將本大題作答於試卷內之「選擇題作答區」。

1. What is a chromatid?
 - A) a chromosome in G1 of the cell cycle
 - B) a replicated chromosome
 - C) a chromosome found outside the nucleus
 - D) a special region that holds two centromeres together
 - E) another name for the chromosomes found in genetics
2. The lateral mobility (fluidity) of lipids and proteins in membranes is a consequence of
 - A) lack of covalent bonds between the lipid and protein components of the membrane.
 - B) weak hydrophobic interactions among the components in the interior of the membrane.
 - C) the presence of liquid water in the interior of the membrane.
 - D) A and B only
 - E) A, B, and C
3. Assume a particular organism has a diploid chromosome number of 4. How many different chromosome combinations can be normally packaged among the gametes of this organism? (Assume that no crossing over occurs.)
A) 4 B) 8 C) 2 D) infinite number E) 0
4. In molecular biology experiments, it is often necessary to quantify the amount of DNA in a given sample. One common method is to use a spectrophotometer, thus taking advantage of a simple relationship: DNA absorbs UV light maximally at 260 nm, and an absorbance unit of 1.0 = 50 $\mu\text{g/ml}$ for double-stranded DNA. Assume that you want to know the concentration of DNA in a sample. You make a hundredfold dilution to give you sufficient volume to place in the spectrophotometer tube. You determine the absorbance (A_{260}) of the diluted (1/100) sample and find it to be 0.2. What is the concentration in the original (undiluted) DNA sample?
A) 100 g/ml B) 500 mg/ml C) 200 mg/ml D) 10 mg/ml E) 1 mg/ml

見背面

5. In the triplet code, which of the following is true?
- A) Each DNA base codes for three amino acids.
 - B) It takes three genes to code for one protein.
 - C) Each amino acid in a protein is coded for by three bases in the DNA.
 - D) Each gene codes for three proteins.
 - E) Each triplet has many different meanings.
6. What might cause a person to produce copious amounts of urine?
- A) drinking large volumes of water relative to their body size
 - B) taking medication that causes increased secretion of antidiuretic hormone (ADH)
 - C) a genetic defect leading to reduced numbers of aquaporin proteins
 - D) answers A and B
 - E) answers A and C
7. How is the stomach of sheep, cows, deer, and other ruminants specially designed to digest vegetation?
- A) Their stomach lining produces enzymes that are capable of digesting cellulose, the major protein in plants.
 - B) Their stomach houses symbiotic bacteria and protists that can digest cellulose.
 - C) They have a cecum that houses symbiotic fermentative bacteria.
 - D) They have especially active pepsin for digesting plant proteins
 - E) All of the above answers apply.
8. Why is it more difficult to obtain enough oxygen via respiration from water than from air?
- A) Water is denser than air.
 - B) Water is less viscous than air.
 - C) Water contains less oxygen than air.
 - D) All of the above.
 - E) A and C only.
9. Which of the following is/are ways in which a single hormone can have multiple effects?
- A) Have different types of receptors in different target tissues.
 - B) Have different second messengers in different target tissues.
 - C) Have different signaling cascades in different target tissues.
 - D) All of the above.
 - E) A and B only.
10. Several physiological adaptations in humans ensure that the developing fetus has enough oxygen and nutrients for development, and that waste removal is sufficient. Which of the following does **not** enhance survival and growth of the fetus?
- A) increased blood volume in the mother during pregnancy
 - B) increased heart rate and stroke volume in the mother during pregnancy
 - C) higher oxygen affinity in maternal hemoglobin than in fetal hemoglobin
 - D) countercurrent blood flow in the placenta between maternal and fetal blood supplies
 - E) increased breathing rate and volume in the mother during pregnancy

三. 填充題：請從選項中挑選一個最適當之名詞將下列題目組成完整並有意義之句子。(每題 2 分，共 10 分) (請考生將答案填寫於答案卷上)

選項：antiport; β -galactosidase; cleavage; cotransport; countercurrent; countertransport; DNA polymerase; domain; gastrulation; hydrostatic; hyperosmotic; hypotonic; implantation; invagination; isotonic; ligase; organ; restriction enzyme; system; tissue

1. During mammalian embryo development, completion of the 三-1 process produces a three-layer embryo.
2. Water moves from 三-2 bony fish bodies into sea water is a result of osmosis.
3. A(An) 三-3 can recognize a specific DNA nucleotide sequence and conducts endonuclease digestion.
4. To facilitate efficient gas exchange process in the gill of a fish, the direction of water and blood flow is organized in a(an) 三-4 way.
5. A(An) 三-5 is made by a group of cells with similar morphology and function.

四. 解釋名詞 (每題 5 分，共 20 分)

1. Clonal selection
2. Neurotransmitter
3. Pleiotrophic effects
4. Chemiosmosis

