

考生注意事項：所有考題務必在答案卷上作答，在問題卷上作答者不計分。

I. 配合題 (1-15 題，每題二分，答錯倒扣 0.5 分，均為單選)

Questions 1 to 5, match each organelle in a eukaryotic cell with the process that occurs in it. (2% each)

- A. protein synthesis
- B. replication
- C. photosynthesis
- D. synthesis and package of molecules destined to be secreted from the cell
- E. generation of energy

- 1. Mitochondrion
- 2. Chloroplast
- 3. Ribosome
- 4. Nucleus
- 5. Golgi apparatus

Questions 6 to 10, match each signal molecule with its function. (2% each)

- A. stimulates metabolism of many cell types.
- B. causes smooth muscle cells to relax; regulates nerve cell activity.
- C. stimulates glucose synthesis, glycogen breakdown, and lipid breakdown.
- D. stimulates glucose uptake, protein synthesis, and lipid synthesis.
- E. causes blood vessels to dilate and become leaky, helping to cause inflammation.

- 6. Insulin
- 7. Glucagon
- 8. Thyroid hormone
- 9. Histamine
- 10. Nitric oxide (NO)

(背面仍有題目,請繼續作答)

Questions 11 to 15, choose the one most appropriate answer for each. (2% each)

- A. NAD
 - B. FMN
 - C. Coenzyme Q
 - D. Cytochrome aa₃
 - E. Cytochrome bc₁ complex
11. can donate electrons directly to O₂.
 12. is a coenzyme of numerous dehydrogenases.
 13. is a tightly bound prosthetic group of NADH dehydrogenase.
 14. is a mobile electron carrier.
 15. receives electrons from coenzymes Q and passes them to cytochrome c.

II. 選擇題 (16-25 題, 每題二分, 答錯倒扣 0.5 分, 均為單選)

16. For the reaction $A \rightarrow B$, if $\Delta G^\circ = -4.26$ kcal/mol, what is the equilibrium ratio of B/A?
(at 37°C, $-2.303RT = -1.42$ kcal/mol)
 - A. 1000/1
 - B. 100/1
 - C. 1
 - D. 1/100
 - E. 1/1000
17. Enzymes increase reaction rates
 - A. by decreasing the entropy ΔS^\ddagger of the enzyme and substrate.
 - B. by decreasing ΔG^\ddagger .
 - C. by increasing ΔG^\ddagger .
 - D. only if reactions are irreversible.
 - E. none of the above.

18. The second messenger, produced from the hydrolysis of PIP_2 , which activates the increase of Ca^{2+} concentration in the cytoplasm is
- A. PI
 - B. DAG
 - C. IP_3
 - D. PIP
 - E. none of the above
19. G proteins are associated with which of the following receptor superfamilies?
- A. cell-adhesion protein receptors.
 - B. single-transmembrane segment receptors.
 - C. 7-transmembrane segment receptors.
 - D. oligomeric ligand-gated ion channel.
 - E. none of the above.
20. Adjacent cells can pass small molecules directly between them by the use of
- A. active transport from one cell to the other.
 - B. translocation.
 - C. connection of intercellular porins between the cells.
 - D. gap junctions.
 - E. none of the above.

----- 請注意後頁仍有考題 -----

(背面仍有題目,請繼續作答)

Answer the following questions using the key outlined below: (2% each)

- A. if 1, 2, and 3 are correct
- B. if 1 and 3 are correct
- C. if 2 and 4 are correct
- D. if only 4 is correct
- E. if all four are correct

21. Which of the following statements about ATP is correct?

- 1. ATP is complexed with Mg^{2+} in most cases.
- 2. ATP has one phosphoester bond.
- 3. ATP has two phosphoanhydride bonds.
- 4. ATP is used for long-term energy storage in the cell.

22. Which of the following contributes to the large negative free-energy change upon hydrolysis of the "high-energy" compounds?

- 1. Electrostatic repulsion in the reactant.
- 2. Low activation energy of forward reaction.
- 3. Stabilization of products by more resonance forms.
- 4. Input of a large energy to cleave the unusually stable bond in the reactant.

23. Which of the following statements concerning enzyme is correct?

- 1. The K_m of an enzyme is a measure of the maximal rate with which the enzyme can catalyze a reaction.
- 2. Allosteric enzymes have two or more binding sites.
- 3. Enzymes lower the activation energy barrier of a reaction, thereby changing the equilibrium point.
- 4. A competitive inhibitor increases K_m without affecting V_{max} .

24. Which of the following statements concerning lipid bilayer is correct?
1. The lipid bilayer is impermeable to all ions and large polar molecules.
 2. A shorter chain length of the hydrocarbon tails of the phospholipid molecule increases the fluidity of the bilayer.
 3. Lipids in a lipid bilayer do not flip-flop readily from one lipid monolayer to the other.
 4. Membrane lipids in a lipid bilayer are held together primarily by hydrophobic forces.
25. Which of the following statements is characteristic of the Na⁺, K⁺-ATPase?
1. It is an electrogenic pump.
 2. Its function is to pump K⁺ ions out of the cell and Na⁺ into the cell.
 3. The ATPase activity is associated with the cytoplasmic side of the pump.
 4. The process does not require the hydrolysis of ATP.

III. 問答題 (26-30 題, 每題十分)

26. Gene expression can be regulated at many of the steps in the pathway from DNA to RNA to protein in eukaryotes. Please describe briefly the controlled levels on gene expression. (10%)
27. Please describe the global structure and function of chromosomes. (10%)
28. Please describe the stages and controls of cell cycle in mammalian cells. (10%)
29. Please compare the differences between the mitosis and meiosis. (10%)
30. Please describe briefly the stages of embryogenesis in animals. (10%)