

(乙組)

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. 選擇題 (1-15 題，每題二分，答錯倒扣 0.5 分，均為單選)

Questions 1 to 5, match the approximate sizes for the following items.

1. Epithelial cell
2. Human immunodeficiency virus (HIV)
3. Myoglobin
4. Ribosome
5. Mitochondrion

- A. 4.5 nm diameter
- B. 30 nm diameter
- C. 100 nm diameter
- D. 1 to 2 μm diameter
- E. 30 μm height

Questions 6 to 10, match the one most appropriate answer for each (2% each)

6. Focal adhesions
7. Hemidesmosome
8. Cadherins
9. Laminin
10. Glycocalyx

- A. A glycoprotein of the extracellular matrix, which consists of three different polypeptide chains linked by disulfide bonds.
- B. A family of related glycoproteins that mediate Ca^{2+} -dependent cell adhesion.
- C. Specialized adhesive structure at the basal surface of epithelial cells that functions to attach the cells to the underlying basement membrane.
- D. Adhesive structures characteristic of cultured cells adhering to the surface of a culture dish.
- E. A layer closely applied to the outer surface of the plasma membrane.

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

11. Rough endoplasmic reticulum (RER)
12. Smooth endoplasmic reticulum (SER)
13. Nucleoli

(背面仍有題目,請繼續作答)

14. Microtubules
 15. Proteasomes
- A. Components of a diverse array of structures, including the mitotic spindle of dividing cells and the core of cilia and flagella.
 - B. Synthesis of secretory proteins, lysosomal proteins, integral membrane proteins, and membrane lipids.
 - C. Synthesis of steroid hormones, and detoxification of a wide variety of organic compounds.
 - D. Function as ribosome-producing organelles.
 - E. Barrel-shape structures that consist of four rings of subunits stacked one on top of the other with a cap attached at either end of the stack.

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

16. Which amino acid is substituted for glutamic acid in the hemoglobin molecule of sickle cell anemia?
 - A. Methionine
 - B. Valine
 - C. Histidine
 - D. Aspartic acid
 - E. None of the above
17. Which of the following statements is correct?
 - A. ΔG° and ΔG mean the same thing.
 - B. When $K'_{eq} < 1$, ΔG° is negative.
 - C. When $K'_{eq} = 1$, $\Delta G^\circ = 0$ kcal/mol.
 - D. ΔG of a given reaction is a constant.
 - E. None of the above.
18. The maximum number of molecules of substrate that can be converted to product by one enzyme molecule per unit time is referred to as the
 - A. maximal velocity (V_{max}).
 - B. turnover number.
 - C. Michaelis-Menten constant.
 - D. association constant.
 - E. none of the above.
19. The sharp transition temperature of model membranes will be abolished by
 - A. increasing the cholesterol content.
 - B. decreasing the cholesterol content.
 - C. increasing the phosphatidylcholine content.
 - D. increasing the phosphatidylserine content.
 - E. none of the above.

20. Which of the following types of membrane transport uses ion gradient as the energy source?
- A. Simple diffusion
 - B. Facilitated diffusion
 - C. Primary active transport
 - D. Secondary active transport
 - E. None of the above
21. Integral membrane proteins
- A. can usually be solubilized by extraction with aqueous solutions.
 - B. are always lipid-anchored through glycosphosphatidylinositol.
 - C. are associated with the membrane by weak electrostatic interactions.
 - D. penetrate deeply into the lipid bilayer.
 - E. none of the above.
22. Which of the following processes are occurred in both photosynthetic phosphorylation and oxidative phosphorylation?
- A. use ferredoxin as an electron carrier.
 - B. use cytochromes in their electron transport chains.
 - C. use oxygen as a terminal electron acceptor.
 - D. are associated with mitochondrial membranes
 - E. none of the above.
23. Which of the following processes dose not occur in peroxisomes?
- A. oxidation of very long chain fatty acids.
 - B. synthesis of hydrogen peroxide.
 - C. degradation of hydrogen peroxide.
 - D. synthesis of ATP.
 - E. none of the above.
24. An electron carrier that contains a long hydrophobic chain composed of five-carbon isoprenoid units is
- A. flavin adenine dinucleotide
 - B. cytochrome
 - C. ubiquinone
 - D. NAD⁺
 - E. iron sulfur center

25. Specialized sites of contacts that block solutes from diffusing between cells in an epithelium are
- A. tight junctions
 - B. gap junctions
 - C. focal adhesions
 - D. plasmodesmata
 - E. none of the above

III. 問答題與簡答題

26. Please describe the intracellular membrane-bound compartments and their biological functions in eukaryotic cells. (10%)
27. Please describe the structure of signal-recognition particle (SRP) and the translocation mechanism of secretory proteins across the endoplasmic reticulum (ER) membrane. (10%)
28. Please describe the regulation of Ras protein, and the cycle of events that occur after binding a ligand to receptor tyrosine kinases and activation of Ras. (10%)
29. Please describe the cell cycle and the checkpoints in cell cycle regulation. (10%)
30. Please define the embryonic stem (ES) cell and stem cell, and their biological and medical applications. (10%)