

※ 注意：請於答案卷內之「選擇題作答區」依序作答。

I. 單一選擇題 (50%; 每題兩分)

1. A primary objective of cell fractionation is to
 - A) view the structure of cell membranes.
 - B) identify the enzymes outside the organelles.
 - C) determine the size of various organelles.
 - D) separate the major organelles so that their particular functions can be determined.
 - E) crack the cell wall so the cytoplasmic contents can be released.
2. The differences among the three categories of cytoskeletal elements would suggest that each of the following has specialized roles. Which of the following is a correct match?
 - A) microfilaments and the nuclear lamina
 - B) microtubules and cleavage furrow formation
 - C) microtubules and chromosome movement
 - D) microfilaments and ciliary motion
 - E) intermediate filaments and cytoplasmic streaming
3. An organism with a cell wall would have the most difficulty doing which process?
 - A) diffusion
 - B) osmosis
 - C) active transport
 - D) phagocytosis
 - E) facilitated diffusion
4. Cellular respiration harvests the most chemical energy from which of the following?
 - A) substrate-level phosphorylation
 - B) chemiosmotic phosphorylation
 - C) converting oxygen to ATP
 - D) transferring electrons from organic molecules to pyruvate
 - E) generating carbon dioxide and oxygen in the electron transport chain
5. You have a friend who lost 7 kg of fat on a "low carb"(低碳水化合物) diet. How did the fat leave her body?
 - A) It was released as CO₂ and H₂O.
 - B) Chemical energy was converted to heat and then released.
 - C) It was broken down to amino acids and eliminated from the body.
 - D) It was converted to ATP, which weighs much less than fat.
 - E) It was converted to urine and eliminated from the body.
6. Carotenoids are often found in foods that are considered to have antioxidant properties in human nutrition. What related function do they have in plants?
 - A) They serve as accessory pigments.
 - B) They reflect orange light.
 - C) They cover the sensitive chromosomes of the plants.
 - D) They take up toxins from the water.
 - E) They dissipate excessive light energy.
7. Why are C₄ plants able to photosynthesize with no apparent photorespiration?
 - A) They do not participate in the Calvin cycle.
 - B) They use PEP carboxylase to initially fix CO₂.
 - C) They are adapted to cold, wet climates.
 - D) They conserve water more efficiently.
 - E) They exclude oxygen from their tissues.
8. The primary role of oxygen in cellular respiration is to

- A) yield energy in the form of ATP as it is passed down the respiratory chain.
B) act as an acceptor for electrons and hydrogen, forming water.
C) combine with carbon, forming CO₂.
D) catalyze the reactions of glycolysis.
E) combine with lactate, forming pyruvate.
9. What is the primary function of the Calvin cycle?
A) use ATP to release carbon dioxide
B) use NADPH to release carbon dioxide
C) split water and release oxygen
D) transport RuBP out of the chloroplast
E) synthesize simple sugars from carbon dioxide
10. Plants with a dominant sporophyte are successful on land because
A) having no stomata, they lose less water.
B) they all disperse by means of seeds.
C) diploid plants are protected from the effects of mutation.
D) their gametophytes are all parasitic on the sporophytes.
E) eggs and sperm need not be produced.
11. Which of the following is not common to all divisions of vascular plants?
A) the development of seeds B) alternation of generations
C) dominance of the diploid generation D) xylem and phloem
E) the addition of lignin to cell walls
12. The closest relatives of fungi are probably
A) animals B) vascular plants C) mosses
D) brown algae E) slime molds
13. If all the bacteria on Earth suddenly disappeared, which of the following would be the most likely direct result?
A) The number of organisms on earth would decrease by ten to twenty percent.
B) Human populations would thrive in the absence of disease.
C) There would be little change in the Earth's ecosystems.
D) Recycling of nutrients would be greatly reduced.
E) The earth's total photosynthesis would markedly decline.
14. Active transport would be least important in the normal functioning of which of the following plant tissue types?
A) leaf epidermis B) stem xylem C) root endodermis
D) leaf mesophyll E) root phloem
15. Which of the following responses is not due to the effect of gibberellin?
A) bolting in rosette plants B) elongation of internodes
C) fruit ripening D) germination in many types of seeds
E) breaking of dormancy
16. We know from the experiments of the past that plants bend toward light because
A) they need sunlight energy for photosynthesis.
B) the sun stimulates stem growth.
C) cell expansion is greater on the dark side.
D) auxin is inactive on the dark side.

- E) phytochrome stimulates florigin formation.
17. The binomial for poison ivy is *Toxicodendron radicans*. To what genus does this plant belong?
- A) *Toxicodendron*
B) *radicans*
C) *Toxicodendron radicans*
D) poison ivy
E) *Toxicodendron radicans* poison ivy
18. The membranous compartmentalization of a cell
- A) divides the cell into two equal-sized halves.
B) allows different metabolic processes to occur simultaneously.
C) requires the presence of a cell wall.
D) requires the presence of a large central vacuole.
E) is common in prokaryotes and eukaryotes.
19. Which of the following statements about primary growth is FALSE?
- A) It results in extension of the plant body.
B) It involves the formation of primary tissues.
C) It results in the thickening of the stem and root.
D) It gives rise to the primary plant body.
E) It results from activity of the root and shoot apical meristems.
20. Which of the following important findings is not awarded for Nobel Prize?
- A) DNA double helix structure
B) Darwin's origin of species
C) Green Fluorescence Protein from jelly fish
D) RNAi
E) RNA splicing
21. If one strand of a DNA molecule has the sequence of bases 5'-CTACTTGA-3', the other strand would have the sequence:
- A) 3'CTACTTGA-5' B) 3'CUACUUGA-5' C) 3'TCAAGTAG-5'
D) 3'GATGAACT-5' E) 3'GAUGAACU-5'
22. Which feature of osmoregulation is found in both marine and freshwater bony fish?
- A) loss of water through the gills B) gain of salt through the gills
C) loss of water in the urine D) no drinking of water
E) gain of water through food
23. All of the following are steroid hormones except
- A) androgen. B) cortisol. C) estrogen.
D) insulin. E) testosterone
24. To leave the digestive tract, a substance must cross a cell membrane. During which stage of food processing does this take place?
- A) ingestion B) digestion C) hydrolysis
D) absorption E) elimination
25. Which of the following are the only vertebrates in which blood flows directly from respiratory organs to body tissues without first returning to the heart?
- A) amphibians B) birds C) fishes
D) mammals E) reptiles

※ 注意：請於答案卷上「非選擇題作答區」內依序作答，並應註明作答之大題及其題號。

II. 解釋名詞: (12%)

1. Rubisco
2. systemic acquired resistance
3. pericycle
4. diatoms

III. 配合題：請由上欄A~L中選出適合下欄各題的答案 (18%, 每題2分)

- A. neuron
- B. DNA
- C. $G1 \rightarrow S \rightarrow G2 \rightarrow M$
- D. RNA
- E. menstrual \rightarrow proliferative \rightarrow secretory
- F. follicular \rightarrow ovulation \rightarrow luteal
- G. RNA polymerase
- H. Starch
- I. B cell
- J. Ribosome
- K. Fat
- L. Blood

1. the uterine cycle in female reproduction system of human
2. An example of a connective tissue
3. Dendrite is a feature of _____
4. the biological molecules where life started from.
5. the genetic material of most eukaryotes.
6. salivary amylase
7. transcription
8. antibody
9. Synthesis of polypeptide

IV. 問答題 (20%, 每題10分)

1. 請比較真核生物和原核生物在基因表現(Gene expression)之不同。
2. 何謂 "countercurrent"? 請解釋, 並舉例說明countercurrent在動物生理上的重要性。