

國立屏東教育大學 100 學年度學士班轉學考試
普通生物學 試題
(化學生物系)

*注意事項：

- (1) 本試題共 6 頁，答案請「橫式」書寫，並依規定上下翻頁，否則不予計分。
(2) 不必抄題，但請依序將題號標出，並寫在答案紙上。

- 一、請嘗試解釋當 G protein-coupled receptor systems 接收到訊息後引發 effector protein 的反應過程。(20 分)
- 二、請說明當細胞內部份的 mRNA 被轉譯成蛋白質時，如何進行 cotranslational translocation。(20 分)

三、每題3分共60分

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

The following question is based on Figure 3.1: solute molecule surrounded by a hydration shell of water.

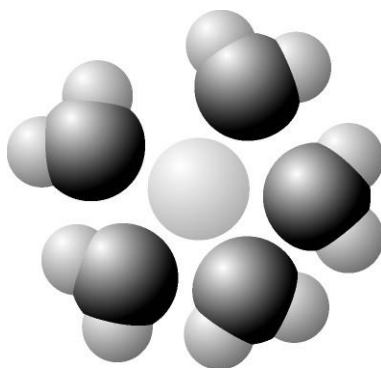


Figure 3.1

1. Based on your knowledge of the polarity of water molecules, the solute molecule is most likely
 - A. negatively charged.
 - B. hydrophobic.
 - C. nonpolar.
 - D. positively charged.
 - E. without charge.
2. A carbon skeleton is covalently bonded to both an amino group and a carboxyl group. When placed in water it
 - A. would function as neither an acid nor a base.
 - B. would function as both an acid and a base.
 - C. is impossible to determine how it would function.

- D. would function only as an acid because of the carboxyl group.
E. would function only as a base because of the amino group.
3. If a DNA sample were composed of 10% thymine, what would be the percentage of guanine?
- A. impossible to tell from the information given
 - B. 10
 - C. 40
 - D. 80
 - E. 20
4. If one strand of a DNA molecule has the sequence of bases 5'ATTGCA3', the other complementary strand would have the sequence
- A. 3'TAACGT5'.
 - B. 5'TAACGT3'.
 - C. 5'UAACGU3'.
 - D. 3'UAACGU5'.
 - E. 5'UGCAAU3'.
5. A new organism is discovered in the forests of Costa Rica. Scientists there determine that the polypeptide sequence of hemoglobin from the new organism has 72 amino acid differences from humans, 65 differences from a gibbon, 49 differences from a rat, and 5 differences from a frog. These data suggest that the new organism
- A. may have evolved from rats but not from humans and gibbons.
 - B. is more closely related to frogs than to humans.
 - C. may have evolved from gibbons but not rats.
 - D. is more closely related to humans than to rats.
 - E. is more closely related to humans than to frogs.
6. The element nitrogen is present in all of the following *except*
- A. monosaccharides.
 - B. proteins.
 - C. DNA.
 - D. amino acids.
 - E. nucleic acids.

The following questions are based on the 15 molecules illustrated in Figure 5.8. Each molecule may be used once, more than once, or not at all.

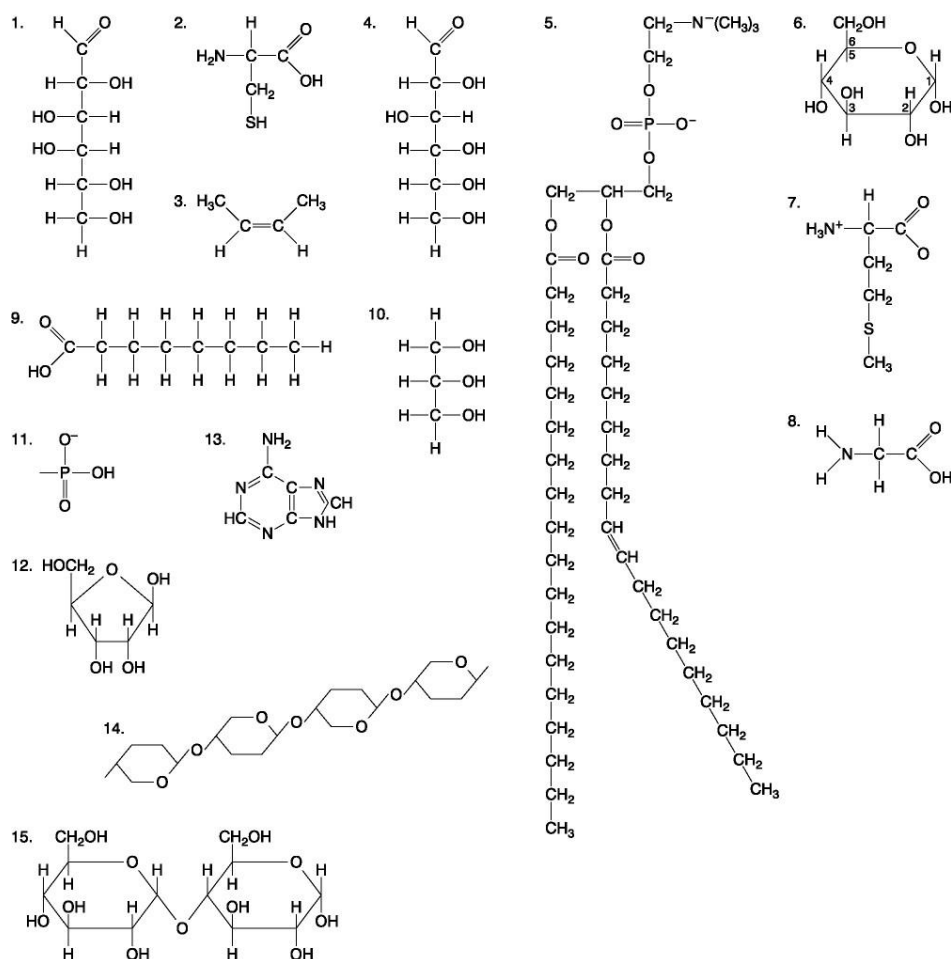


Figure 5.8

7. Which molecule has hydrophilic and hydrophobic properties and would be found in plasma membranes?
 A. 6 B. 5 C. 1 D. 14 E. 12
8. Which of the following combinations could be linked together to form a nucleotide?
 A. 11, 12, and 13
 B. 1, 2, and 11
 C. 3, 7, and 8
 D. 5, 9, and 10
 E. 12, 14, and 15
9. Which of the following molecules contain(s) an aldehyde type of carbonyl functional group?
 A. 10 B. 4 C. 1 D. 8 E. 1 and 4
10. Which of the following molecules act as building blocks (monomers) of polypeptides?
 A. 12, 13, and 15
 B. 1, 4, and 6

- C. 11, 12, and 13
 - D. 2, 7, and 8
 - E. 7, 8, and 13
11. A fat (or triacylglycerol) would be formed as a result of a dehydration reaction between
- A. one molecule of 5 and three molecules of 10.
 - B. one molecule of 9 and three molecules of 10.
 - C. one molecule of 5 and three molecules of 9.
 - D. three molecules of 9 and one molecule of 10.
 - E. three molecules of 5 and one molecule of 9.
12. Tubulin is a dimer, made up of 2 slightly different polypeptides, alpha and beta. Given the structure above, what is the most likely consequence to the structure of the microtubule?
- A. Microtubules grow by adding a complete circular layer at a time rather than spiraling.
 - B. One "half-pipe" side of the tubule must be heavier in alpha and the other in beta subunits.
 - C. Microtubules in cilia must never grow or become shorter.
 - D. Tubulin molecules themselves must be rigid structures.
 - E. One end of a microtubule can grow or release dimers at a faster rate than the other.
13. 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. microtubules and chromosome movement
 - B. intermediate filaments and cytoplasmic streaming
 - C. microtubules and cleavage furrow formation
 - D. microfilaments and ciliary motion
 - E. microfilaments and the nuclear lamina
14. The cell walls of bacteria, fungi, and plant cells and the extracellular matrix of animal cells are all external to the plasma membrane. Which of the following is a characteristic of all of these extracellular structures?
- A. They are constructed of materials that are largely synthesized in the cytoplasm and then transported out of the cell.
 - B. They must block water and small molecules in order to regulate the exchange of matter and energy with their environment.
 - C. They must permit information transfer between the cell's cytoplasm and the nucleus.
 - D. They must provide a rigid structure that maintains an appropriate ratio of cell surface area to volume.
 - E. They are composed of a mixture of lipids and carbohydrates.
15. Recent evidence shows that the extracellular matrix can take part in regulating the expression of genes. A likely possibility for this might be which of the following?
- A. Proteoglycans in the ECM become large enough in aggregate to force genetic alteration.

- B. Intracellular signals might cause changes in the fibronectin binding to the cell surface.
- C. Mechanical signals of the ECM can alter the cytoskeleton, which can alter intracellular signaling.
- D. Fibronectin binds to integrins built into the plasma membrane.
- E. Orientation of microfilaments to the ECM can change the gene activity.

Read the following information and refer to Figure 7.4 to answer the following questions.

Five dialysis bags, constructed from a semi-permeable membrane that is impermeable to sucrose, were filled with various concentrations of sucrose and then placed in separate beakers containing an initial concentration of 0.6 M sucrose solution. At 10-minute intervals, the bags were massed (weighed) and the percent change in mass of each bag was graphed.

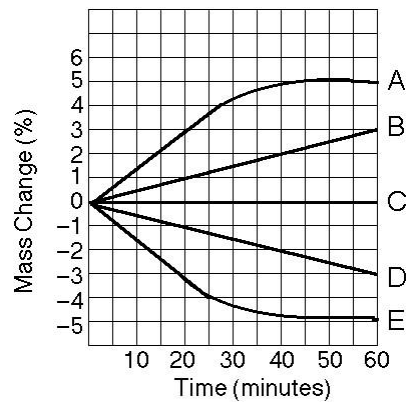


Figure 7.4

16. Which line represents the bag that contained a solution isotonic to the 0.6 molar solution at the beginning of the experiment?
17. Which line represents the bag with the highest initial concentration of sucrose?
18. Which line or lines represent(s) bags that contain a solution that is hypertonic at the end of 60 minutes?
 A. A and B B. B C. C D. D E. D and E
19. Glucose diffuses slowly through artificial phospholipid bilayers. The cells lining the small intestine, however, rapidly move large quantities of glucose from the glucose-rich food into their glucose-poor cytoplasm. Using this information, which transport mechanism is most probably functioning in the intestinal cells?
 A. phagocytosis
 B. facilitated diffusion
 C. active transport pumps
 D. exocytosis
 E. simple diffusion
20. If a membrane protein in an animal cell is involved in the cotransport of glucose and sodium ions into the cell, which of the following is most likely true?

- A. The sodium ions are moving down their electrochemical gradient while glucose is moving up.
- B. Glucose is entering the cell along its concentration gradient.
- C. A substance that blocked sodium ions from binding to the cotransport protein would also block the transport of glucose.
- D. Sodium ions can move down their electrochemical gradient through the cotransporter whether or not glucose is present outside the cell.
- E. Potassium ions move across the same gradient as sodium ions.

