

考 試 科 目	細胞與分子生物學	系 所 別	神經科學研究所	考 試 時 間	2 月 7 日(五) 第二節
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一. 選擇題(共 10 題， 每題 3 分)

1. Which base pair(s) typically occur(s) in double-stranded DNA?

- a. C·C
- b. C·T
- c. C·A
- d. C·G

2. Short micro RNAs (miRNAs)

- a. are common in bacteria but not eukaryotes.
- b. code for proteins.
- c. are involved in regulation of gene expression.
- d. have no known function.

3. Cholesterol in cell membranes:

- a. decrease membrane thickness.
- b. increase membrane thickness.
- c. cause biomembranes to become curved.
- d. allow hydrophilic molecules to diffuse across the lipid bilayer.

4. When computing the osmotic pressure that must be placed across the membrane to stop the flow of water, what is the glucose osmotic equivalent of 1 M NaCl?

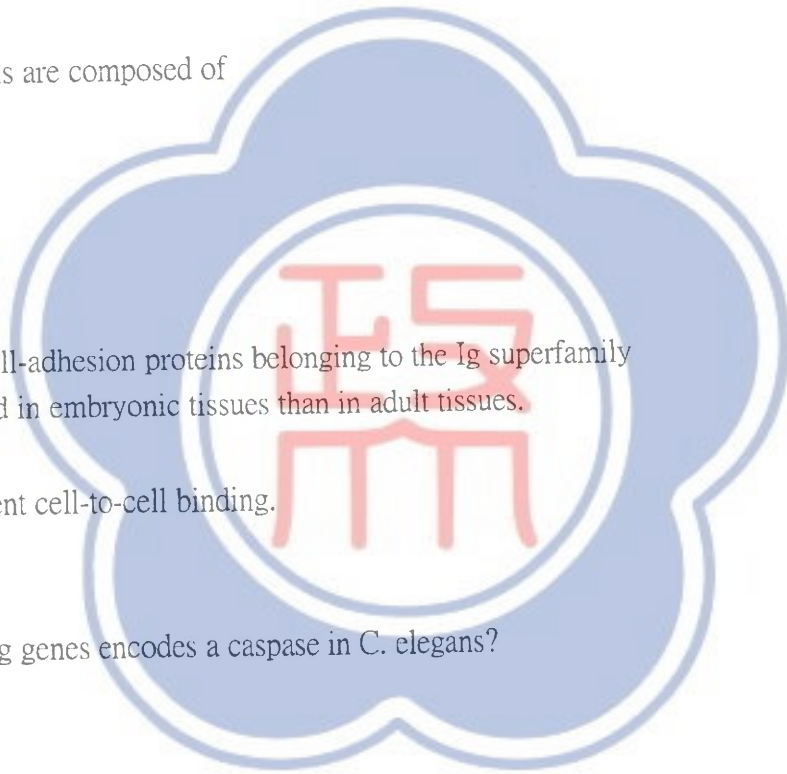
- a. 0.5 M
- b. 3 M
- c. 2 M
- d. 1 M

5. Glycosylation, a post-translational modification to proteins, occurs in the

- a. Golgi.
- b. proteasome.
- c. mitochondria.
- d. none of the above

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6. Which of the following statements best describes the difference between low-affinity integrins and high-affinity integrins?
- Many integrins can exist in two conformations a low-affinity (bent) conformation and a high-affinity (straight) conformation.
 - Dissociation of the heterodimer converts many integrins from the low-affinity to the high-affinity state.
 - Association of the heterodimer converts many integrins from the low-affinity to the high-affinity state.
 - Proteolytic cleavage of the C-terminal tails of the two subunits converts many integrins from the low-affinity to the high affinity state.
7. Vertebrate gap junctions are composed of
- adherins.
 - collagens.
 - connexins.
 - integrins.
8. NCAMs, a group of cell-adhesion proteins belonging to the Ig superfamily
- are less heavily sialylated in embryonic tissues than in adult tissues.
 - bind to proteoglycans.
 - mediate Ca^{2+} -independent cell-to-cell binding.
 - none of the above
9. Which of the following genes encodes a caspase in *C. elegans*?
- ced-9
 - ced-4
 - ced-3
 - b and c
10. During X inactivation in females, the XIST gene product is expressed
- only by the paternally derived X chromosome.
 - only by the maternally derived X chromosome.
 - only by the active X chromosome in each female cell.
 - only by the inactivated X chromosome in each female cell.



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二、問答題(共 10 題，每題 7 分)

1. A double-stranded piece of DNA containing the sequence GCATGGCCACTACCG has a higher T_m than one containing the sequence GAATGGTAACAACCTG. Describe the properties of DNA that make this true.
2. Describe how lipid soluble hormones, glucocorticoid for example, regulate gene transcription acting through nuclear hormone receptors.
3. What are the primary functions of the plasma membrane in animal cells?
4. When examined by fluorescent recovery after photobleaching (FRAP), certain integral membrane proteins are significantly less mobile than others. What accounts for this reduced mobility?
5. In a classic experiment, H. V. Wilson studied aggregation of mechanically dissociated individual sponge cells from two different species. He found that the cells of each species would adhere to one another but not to cells of the other species. Describe the factors involved in this species-specific aggregation.
6. Define stem cells. Which of the following cells are stem cells: (a) fertilized egg, (b) intestinal crypt cell, (c) cancer cells? Please explain your answers.
7. Explain the role of mitochondria in apoptosis.
8. What is a dominant-negative mutation? Describe the mechanism by which this mutation causes the dominant-negative phenotype.
9. What are the roles of SNARE proteins in exocytosis? How do they bring about specific membrane fusion?
10. What happens to a microtubule that loses its GTP cap?

備

註

- 一、作答於試題上者，不予計分。
- 二、試題請隨卷繳交。