

所別：生物物理研究所碩士班 科目：普通生物

I 問答題:

1. (10 分) You examine some muscle cells and some epithelial cells with an electron microscope. You notice that the muscle cells contain far more mitochondria. What does this tell you about the functions and needs of these 2 cell types?
2. (共 15 分) Proteins are made of amino acids.
 - (a) (5 分) Give the generic chemical structure for an amino acid.
 - (b) (5 分) Show how a condensation reaction could proceed between two amino acids to result in a peptide.
 - (c) (5 分) Label the C and N ends (terminuses) of this peptide.
3. (共 15 分) Explain how a protein displays structural hierarchy:
 - (a) (7 分) List 4 levels of structure for a protein,
 - (b) (8 分) Describe each of these levels of structure.
4. (共 10 分) The following is the sequence of a piece of single stranded nucleic acid: 5'-ACCUGGCUAA-3'.
 - (a) (5 分) Is this DNA or RNA? Why?
 - (b) (5 分) Write the sequence of the duplex, or double stranded, nucleic acid
5. (共 10 分) A man of blood group B is being sued by a woman of blood group A for paternity. The woman's child is blood group O.
 - (a) (5 分) Is this man the father of this child? Explain.
 - (b) (5 分) If this man actually is the father of this child, specify the genotypes of both parents.
6. (共 15 分) Consider a bacterial gene that is approximately 2100 nucleotides long.
 - (a) (5 分) Approximately how many amino acids would this gene code for?
 - (b) (5 分) How many mRNA molecules will probably be transcribed from this gene?
 - (c) (5 分) How many proteins will probably be made from this gene?

II 選擇題 (單選):

1. (5 分) Photosynthesis is...
 - A. Part of neither the fast nor the slow pathway of carbon recycling

注：背面有試題

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- B. A process that requires oxygen
C. A process that results in the production of greenhouse gases
D. Part of the fast pathway of carbon recycling
E. A process NOT performed by most producers
2. (5 分) You observe some dividing cells under microscope. How would you know whether a cell was in metaphase of mitosis or metaphase I of meiosis?
- A. If the chromosomes line up in homologous pairs, it's mitotic metaphase
B. If the DNA has replicated, it's mitotic metaphase
C. If the chromosomes line up in homologous pairs, it's metaphase I of meiosis
D. If the DNA has replicated, it's metaphase I of meiosis
E. It simply cannot be determined
3. (5 分) Consider the following events of protein synthesis and then choose the option that has placed them in the correct chronological order.
1. mRNA transcribed
 2. Polypeptide chain completed
 3. mRNA binds to ribosome
 4. Ribosome bonds amino acids together
 5. tRNA delivers amino acids to ribosomes
 6. mRNA leaves nucleus
 7. DNA double helix unwinds
- A. 1-3-4-6-7-5-2
B. 2-6-5-4-3-7-1
C. 7-1-3-4-5-6-2
D. 1-3-5-2-7-4-6
E. 7-1-6-3-5-4-2
4. (5 分) Which of the following is TRUE?
- A. Fatty acids are an end product of lipid hydrolysis
B. Nucleotides are the polymers of nucleic acids
C. Because of its status as an unsaturated carbohydrate, RNA cannot be considered a polymer
D. A and C
E. A and B
5. (5 分) The control of body temperature involves:
- I. Blood Vessels
 - II. Skeletal Muscles (for shivering)
 - III. Hypothalamus
- A. Only I
B. I, II, and III
C. Only I and III
D. Only II and III
E. Only I and II