

大 葉 大 學 九 十 四 學 年 度 碩 士 班 甄 試 試 題 紙

所 別	組別	考 試 科 目 (中 文 名 稱)	考 試 日 期	考 試 時 間	備 註
分子生物科技所	甲	生物化學	12月13日	9:00-10:30	P2-1

註：備註欄若未註明可攜帶計算機或其他資料作答時，考生一律不准攜帶。

※背面有試題

Multiple Choice Questions (2 points each , 40 points total) :

1. When a region of DNA must be repaired by removing and replacing some of the nucleotides, what ensures that the new nucleotides are in the correct sequence?
 A) DNA cannot be repaired and this explains why mutations occur. B) Specific enzymes bind the correct nucleotides.
 C) The new nucleotides basepair accurately with those on the complementary strand. D) The repair enzyme recognizes the removed nucleotide and brings in an identical one to replace it. E) The three-dimensional structure determines the order of nucleotides.
2. Osmosis is movement of a:
 A) charged solute molecule (ion) across a membrane. B) gas molecule across a membrane. C) nonpolar solute molecule across a membrane. D) polar solute molecule across a membrane. E) water molecule across a membrane.
3. During oxidative phosphorylation, the proton motive force that is generated by electron transport is used to:
 A) create a pore in the inner mitochondrial membrane. B) generate the substrates (ADP and P_i) for the ATP synthase.
 C) induce a conformational change in the ATP synthase. D) oxidize NADH to NAD⁺. E) reduce O₂ to H₂O.
4. Which of these chloroplast enzymes is *not* regulated by light?
 A) Fructose 1,6-bisphosphatase B) Glyceraldehyde-phosphate dehydrogenase C) Ribulose 5-phosphate kinase D) Sedoheptulose 1,7-bisphosphatase E) All of the above are regulated by light.
5. Cholesterol is synthesized from:
 A) acetyl-CoA. B) choline. C) lipoic acid. D) malate. E) oxalate.
6. One distinction between peptide and steroid hormones is that peptide hormones:
 A) act through nonspecific receptors, whereas steroid hormones act through specific receptors. B) are generally water-insoluble, whereas steroid hormones are water soluble. C) are more stable than steroid hormones. D) bind to cell surface receptors, whereas steroid hormones bind to nuclear receptors. E) bind to their receptors with high affinity, whereas steroid hormones bind with low affinity.
7. Of the 20 standard amino acids, only _____ is not optically active. The reason is that its side chain _____.
 A) alanine; is a simple methyl group. B) glycine; is a hydrogen atom. C) glycine; is unbranched. D) lysine; contains only nitrogen. E) proline; forms a covalent bond with the amino group.
8. An average protein will *not* be denatured by:
 A) a detergent such as sodium dodecyl sulfate. B) heating to 90°C. C) iodoacetic acid. D) pH 10. E) urea.
9. The fundamental cause of sickle-cell disease is a change in the structure of:
 A) blood. B) capillaries. C) hemoglobin. D) red cells. E) the heart.
10. Enzymes are potent catalysts because they:
 A) are consumed in the reactions they catalyze. B) are very specific and can prevent the conversion of products back to substrates. C) drive reactions to completion while other catalysts drive reactions to equilibrium. D) increase the equilibrium constants for the reactions they catalyze. E) lower the activation energy for the reactions they catalyze.
11. Which of the following is *not* a reducing sugar?
 A) Fructose B) Glucose C) Glyceraldehyde D) Ribose E) Sucrose
12. In the laboratory, several factors are known to cause alteration of the chemical structure of DNA. The factor(s) likely to be important in a *living* cell is (are):
 A) heat. B) low pH. C) oxygen. D) UV light. E) both C and D.

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分子生物科技所	甲	生物化學	12月13日	9:00-10:30	P2-2

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13. In the laboratory, recombinant plasmids are commonly introduced into bacterial cells by:
 - A) electrophoresis – a gentle low-voltage gradient draws the DNA into the cell.
 - B) infection with a bacteriophage that carries the plasmid.
 - C) microinjection.
 - D) mixing plasmids with an extract of broken cells.
 - E) transformation – heat shock of the cells incubated with plasmid DNA in the presence of CaCl_2 .
14. Which vitamin is derived from cholesterol?
 - A) A
 - B) B12
 - C) D
 - D) E
 - E) K
15. An integral membrane protein can be extracted with:
 - A) a buffer of alkaline or acid pH.
 - B) a chelating agent that removes divalent cations.
 - C) a solution containing detergent.
 - D) a solution of high ionic strength.
 - E) hot water.
16. Calmodulin is a(n):
 - A) allosteric activator of calcium-dependent enzymes.
 - B) allosteric inhibitor of calcium-dependent enzymes.
 - C) calcium-dependent enzyme.
 - D) cell surface calcium receptor.
 - E) regulatory subunit of calcium-dependent enzymes.
17. Which of the following is *not* an intermediate of the citric acid cycle?
 - A) Acetyl-coA
 - B) Citrate
 - C) Oxaloacetate
 - D) Succinyl-coA
 - E) α -Ketoglutarate
18. During α -oxidation of fatty acids, _____ is produced in peroxisomes but not in mitochondria.
 - A) acetyl-CoA
 - B) FADH_2
 - C) H_2O
 - D) H_2O_2
 - E) NADH
19. If a person's urine contains unusually high concentrations of urea, which one of the following diets has he or she probably been eating recently?
 - A) High carbohydrate, very low protein
 - B) Very high carbohydrate, no protein, no fat
 - C) Very very high fat, high carbohydrate, no protein
 - D) Very high fat, very low protein
 - E) Very low carbohydrate, very high protein
20. Glycolysis in the erythrocyte produces pyruvate that is further metabolized to:
 - A) CO_2 .
 - B) ethanol.
 - C) glucose.
 - D) hemoglobin.
 - E) lactate.

Short Answer Questions : (10 points each, 60 points total)

21. In mammalian liver, glucose-1-phosphate, the product of glycogen phosphorylase, can enter glycolysis or replenish blood glucose. Describe the reactions by which these two processes are carried out.
22. What is an oxidation? What is a reduction? Can an oxidation occur without a simultaneous reduction? Why or why not?
23. List the types of noncovalent interactions that are important in providing stability to the three-dimensional structures of macromolecules. Why is it important that these interactions be noncovalent, rather than covalent, bonds?
24. Discuss how a mutation in DNA could be harmful or beneficial to an organism.
25. What are introns? What is satellite DNA?
26. What distinguishes the simple from the complex class of bacterial transposon?

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