

大葉大學九十學年度研究所碩士班招生考試試題紙

系 所 組 別	考 試 科 目 (中文名稱)	考 試 日 期	備 註
食品工程(乙組)	生物化學	4 月 22 日 第 2 節	P2-1

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）

I. True (O) or False (X): 20 pts (2 pts each)

- Nonsense suppressor tRNAs decode stop codons as an amino acid.
- Codon usage refers to the number of different tRNAs used to decode a message.
- Human can store more energy in glycogen than in triacylglycerols.
- There is at least one tRNA for each of the 20 amino acids.
- During polypeptide synthesis, ribosomes move along the mRNA in the direction 5' → 3'.
- A monoclonal antibody differs from a polyclonal antibody in that monoclonal antibodies are produced by cells from the same organism that produced the antigen.
- Proteins with the same molecular weight have the same amino acid composition.
- If the ΔG^0 for a reaction is positive, the reaction will proceed spontaneously.
- Primers complementary to the 3' ends of single-stranded RNA can be used for PCR.
- Isomaltose is a nonreducing sugar.

II. Simple Choice: 40 pts (2 pts each)

- If GGGGCCCC represents the sequence of bases in one strand of a double-stranded DNA, then the complementary strand must have the sequence
(A) AAAATTTT (B) TTTTAAAA (C) GGGGCCCC (D) CCCCAGGG
- How many malonyl-CoAs are involved in the biosynthesis of one palmitate?
(A) 7 (B) 8 (C) 9 (D) 10 (E) 11
- Which of the following organelles lacks a double membrane?
(A) mitochondrion (B) nucleus (C) chloroplast (D) plasma membrane
- During strictly anaerobic exercise, muscle cells preferentially
(A) reduce pyruvate to lactate. (B) oxidize pyruvate to acetyl-CoA.
(C) decarboxylate pyruvate to acetaldehyde. (D) carboxylate pyruvate to oxaloacetate.
- The purine is derived in part from which of the following metabolic precursors?
(A) glutamic acid (B) glutamine (C) asparagine (D) O₂
- The urea cycle is linked to the citric acid cycle by
(A) oxaloacetate (B) citrate (C) fumarate (D) aspartate
- A lipid which does not have a sphingosine backbone is
(A) ganglioside GM₁ (B) sphingomyelin (C) phosphatidylinositol (D) ceramide.
- The principal substrate in the fatty acid biosynthetic pathway is
(A) acetyl-CoA (B) acetyl-ACP (C) malonyl-CoA (D) NADPH
- The β -oxidation of saturated fatty acids is not characterized by
(A) the elimination of 2-C units at each step.
(B) β -oxidation occurs in the mitochondrial matrix.
(C) β -oxidation is quantitatively the primary route to degradation.
(D) β -oxidation is initiated at the methyl end of the fatty acid.
- How many NAD⁺ are reduced in the degradation of palmitoyl-CoA to form eight molecules of acetyl-CoA?
(A) 1 (B) 7 (C) 8 (D) 16 (E) 18
- How many tricarboxylic acids are in the TCA cycle?
(A) 1 (B) 2 (C) 3 (D) 4 (E) 5
- In mammals, pyruvate cannot be converted to
(A) acetyl-CoA (B) lactate (C) ethanol (D) oxaloacetate

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13. Which of the following could serve as a universal oligonucleotide primer used to make cDNA from eukaryotic mRNA?
 (A) oligo(dA) (B) oligo(dT) (C) *EcoRI* linkers (D) dATP and dTTP
 14. IPTG is needed to stimulate transcription of the foreign gene in the P_{lac} expression vector in *E. coli*, because
 (A) IPTG is essential in all *E. coli* expression.
 (B) it suppresses the other *E. coli* genes from being expressed at high level.
 (C) it binds to the lactose repressor, which precludes it binding to DNA.
 (D) it reacts with and activates RNA polymerase.
 15. RNA is hydrolyzed in basic solution but DNA is not. This occurs because
 (A) thymine is found in DNA, but uracil is not.
 (B) DNA is double stranded, while RNA is single stranded.
 (C) DNA contains a 2'-deoxyribose, while RNA does not.
 (D) RNA has modified bases, while DNA does not.
 16. Which of the following amino acids has the one letter symbol Q?
 (A) glutamate (B) glutamine (C) aspartate (D) asparagine (E) arginine
 17. Hydropathy plots for transport proteins are utilized to reveal
 (A) amino acid residues that may be highly modified.
 (B) amino acid residues that may be directly involved in facilitated transport.
 (C) stretches of amino acid residues that make up hydrophobic regions and may be associated with the lipid bilayer.
 (D) amino acid residues that are hyper-reactive due to their location.
 18. The component(s) of DNA which is responsible for the absorbance band at 250-270 nm is
 (A) bases, pentoses, and phosphates all contribute (B) only bases
 (C) only bases and pentoses (D) only pentoses and phosphates
- 19.-20. The dependence of velocity of an enzyme-catalyzed reaction on the substrate concentration was determined in the absence or presence of inhibitor and plotted using a double reciprocal plot.
19. What type is displayed by the inhibitor?
 (A) competitive (B) noncompetitive
 (C) mixed (D) uncompetitive

20. Which curve corresponds to the inhibited case?
 (A) I (B) II (C) I and II (D) none

III. Questions: 40 pts

1. What is the central dogma of molecular biology? (5 pts)
2. Foods containing aspartame have a warning to phenylketonurics. Why? (5 pts)
3. What two important compounds couple anabolism and catabolism? (5 pts)
4. Draw Fisher projection formula for cysteine. (5 pts)
5. Calculate the pH at which the γ -carboxyl group of glutamic acid is 20% dissociated. The pKas for glutamic acid are 2.2, 4.3, and 9.7. ($\log 2 = 0.3$) (10 pts)
6. For proteins with a single transmembrane segment, the segment is a hydrophobic helix. Why a helix? Why hydrophobic residues? (10 pts)