

國立嘉義大學 99 學年度

食品科學系碩士班（保健食品組）招生考試試題

科目：生物化學

一、填充題：(每格 2 分，計 30 分)

(下列二十六個答案中只有十五個答案是可能填入空格內的答案，而且每個答案只能使用一次並適合填入一個空格內。請仔細閱讀題目並將題號與答案所代表的英文字母回答於答案卷即可，不必抄寫題目。)

(A) lactate; (B) pyruvate; (C) glycerol; (D) pyruvate carboxylase; (E) pyruvate dehydrogenase; (F) glucose; (G) ketone bodies; (H) UDP-glucose; (I) cAMP; (J) glucagon; (K) adenylate cyclase; (L) glycogenin; (M) TCA cycle; (N) acetyl-CoA carboxylase; (O) HMG-CoA reductase; (P) insulin; (Q) triglyceride; (R) phospholipid; (S) malonyl-CoA; (T) phosphoenolpyruvate carboxykinase; (U) collagen; (V) interleukin; (W) metabolic alkalosis; (X) phenylalanine hydroxylase; (Y) citrate lyase; (Z) amylopectin.

- _____ is the rate-limiting enzyme in cholesterol synthesis.
- Glycogen synthesis requires a glycogen chain. Glycogen synthesis is now believed to be initiated by the transfer of glucose from _____ to a specific tyrosine residue in a “primer” protein called _____.
- The noncarbohydrate precursors for gluconeogenesis include _____, _____, _____, and certain α -keto acids (molecules derived from amino acids).
- Phenylketonuria (PKU), caused by a deficiency of _____, is the most common clinically encountered inborn error of amino acid metabolism.
- Both synthesis and degradation of glycogen are controlled through a complex mechanism involving insulin, glucagon, and epinephrine. After glucagon binds to its receptor, _____ (a cell membrane enzyme) is stimulated to convert ATP to the

second messenger _____.

- In gluconeogenesis, phosphoenolpyruvate synthesis from pyruvate requires two enzymes: _____ and _____.
- Fatty acid synthesis begins with the carboxylation of acetyl-CoA to form _____ and this carboxylation is catalyzed by an enzyme named _____.
- Brain and red blood cells rely exclusively on _____ as their energy source. Under exceptional circumstances, brain cells can also use _____ to generate energy.

二、單選題：(每題 2 分，計 20 分)

- A solution contains 2×10^{-3} moles per liter of a weak acid ($pK = 3.5$) and 2×10^{-3} moles per liter of its conjugate base. Its pH is
(A) 2.7 (B) 3.1 (C) 3.5 (D) 4.1.
- Complete acid hydrolysis of nucleic acids yields all of the following EXCEPT:
(A) phosphoric acid (B) purines (C) adenosine (D) pentoses.
- Which one of the following statements about human genes is CORRECT?
(A) Genes for ribosomal RNAs are scattered randomly throughout the genome.
(B) Many genes have intervening sequences but many do not.
(C) All genes used for protein synthesis are tightly clustered together with very little DNA between one gene and the next.
(D) The promoter region is usually located at the 3'-end of the gene.

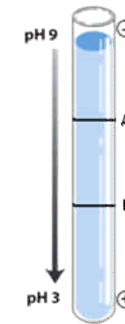
4. The amino acids asparagine, aspartate, and lysine are separated by ion-exchange chromatography. The order in which they are eluted from a sulfated polystyrene resin by a pH 7 buffer is
 (A) aspartate, lysine, asparagine (B) lysine, aspartate, asparagine
 (C) lysine, asparagine, aspartate (D) aspartate, asparagine, lysine.
5. Which of the following reagents would be most useful in determining the N-terminal amino acid of a polypeptide?
 (A) 1 mol/L HCL (B) phenylisothiocyanate
 (C) cyanogen bromide (D) trypsin.
6. Which one of the following statements about protein structure is CORRECT?
 (A) Proteins consisting of one polypeptide can have quaternary structure.
 (B) The information required for the correct folding of a protein is contained in the specific sequence of amino acids along the polypeptide chain.
 (C) The stability of quaternary structure in proteins is mainly due to covalent bonds among the subunits.
 (D) The formation of a disulfide bond in a protein requires that the two participating cysteine residues be adjacent to each other in the primary sequence of the protein.
7. Which of the following compounds can be synthesized in humans?
 (A) riboflavin (B) niacin (C) leucine (D) thiamine.
8. A deficiency of pantothenic acid would most directly affect the reaction catalyzed by
 (A) fumarase (B) malate dehydrogenase
 (C) citrate synthase (D) succinate dehydrogenase.
9. Which one of the following statements is CORRECT?
 (A) An amino acid sequence of a protein can be deduced from the corresponding cDNA nucleotide sequence.
 (B) The size and sequence of introns can be deduced from the cDNA sequence alone.
 (C) Restriction endonucleases cleave both single-stranded and double-stranded DNA.
 (D) Restriction fragment length polymorphism (RFLP) is usually found in the coding

sequence of a gene.

10. When excessive amounts of iron are present in the diet, the excess iron is stored as
 (A) ferritin (B) transferrin (C) hemosiderin (D) hemoglobin.

三、簡答題：(50 分)

1. Give an example of each of the following (12 分)
 (A) amino acid without chiral C (B) polyunsaturated fatty acid (C) hydrolases
 (D) ketose (E) branched amino acid (F) ketone body
2. Egg albumin 與 hemoglobin 的 pI 值分別為 4.6 與 6.8，若以 isoelectric focusing 分離時，請分別標出 A 與 B 位置的蛋白質為何？並說明此方法所應用之原理？(5 分)



3. Rank the standard reducing potentials for the following: O_2 , NAD^+ , cytochrome c, ubiquinone, FAD。(3 分)
4. 在 brain 中 hexokinase 對下列各 substrate (ATP, D-glucose, D-fructose) 的 K_m 值分別為 0.4 mM, 0.05 mM 與 1.5 mM，試說明此 K_m 代表之意義。(3 分)
5. 如何得知 DNA denaturation？(3 分)
6. 針對下列幾項比較脂肪酸的氧化與合成作用之異同處：(A)位置，(B)輔因子，(C)方向性，(D) citrate 如何調控脂肪酸的氧化與合成。(8 分)
7. 針對下列幾項比較 glycolysis 與 gluconeogenesis (pyruvate→glucose) 之異同處：(A)步驟中主要不同處，(B)多少 ATP 參與，(C) citrate 如何調控 glycolysis 與 gluconeogenesis, (D) fructose-2,6-bisphosphate (F26BP) 如何調控 glycolysis 與 gluconeogenesis。(8 分)
8. 各舉一例簡述 4 種體內常見調控代謝之機轉。(8 分)