所別：生命科學系碩士班 醫藥與環境生物科技組(一般生) 科目：生物化學

(一)

單選題（每題只有一個答案）；1～10：每題四分；11～12：每題五分

1. The conversion of pyruvate to oxaloacetate is likely to require which of the following coenzymes?

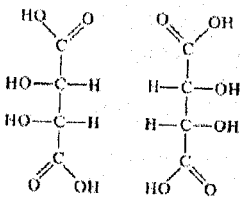
(A) Biotin.
(B) Vitamin B_{12}.
(C) Thiamine pyrophosphate.
(D) Pyridoxine.
(E) Nicotinic acid.

2. Which of the following takes place during oxidative phosphorylation in mitochondria or chloroplasts?

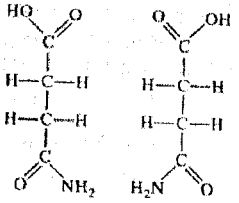
(A) Electrons are pumped from the matrix to the intermembrane space in Mitochondria
(B) Protons are pumped from the matrix to the intermembrane space in mitochondria
(C) Electrons are pumped from the lumen to the stroma in chloroplasts
(D) Protons are pumped from the lumen to the stroma in chloroplasts
(E) NADH is pumped from the matrix to the intermembrane space in mitochondria

3. Which of the following pairs of structures depicts stereoisomers according to conventional rules of projection?

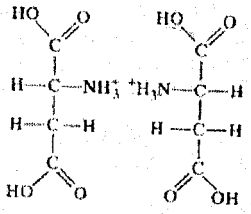
(A)



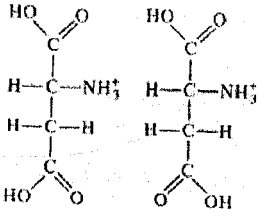
(B)



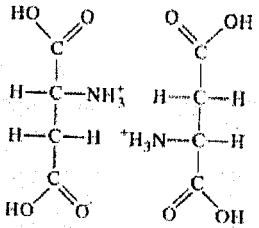
(C)



(D)



(E)



4. Which of the following enzyme is unique to gluconcogenesis in animals?

(A) glyceraldehyde 3-phosphate dehydrogenase
(B) fructose 1, 6-bisphosphate
(C) fructose 2, 6-bisphosphate
(D) phosphoglycerate kinase
(E) enolase

5. Which of the following pairs of protein kinase and its activating factor in eukaryotic cells is **NOT** true?

(A) MAP kinase and Raf
(B) glycogen phosphorylase kinase and protein kinase A
(C) protein kinase A and cAMP
(D) protein tyrosine kinase and insulin
(E) Ca^{2+}/CaM kinase and Ras

6. How many turns of the fatty acid oxidation cycle are required for complete oxidation of lignoceric acid ($CH_3(CH_2)_{22}COOH$) to acetyl-CoA?

注意：背面有試題

(~back~)

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(A) 9
(B) 10
(C) 11
(D) 12
(E) 15

7. All of the following processes occur in the mitochondria of mammalian cells EXCEPT

(A) protein synthesis
(B) DNA synthesis
(C) fatty acid biosynthesis
(D) β-oxidation of fatty acids
(E) the electron transport chain

8. Which of the following enzymes plays a key role in the biosynthesis of collagen?

(A) Tyrosine hydroxylase
(B) Choline oxidase
(C) Prolyl hydoxylase
(D) Adenylyl cyclase
(E) pyruvate dehydrogenase

9. Which of the following intermediate products is involved in the hydrolysis of a peptide with chymotrypsin?

(A) An amide between the substrate's acyl carbon and the asparagines of the active site
(B) An amide between the substrate's acyl carbon and the tyrosine of the active site
(C) An ester between the substrate's acyl carbon and the serine of the active site
(D) A thioester between the substrate's acyl carbon and the methionine
(E) An amide between the substrate's α-amino group and the glutamate of the active site

10 Which of the following amino acids is most likely to compose the core of a water-soluble globular protein?

(A) Isoleucine
(B) Glutamate
(C) Serine
(D) Proline
(E) Arginine

11 According to energy yield, phosphorolysis is preferable to hydrolysis in the breakdown of glycogen because

(A) the abundance of phosphate in the cell ensures that the reaction will in the catabolism and not the synthesis
(B) glucose 1-phosphate produces more ATP molecules than glucose does
(C) the products of hydrolysis cannot be used by glycolytic pathway
(D) the phosphorylases have lower K_m values
(E) the debranching process needs phosphorylated glucose

12. Substrate-level phosphorylation in the Krebs cycle depends on the energy of the

(A) formation of citrate from oxaloacetate and acetyl-CoA
(B) oxidative decarboxylation of α-ketoglutarate and acetyl-CoA to succinyl-CoA
(C) thioester bond of succinyl-CoA
(D) FAD-dependent oxidation of succinate to fumarate
(E) NAD-dependent oxidation of malate to oxaloacetate

注意：背面有試題

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(二)

1. Please describe principles of all available methods to detect mRNA levels? (15 points)

2. Please compare the differences of translation mechanisms between prokaryote and eukaryote. (5 points)

3. 解釋名詞: (20 points)

a. Dominant negative
b. Euchromatin
c. Tm value
d. Alternative splicing
e. MicroRNA
f. Okazaki fragment
g. Ubiquitin
h. Transcription factor
i. Reverse transcriptase
j. Glucose repression

4. Following article is an abstract from a recent scientific journal. Please read this abstract and write down what information this paper provides to let people in another area easily understand.(10 points)

The detection, stabilization, and repair of stress-induced damage are essential requirements for cellular life. All cells respond to osmotic stress-induced water loss with increased expression of genes that mediate accumulation of organic osmolytes, solutes that function as chemical chaperones and restore osmotic homeostasis. The signals and signaling mechanisms that regulate osmoprotective gene expression in animal cells are poorly understood. Here, we show that gpdh-1 and gpdh-2, genes that mediate the accumulation of the organic osmolyte glycerol, are essential for survival of the nematode Caenorhabditis elegans during osmotic stress. Expression of GFP driven by the gpdh-1 promoter (Pgpdh-1::GFP) is detected only during hypertonic stress but is not induced by other stressors. Using Pgpdh-1::GFP expression as a phenotype, we screened 16,000 genes by RNAi feeding and identified 122 that cause constitutive activation of gpdh-1 expression and glycerol accumulation. Many of these genes function to regulate protein translation and cotranslational protein folding and to target and degrade denatured proteins, suggesting that the accumulation of misfolded proteins functions as a signal to activate osmoprotective gene expression and organic osmolyte accumulation in animal cells. Consistent with this hypothesis,

注意：背面有試題

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73% of these protein-homeostasis genes have been shown to slow age-dependent protein aggregation in C. elegans. Because diverse environmental stressors and numerous disease states result in protein misfolding, mechanisms must exist that discriminate between osmotically induced and other forms of stress-induced protein damage. Our findings provide a foundation for understanding how these damage-selectivity mechanisms function.