

所別：生命科學系碩士班 分子與環境生物學組(一般生) 科目：生物化學I(含代謝) 共 2 頁 第 1 頁
 生命科學系碩士班 分子與環境生物學組(在職生)

本科考試禁用計算器

*請在試卷答案卷(卡)內作答

參考用

Part I. Multiple choice questions (total 66%): each of questions or incomplete statements below is followed by five suggested answers or completions. Select the one that is best in each case.

- Which of the following amino acid residues is LEAST likely to be found in transmembrane domain of a protein?
(a) Arginine (b) Isoleucine (c) Leucine (d) Valine (e) Glycine
- What molecule contributes at least two nitrogen atoms to each purine?
(a) Glutamine (b) Asparagine (c) Lysine (d) Arginine (e) 10-formyl-THF
- Parkinson's disease can be treated L-Dopa that is derived from
(a) Tyrosine (b) Tryptophan (c) Phenylalanine (d) Glutamine (e) Asparagine
- Which of the following is an essential amino acid for humans?
(a) Alanine (b) Histidine (c) Tyrosine (d) Serine (e) Glutamine
- In animals, all the nitrogen of heme groups is derived from
(a) Succinate (b) Glycine (c) Alanine (d) Succinate and glycine (e) Succinate and alanine
- For each molecule of CO₂ fixed by the Calvin cycle, how many ATP are required?
(a) 2 ATP (b) 3 ATP (c) 6 ATP (d) 4 ATP (e) 9ATP
- Which of the following causes denaturation of a protein when disulfide bonds are present?
(a) Heat (b) Reducing agent (c) detergent (d) pH changes (e) None of the above
- Which of the following enzyme is induced by inflammation and is inhibited by NSAID and aspirin?
(a) PGH-PGE isomerase (b) PGI₂ synthase (c) Cyclooxygenase-2 (d) Reductase (e) None of the above
- Ubiquitination of protein is to added ubiquitine to which residues of the target protein?
(a) Serine (b) Threonine (c) Lysine (d) Arginine (e) Cysteine
- Which of the following amino acids can undergo an oxidation reaction to form a disulfide bond?
(a) Lysine (b) Threonine (c) Cysteine (d) Tyrosine (e) Alanine
- Which amino acid most commonly serves as a general acid and general base in an enzyme mechanism?
(a) Lysine (b) Serine (c) Histidine (d) Cysteine (e) Aspartic acid
- The binding of oxygen to hemoglobin is said to be _____
(a) high affinity (b) low affinity (c) cooperative (d) sequential (e) sigmoidal
- Which of the following types of tissue can use glucose, but not fatty acids, as a source of fuel?
(a) Cardiac muscle (b) Skeletal muscle (c) Brain (d) Liver (e) Adipose tissue
- What is the C-4 epimer of glucose?
(a) Gulose (b) Mannose (c) Talose (d) Galactose (e) Idose
- Which enzyme is important in the regulatory step for cholesterol biosynthesis?
(a) Squalene synthase (b) Squalene peroxidase (c) HMG-CoA lyase (d) HMG-CoA reductase (e) HMG-CoA synthase
- In a circular DNA molecule of 126 bp with 10.5 bp/turn, which of the following represents in an unstrained circle? (L = linking number, T = twist and W = writhe)
(a) L = 12, T = 11, W = 0 (b) L = 11, T = 12, W = -1 (c) L = 11, T = 11, W = 0 (d) L = 12, T = 12, W = 0 (e) L = 11, T = 11, W = +1
- Which enzyme is the most important regulator in fatty acid synthesis?
(a) Citrate lyase (b) Ketoacyl-ACP synthase (c) malonyl-CoA-ACP transacylase (d) Acetyl-CoA carboxylase (e) Acetyl-CoA-ACP transacylase
- Phospholipids are synthesized in the _____
(a) Golgi complex (b) Mitochondria (c) Peroxisome (d) Rough endoplasmic reticulum (e) Smooth endoplasmic reticulum
- In a typical eukaryotic cell the pH is usually around 7.4. What is the [H⁺] in a typical eukaryotic cell?
(a) 7.4x10⁻⁵ M (b) 0.00000074M (c) 7.6 nM (d) 6.6 μM (e) 4x10⁻⁸ M
- Degradation and synthesis of saturated fatty acids occur separately in _____
(a) Plasma membrane and cytosol (b) Cytosol and mitochondria (c) Adipocyte and mitochondria (d) Mitochondria and plasma membrane (e) Mitochondria and cytosol
- Which of the reactive oxygen species is thought to damage lipid membranes?
(a) Hydroxyl radical (b) Superoxide (c) Nitric oxide (d) Semiquinone radical (e) None of the above
- Why do individuals who are heterozygous for sickle cell anemia have a resistance to malaria?
(a) Aggregation of hemoglobin prevents parasitic infection
(b) Shortened life span of red blood cells does not allow sufficient time for the parasite to mature in the red blood cell
(c) Diminished blood flow to the skin prevents mosquitoes from transferring the malaria parasite to individuals
(d) Sickle cell hemoglobin fibers have decreased CO₂ carrying capacity, so diminished CO₂ exhalation does not attract mosquitoes
(e) None of the above

注意：背面有試題

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23. Which carrier is used in tissues for the transport of ammonia to the liver?
 (a) Alanine in all tissues
 (b) Glutamine in all tissues
 (c) Glutamine in most tissues but alanine in muscle
 (d) Alanine in most tissues but glutamine in muscle
 (e) None of the above
24. A group of transgenic mice that overexpress SIRT1 were fed *ad libitum* (no food restriction), what would be the consequences?
 (a) Shortened lifespan with increased incidence of age-related diseases such as diabetes and cardiovascular disease
 (b) Normal lifespan with increased incidence of age-related diseases
 (c) Normal lifespan with no increased incidence of age-related diseases
 (d) Lengthened lifespan with no increased incidence of age-related diseases
 (e) Lengthened lifespan with increased incidence of age-related diseases
25. Homocysteinemia can result from _____
 (a) Defect in cystathionine β -synthase
 (b) Defect in methionine synthase
 (c) Defect in 5,10-methylenetetrahydrofolate reductase
 (d) Dietary deficiency of folic acid, vitamin B₆ or B₁₂
 (e) All above
26. In the pathway for conversion of phenylalanine to fumarate and acetoacetate, there are two well-known enzyme defects that cause inheritable metabolic diseases. What are the names of these two diseases?
 (a) Alkaptonuria and phenylketonuria
 (b) Homocysteinuria and nonketotic hyperglycinemia
 (c) Phenylketonuria and maple syrup urine disease
 (d) Akaptonuria and nonketotic hyperglycinemia
 (e) Maple syrup urine disease and homocysteinuria
27. Albinism is resulted from the genetic deficiency of _____
 (a) Tryptophan hydroxylase (b) Tyrosinase (c) Tyrosine hydroxylase (d) Tyrosine aminotransferase (e) Tryptophanase
28. In the citric acid cycle, CO₂ generation are catalyzed by _____
 (a) Succinate dehydrogenase and malate dehydrogenase
 (b) Isocitrate dehydrogenase and malate dehydrogenase
 (c) Isocitrate dehydrogenase and α -ketoglutarate dehydrogenase
 (d) α -ketoglutarate dehydrogenase and succinate dehydrogenase
 (e) α -ketoglutarate dehydrogenase and malate dehydrogenase
29. Which enzyme catalyzes the primary regulation step of glycolysis?
 (a) Hexokinase (b) Glyceraldehyde-3-phosphate dehydrogenase (c) Phosphoglycerate kinase (d) Phosphofructokinase-1 (e) pyruvate kinase
30. Which of the following pathways takes place primarily within the inner mitochondrial membrane?
 (a) Glycolysis (b) Citric acid cycle (c) Fatty acid β -oxidation (d) Pentose phosphate pathway (e) Electron transport
31. Which of the following descriptions about "mitochondrial encephalomyopathies" is NOT TRUE?
 (a) Are caused by mitochondrial DNA mutations
 (b) Many of these diseases involve brain and skeletal muscle
 (c) The tissues affected and the severity of the disease vary among patients
 (d) The variability of these disease is due to the fact that each cell contains hundreds or thousands of mtDNA copies
 (e) None of the above
32. Which the following description about "Gout" is NOT TRUE?
 (a) Excessive accumulation of uric acid
 (b) Result from elevated activity of PRPP amidotransferase
 (c) Result from Glucose-6-phosphatase deficiency
 (d) Result from deficiency of hypoxanthine-guanine phosphoribosyl transferase
 (e) Is treated by allopurinol, a structural analog of hypoxanthine
33. All of the following enzymes are linked to the reduction of NADH except:
 (a) Isocitrate dehydrogenase (b) Lactate dehydrogenase (c) succinate dehydrogenase (d) pyruvate dehydrogenase (e) α -ketoglutarate dehydrogenase

參考用

Part II Short Answer and Essay Questions (total 34%):

1. What is the major difference between B-DNA and A-DNA? (5%)
2. From the following polynucleotide sequence, please answer the following questions: (6%)
 ACCAGTCG
 (a) The base found at the 3' end of the molecule is
 (b) Which nucleotide contains a free 3' hydroxyl group
 (c) Which nucleotide contains a free 5' phosphate group
 (d) Complementary sequence from 5' to 3' is
3. A number of human genetic defects of sphingolipid metabolism because sphingolipids are important in nervous tissues, why? (5%)
4. Which related mechanisms have been proposed as causes of type 2 diabetes? (8%)
5. What is the final product of glycolysis? How does animal cells use this product in aerobic condition and in anaerobic condition? How is this product used in beer brewing or biofuel production? (10%)

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