系所組別： 生物科技研究所甲、乙組

考試科目： 生物化學

考試日期：0226，節次：2

Multiple choice questions (60 分，每題 3 分)

請勿在本試題紙上作答，否則不予計分

1. Which organelle contains functional DNA?
   (A) nuclei
   (B) chloroplasts
   (C) mitochondria
   (D) bacterial plasmid
   (E) ER membrane

2. Which material can be converted into acetate (acetyl-CoA)?
   (A) Glycogen
   (B) Sucrose
   (C) Phospholipids
   (D) Triacylglycerols

3. Which of the following is true for storage lipid?
   (A) Derivatives of fatty acids are stored forms of energy in living organisms
   (B) Fatty acids are hydrocarbon derivatives
   (C) Triacylglycerols and glycerophospholipids are common types
   (D) Triacylglycerols are nonpolar molecules

4. Which of the following is true for gluconeogenesis?
   (A) Gluconeogenesis occurs primarily in the stomach in mammals
   (B) Gluconeogenesis employs several enzymes that also act in glycolysis
   (C) Pyruvate can be converted to oxaloacetate to start gluconeogenesis
   (D) Animals and plants can convert stored fats into glucose

5. Several reactions of glycolysis are irreversible, including metabolites catalyzed by
   (A) hexokinase
   (B) glucose 6-phosphatase
   (C) Phospho-fructokinase-1
   (D) pyruvate carboxylase

6. Which of the following is true about protein targeting?
   (A) Signal sequence directs an intracellular localization of a protein
   (B) ER targeting sequence is usually located near the carboxyl-terminus
   (C) When a signal sequence is synthesized on ribosomes and bound by the signal recognition particle, the elongation of the polypeptide is not affected
   (D)Signal sequences for ER and nuclear transport are cleaved after the protein arrives at its targeting

7. Which of the following is true about protein structure?
   (A) The common primary structures are the alpha-helix, and beta-sheet.
   (B) LC-MS is a method for determining the 3D protein structure
   (C) The causative agent of Creutzfeldt-Jakob disease is a misfolded protein
   (D) The term "protein quaternary structure" refers to the arrangement of a protein and its interacting protein subunits in complexes

8. Which of the following is true about pentose phosphate pathway?
   (A) This pathway is also called the hexose monophosphate pathway
   (B) It is a reductive pathway that glucose-6-phosphate is converted to pentose phosphates
   (C) The product of this pathway is required to overcome oxidative stress
   (D) The relative concentrations of $NADP^+$ and NADPH affects whether glucose -6 phosphate enters the pentose phosphate pathways or glycolysis

(背面仍有題目,請繼續作答)

9. Which of the following is true about amino acid degradation?
   (A) Amino acid catabolism is one of potential sources of energy production
   (B) Amino acids can be converted to glucose, ketone or both
   (C) The carbon skeletons of amino acids can enter the citric acid cycle
   (D) The carbon skeletons of some amino acids can be converted to pyruvate.

10. Which of the following is true about mitochondria?
   (A) double-membrane organelle
   (B) contains the pyruvate dehydrogenase complex
   (C) contains the enzymes of the fatty acid beta-oxidation pathway
   (D) contains the enzymes of the lactate production

11. Which of the following is false about the structure of chromosome?
   (A) Chromatin consists of only genome DNA
   (B) Acidic histones package the DNA into nucleosomes
   (C) One nucleosome consists of histone proteins and a ~200 bp DNA segment
   (D) Without histone package, bacterial DNA is loose.

12. Which of the following is true about DNA replication?
   (A) Only sense strand can act as template
   (B) There are many replication origins on eukaryotic chromosomes
   (C) The synthesis of Okazaki fragments is started with RNA primer
   (D) Because DNA replication is very accurate, most cells contain only one DNA polymerase

13. Which of the following is true about RNA synthesis?
   (A) RNA synthesis begins at untranslational region (UTR) of a gene
   (B) RNA polymerase III is responsible for the synthesis of tRNAs and microRNAs
   (C) rRNAs is transcribed by RNA polymerase I and RNA polymerase III
   (D) TATA box is one feature of RNA polymerase II promotors

14. Which of the following is true about modified bases in tRNAs?
   (A) The modifications include not only simple methylation, but also wholesale restructuring of the base
   (B) Modified bases affect codon-anticodon pairing
   (C) Modified bases can be found in TΨC loop.
   (D) The dihydrouridine modification is found in the D loop of tRNAs

15. Which antibiotic can inhibit protein synthesis in bacteria?
   (A) Puromycin
   (B)Tunicamycin
   (C) Tetracycline
   (D) Streptomycin

16. Which of the following is true about RNA interference?
   (A) It is an anti-virus mechanism
   (B) Long dsRNA can be cleaved by Dicer, a kind of exonucleases
   (C) Endogenous microRNA regulates both mRNA degradation and translation inhibition
   (D) RNA interference is found in animals, not in plants

17. Which amino acid contains an aromatic side chain?
   (A) Threonine
   (B) Phenylalanine
   (C) Tyrosine
   (D) Tryptophan

18. Which of the following is true about glycoprotein?
(A) They can act in cell-cell recognition
(B) They can be found on the outer face of the cell membrane only
(C) The structure of carbohydrate moieties of glycoproteins are identical
(D) O-liked oligosaccharides is attached to the amide nitrogen of an Asn residue

19. Which molecules can be transported into mitochondria?
(A) Protein
(B) Fatty acids
(C) Ribosome
(D) Golgi apparatus

20. Which molecule is involved in DNA synthesis?
(A)DNA polymerase
(B) helicases
(C) topoisomerases
(D) primases

Define the following terms: (10 分，每題 2 分)

1. Anabolism
2. Catabolism
3. Orthologs
4. Shuttle vector
5. *ex vivo*

Essays (共 30 分)

1. What evidence suggests the RNA world hypothesis? (5 %)
2. What are differences between bacterial mRNA and eukaryotic mRNA? (4%)
3. Address the concept and importance of metabolomics and give two analytical technologies. (6%)
4. Address the features of glucose metabolism in tumor cells (5%)
5. Address the functions of ribosomes (5%)
6. What is the glyoxylate cycle and how it works (5%)