請勿在本試題紙上作答，否則不予計分

第一部分：50%

I. Please select one of the best answers in the following questions (2.5% each)

1. The base in the wobble position of a codon
   a. is the 5′ (first) base.
   b. is the 3′ (third) base.
   c. is the second base.
   d. often contains adenine.

2. Which of the following is a protein that is involved in translation?
   a. topoisomerase
   b. ribosomal RNA
   c. RNA polymerase
   d. aminoacyl-tRNA synthetase

3. In which of these polymers are the monomers added one at a time?
   a. DNA
   b. rRNA
   c. protein
   d. all of the above

4. Which of the following is not required for both DNA replication and RNA transcription?
   a. DNA
   b. primers
   c. RNA
   d. proteins

5. All the following statements about molecular chaperones are true except
   a. They play a role in the proper folding of proteins.
   b. They are located in every cellular compartment.
   c. They are found only in mammals.
   d. They bind a wide range of proteins.

6. For an enzyme-catalyzed reaction, doubling the concentration of enzyme will
   a. double the *V*max.
   b. halve the *V*max.
   c. double the *K*m.
   d. halve the *K*m.

(背面仍有題目,請繼續作答)

7. Which of the following methods can separate proteins based on their mass?
   a. centrifugation
   b. ion exchange chromatography
   c. SDS polyacrylamide gel electrophoresis
   d. a and c
   e. all of the above

8. All the following statements about complex transcription units are true except
   a. They can have multiple poly(A) sites.
   b. They can generate multiple mRNAs.
   c. They can generate multiple polypeptides.
   d. They are common in bacteria.

9. Which of the following is not a mobile DNA element?
   a. transposon
   b. long terminal repeats (LTR)
   c. long interspersed elements (LINES)
   d. insertion sequence (IS) elements

10. Mobile DNA elements likely contributed to the evolution of higher organisms by the
   a. generation of gene families by gene duplication.
   b. creation of new genes by exon shuffling.
   c. formation of more complex regulatory regions.
   d all of the above

11. All of the following statements about mitochondrial DNA are true except
   a. Mammalian mitochondrial DNA contains introns.
   b. In mice, 99.99 percent of mitochondrial DNA is maternally inherited.
   c. Mitochondrial DNA encodes rRNAs and tRNAs.
   d. The human mitochondrial genome is smaller than the yeast mitochondrial genome.

12. Open reading frame (ORF) analysis is not effective in identifying genes in higher eukaryotes because of the presence of
   a. promoters.
   b. enhancers.
   c. introns.
   d. repetitious DNA.

13. Which of the following evidence is indicative of the presence of a gene in an unknown DNA sequence?
   a. alignment to a partial cDNA sequence

b. sequence similarity to genes of other organisms
c. ORF consistent with the rules for exon and intron sequences
d. all of the above

14. DNA that is transcriptionally active
a. is more susceptible to DNase I digestion.
b. is tightly packed into a solenoid arrangement.
c. contains unacetylated histones.
d. is more condensed than nontranscribed DNA.

15. All of the following can be found in chromatin except
a. DNA.
b. histones.
c. RNA.
d. transcription factors.

16. All the following statements about heterochromatin except
a. It is a dark-staining area of a chromosome.
b. It is usually transcriptionally active.
c. It is often simple sequence DNA.
d. It is a region of condensed chromatin.

II. Please answer in detail for the following questions (5% each)

1. Describe the types of bonds/interactions that hold together or stabilize the primary, secondary, tertiary, and quaternary structures of proteins.

2. To incorporate radio-labeled nucleotides into newly synthesized DNA, researchers use α-phosphorus32-labeled nucleotides, in a DNA synthesis reaction, where the α denotes the position of the radioactive phosphate moiety. Explain why the α position and not the β or γ position is the best position for the radioactive group in these experiments.

第二部分：50%

I. Choose the best answer of the following questions (2% each)

1. According to the chemiosmotic hypothesis, please choose the following correct statement.
   a. The inner mitochondrial membrane is permeable to protons and other ions.
   b. Electron flow through the respiratory chain causes bidirectional transport of protons across the inner mitochondrial membrane.
   c. ATP synthetic machinery can not establish a chemiosmotic gradient.
   d. The combined effects of membrane imperability and unidirectional proton transport establish a chemiosmotic or electrochemical gradient consisting of two components, a pH gradient and a charge gradient.
   e. All of the above are true.

2. Of the following inhibitors, the only one that will not block both oxygen consumption and ATP synthesis in normal mitochondria is
   a. oligomycin
   b. rotenone
   c. 2,4-dinitrophenol
   d. antimycin A
   e. cyanide

3. In terms of its response to adrenaline, lipase in fat cells is most like
   a. acetyl-CoA carboxylase in liver cells
   b. glycogen synthase
   c. glycogen phosphorylase
   d. pyruvate dehydrogenase
   e. glycerol kinase

4. Citrate lyase plays a crucial role in
   a. the conversion of glucose to fatty acids in all organisms
   b. the conversion of glucose to fatty acids in eukaryotes
   c. the conversion of glucose to fatty acids in prokaryotes
   d. fatty acid degradation in prokaryotes
   e. fatty acid degradation in eukaryotes

5. Aspirin
   a. stimulates thromboxane and prostaglandin synthesis.
   b. stimulates prostaglandin synthesis and inhibits thromboxane synthesis.
   c. stimulates thromboxane synthesis and inhibits prostaglandin synthesis.
   d. inhibits thromboxane and prostaglandin synthesis.
   e. does none of the above.

II. Briefly answer the following questions (5% each)

1. Listed below are several characteristics for the amino acids. List an amino acid that complies with each characteristic.
   a. Side chain that reacts with NaOH;
   b. An imidazole side chain;
   c. A side chain that can form hydrogen bonds with water;
   d. A side chain that reacts with HCl;
   e. An amino acid that releases ammoinia (NH_3) when heated with aqueous NaOH.

2. Each of the proteins listed below is treated with sodium dodecyl sulfate and separated by electrophoresis on a polyacrylamide gel. Each is run on an individual gel. Draw pictures of the final results.
   a. Myoglobin
   b. Hemoglobin (two a subunits, molecular weight = 15,500; two b subunits, molecular weight =16,000)

3. A peptide chain of polylysine coils into an α-helix in solution at pH 13; however, it becomes a random coil at pH 7. Explain this phenomenon?

4. Enzymes often use electron-rich nucleophilic functional groups in their reactions. For example, in the process of covalent catalysis, nucleophilic amino acid side chains initial attack on the substrate. Please name at least three amino acid side chains are considered nucleophilic?

5. Describe the general type of biochemical reaction that requires each of the following

(背面仍有題目,請繼續作答)

coenzymes.

a. Thiamine pyrophosphate
b. Pyridoxal phosphate
c. Nicotinamide adenine dinucleotide

6. Which of the following molecules are in the lipid family of compounds?

a. 1-Decanol; b. Alanine; c. Fructose; d. Palmitic acid; e. Trimyristin;
f. Glycerol; g. Adenine; h. β-Carotine; i. Aspartame; j. Insulin;
k. Ubiquinone; l. Ethanol.

7. Some scientists and physicians now recommend the ingestion of fish oil to reduce the risk of heart disease. The two major fatty acid components in a fish oil capsule are listed below. Draw the structure of these compounds

a. Ecosanpentaenoic acid ($20:5^{\Delta 5,8,11,14,17}$);
b. Docosahexaenoic acid ($22:6^{\Delta 5,8,11,14,17,20}$)

8. From the list below, identify those reactants or characteristics that describe β oxidation and fatty acid synthesis.

a. Enzymes located in the cytoplasm
b. Requires ADPH + H^+
c. Acyl CoA
d. Malonyl CoA
e. Enzymes located in mitochondria
f. Requires FAD
g. Acyl carrier protein (ACP)