單選題 (30%) (每題 2 分，答錯倒扣 0.5 分)

1. What is the approximate charge difference between glutamic acid and α-ketoglutarate at pH 9.5?
   A) 0　B) ½　C) 1　D) 1½　E) 2

2. By adding SDS (sodium dodecyl sulfate) during the electrophoresis of proteins, it is possible to:
   A) determine a protein's isoelectric point.　B) determine an enzyme's specific activity.
   C) determine the amino acid composition of the protein.
   D) preserve a protein's native structure and biological activity.
   E) separate proteins exclusively on the basis of molecular weight.

3. Which of the following parts of the IgG molecule are *not* involved in binding to an antigen?
   A) Fab　B) Fc　C) Heavy chain　D) Light chain　E) Variable domain

4. An α helix would be destabilized most by:
   A) an electric dipole spanning several peptide bonds throughout the α helix.
   B) interactions between neighboring Asp and Arg residues.
   C) interactions between two adjacent hydrophobic Val residues.
   D) the presence of an Arg residue near the carboxyl terminus of the α helix.
   E) the presence of two Lys residues near the amino terminus of the α helix.

5. A sequence of amino acids in a certain protein is found to be -Ser-Gly-Pro-Gly-. The sequence is most probably part of a(n):
   A) antiparallel β sheet.　B) parallel β sheet.　C) α helix.　D) α sheet.　E) β turn.

6. How is trypsinogen converted to trypsin?
   A) A protein kinase-catalyzed phosphorylation converts trypsinogen to trypsin.
   B) An increase in Ca^{2+} concentration promotes the conversion.
   C) Proteolysis of trypsinogen forms trypsin.
   D) Trypsinogen dimers bind an allosteric modulator, cAMP, causing dissociation into active trypsin monomers.
   E) Two inactive trypsinogen dimers pair to form an active trypsin tetramer.

7. Which of the following is *not* a reducing sugar?
   A) Fructose　B) Glucose　C) Glyceraldehyde　D) Ribose　E) Sucrose

8. In glycoproteins, the carbohydrate moiety is always attached through the amino acid residues:
   A) asparagine, serine, or threonine.　B) aspartate or glutamate.　C) glutamine or arginine.
   D) glycine, alanine, or aspartate.　E) tryptophan, aspartate, or cysteine.

9. The biological role of restriction enzymes is to:
   A) aid recombinant DNA research.　B) degrade foreign DNA that enters a bacterium.
   C) make bacteria resistant to antibiotics.　D) restrict the damage to DNA by ultraviolet light.
   E) restrict the size of DNA in certain bacteria.

10. In the laboratory, recombinant plasmids are commonly introduced into bacterial cells by:
   A) electrophoresis: a gentle low-voltage gradient draws the DNA into the cell.
   B) infection with a bacteriophage that carries the plasmid.

背面有題，請繼續作答。

C) microinjection.
D) mixing plasmids with an extract of broken cells.
E) transformation: heat shock of the cells incubated with plasmid DNA in the presence of $CaCl_2$.

11. Ubiquitin is a:
A) component of the electron transport system. B) protease. C) protein kinase.
D) protein phosphorylase. E) protein that tags another protein for proteolysis.

12. Glucose labeled with ^{14}C in C-1 and C-6 gives rise in glycolysis to pyruvate labeled in:
A) all three carbons. B) A and C. C) its carbonyl carbon.
D) its carboxyl carbon. E) its methyl carbon.

13. Which of these cofactors participates directly in most of the oxidation-reduction reactions in the fermentation of glucose to lactate?
A) ADP B) ATP C) $FAD/FADH_2$ D) Glyceraldehyde 3-phosphate E) $NAD^+/NADH$

14. What is the correct order of function of the following enzymes of β-oxidation?
(1) β-Hydroxyacyl-CoA dehydrogenase (2) Thiolase
(3) Enoyl-CoA hydratase (4) Acyl-CoA dehydrogenase
A) 1, 2, 3, 4 B) 3, 1, 4, 2 C) 4, 3, 1, 2 D) 1, 4, 3, 2 E) 4, 2, 3, 1

15. If the 16-carbon saturated fatty acid palmitate is oxidized completely to carbon dioxide and water (via the β-oxidation pathway and the citric acid cycle), and all of the energy-conserving products are used to drive ATP synthesis in the mitochondrion, the net yield of ATP per molecule of palmitate is:
A) 3. B) 10. C) 25. D) 108. E) 1,000.

問答及簡答 (52%):

1. A given mRNA sequence might be translated in any of three reading frames. Describe how prokaryotes and eukaryotes determine the correct reading frame. (8%)

2. Describe the role of the following components in bacterial protein synthesis.(8%)
(a) Initiation factor 2 (IF-2) (b) $fMet\text{-}tRNA^{fMet}$ (c) N^{10}-formyltetrahydrofolate (d) $tRNA^{fMet}$

3. All known DNA polymerases catalyze synthesis only in the 5' →3' direction. Nevertheless, during semiconservative DNA replication in the cell, they are able to catalyze the synthesis of both daughter chains, which would appear to require synthesis in the 3' →5' direction. Explain the process that occurs in the cell that allows for synthesis of both daughter chains by DNA polymerase. (6%)

4. Briefly describe DNA repair by base-excision repair pathway (8%)

5. Describe briefly the processing of tRNAs in bacteria and eukaryotic (10%)

6. What is yeast artificial chromosome (YAC)? How is it used? (6%)

7. Describe how the transcription of *E. coli trp* operon is regulated. (6%)

解釋名詞 (18%)

1. scfv
2. RNA interference
3. monoclonal antibodies
4. site-directed mutagenesis
5. suppressors of gene silencing
6. ribozyme
7. DNA mobility shift assay
8. RT-PCR
9. alternative splicing