Part I：50%

(一) 選擇題 (2% of each answer)

1. When [S] = 2 K_M for an enzyme obeying classical Michaelis-Menten kinetics, the initial velocity, v_o, equals
   (a) Vmax (b) 0.67 Vmax (c) 0.5 Vmax (d) 0.33 Vmax

2. When yeast extracts act on [1-^{14}C] glucose, the radioactive label will end up in
   (a) [^{14}C] CO_2 (b) [1-^{14}C] ethanol (c) [2-^{14}C] ethanol
   (b) (d) [^{14}C] CO_2 and [1-^{14}C] ethanol (e) [^{14}C] CO_2 and [2-^{14}C] ethanol

3. The PEP carboxykinase-catalyzed reaction requires
   (a) biotin (b) biotin and thiamine pyrophosphate (c) biotin and GTP
   (d) GTP (e) GTP and ATP

4. The only cytochrome in the respiratory chain that can transfer electrons to molecular oxygen is
   (a) cytochrome a (b) cytochrome a_3 (c) cytochrome b (d) cytochrome c
   (e) cytochrome c_1

5. Okazaki fragments will accumulate when a defect exists in
   (a) RNase H (b) primase (c) helicase (d) DNA gyrase (e) DNA ligase

6. The eukaryotic enzyme that is responsible for the formation of pre-mRNA is called
   (a) RNA polymerase I (b) RNA polymerase II (c) RNA polymerase III
   (d) reverse transcriptase (e) telomerase

7. A cell-free protein synthetic system requires each of the following except
   (a) ribosomes (b) mRNA (c) ATP and GTP (d) aminoacyl-tRNAs (e) DNA

8. 3-Phosphohydroxypyruate is an intermediate in the synthesis of
   (a) serine (b) alanine (c) threonine (d) aspartate (e) glutamine

9. Humans can synthesize each of the following amino acids from a citric acid cycle or glycolytic intermediate except
   (a) alanine (b) aspartate (c) glutamate (d) threonine (e) serine

(背面仍有題目,請繼續作答)

10. The glycolytic pathway requires each of the following except
(a) NAD^+ (b) ATP (c) ADP (d) biotin (e) phosphate

(二) 填充題 (2% of each answer)

1. Please give two basic amino acids : (1)、(2)
2. Please give two acidic amino acids : (3)、(4)
3. The aminio acid that carries the ammonium ion from muscle to liver is (5)
4. The complete degradation of stearoyl –CoA through the β-oxidation pathway produces (6) FADH2, (7) NADH, and (8) acetyl-CoA molecules.
5. Oligo-dT column can be used to enrich which class of RNA (9)
6. The Vitamin (10) is important for maturation of collagen and required for the integrity of blood vessels.

(三) 簡答題 (5% of each answer)
1. Nucleosome and linker DNA
2. TCA (Tricarboxylic acid) cycle

Part II：50%

I. Multiple Choice (Choose only *one* correct answer) (2 points each)
1. Noncovalent bonds include all the following *except*:
a. A carbon-carbon double bond.
b. An ionic bond.
c. A hydrogen bond.
d. A van der Waals interaction.

2. Biomembranes are stabilized by all the following interactions *except:*
a. van der Waals interactions between the hydrophobic side chains of phospho-lipids.
b. Ionic bonds that stabilize the interaction of the phospholipid polar heard groups with water.
c. Hydrogen bonds that stabilize the interaction of the phospholipid polar head groups with water.
d. Carbon-carbon bonds between adjacent phospholipids.

3. All enzymes alter the rate of a chemical reaction through the following, *except*:
   a. Forming a covalent bond with the substrate.
   b. Binding to the substrate.
   c. Bringing multiple substrates close to one another.
   d. Raising the activation energy for formation of a reaction intermediate.

4. The rate of migration of a protein through an SDA-polyacrylamide get is *not* influenced by
   a. Size of the protein.
   b. Charge of the protein.
   c. Pore size of the gel.
   d. Strength of the electric field.

5. Which of the following occurs when the eukaryotic translational machinery encounters the TAG codon:
   a. The bound preinitiation complex stops scanning and positions the Met-$tRNA_i^{met}$ at this site.
   b. The termination factors recognize this codon and translation ends.
   c. This codon is recognized by the corresponding anticodon of an empty tRNA molecule that is not linked to an amino acid.
   d. This codon is not recognized by any factor that ultimately cause the translational machinery to stop.

6. An investigator would be able to distinguish a solution containing RNA from one containing DNA by
   a. Heating the solutions to 82.5° C and measuring the absorption of light at 260 nm.
   b. Comparing the T_m of each solution.
   c. Monitoring the change in absorption of light at 260 nm while elevating the temperature.
   d. Measuring the absorption of light at 260 nm.

7. The percentage of G.C base pairs in a DNA molecule is related to the T_m because
   a. The stability of G.C and A.T base pairs is intrinsically different.
   b. A.T base pairs require a higher temperature for denaturation.
   c. The triple bonds of G.C base pairs are less stable than the double bonds of A.T base pairs.
   d. The G.C content equals the A.T content.

8. The observation that plasama membrane proteins mix after cell fusion provides evidence for
   a. Rotational movement of plasma membrane proteins.
   b. The bilayer structure of biomembranes.
   c. The fluid mosaic model.
   d. Interaction between the plasma membrane proteins from two different cell types.

(背面仍有題目,請繼續作答)

9. Special structures called telomeres are needed in eukaryotic cells but not bacteria because
   a. Eukaryotic cells contain liner chromosomes.
   b. Eukaryotic cells have more than one chromosome.
   c. Eukaryotic cells contain a nucleus.
   d. Eukaryotic cells contain more forms of DNA polymerase.

10. Which of the following enzymatic activities does not play a role in mismatch repair:
   a. Helicase.
   b. Single-stranded exonuclease.
   c. DNA ligase.
   d. Primase.

II. Matching questions (2 points each)

Following is a list of hereditary metabolic defects involving loss of single enzymes of catabolism, and a second list of possible consequences of such defects. Match each enzyme defect with its *most likely* consequence (only one) from the second list.

1. Lack of pyridoxal kinase (catalyzes conversion of pyridoxal to pyridoxal phosphate)
2. Lack of isocitrate dehydrogenase
3. Lack of phosphofructokinase
4. Lack of glycogen phosphorylase kinase
5. Lack of phosphorylase *a* phosphatase

Consequences:

a. A lower than normal steady-state level of glycogen.
b. Inability to use glycogen as an energy source, with no effect on ability to use galactose.
c. Lethal; prevents use of carbohydrates for ATP production.
d. Lethal; prevents complete oxidation of all fuel molecules.
e. Inability to synthesize or degrade almost all amino acids.

III. Short Assays (5 points each)

1. What is the P/O ratio of oxidative phosphorylation?
2. Mutations that alter DNA can alter the function of an expressed protein. A mutation is characterized in a gene from a model organism and found to contain a single base change relative to the wild-type gene, yet the encoded protein still functions in this organism. How is this possible?
3. What is the main feature of allosteric control that makes it such a tremendously important concept?
4. How does insulin control the rate of glucose entry into fat cells?