(A) Answer the following questions: (88%)

1. The three-dimensional structure of proteins is important for the determination of protein function.
   a. Describe some factors and their roles involving in the stabilizing of protein structure. (8%)
   b. Describe how prions, a kind of protein called prion-related proteins, that could transmit bovine spongiform encephalopathy (or mad cow disease) in sheep, cow and even human according to their structure. (8%)
2. Function of apoptosis:
   a. What is apoptosis and explain why it is important in the regulation of normal development and homoeostasis in multicellular organisms. (6%)
   b. Describe the two different pathways, intrinsic and extrinsic pathway for the activation of apoptosis. (8%)
3. Illustrate transformylation reactions in purine nucleotide synthesis. (5%)

4. What would be the effect on the overall rate of the citric acid cycle (TCA) of the following changes? For those that do produce an effect, which enzymes are involved in the regulation? (8%)
   a. Increased concentration of citrate
   b. Increased concentration of glucose-6-phosphate
   c. Increased concentration of ATP

5. Explain the following reaction　A). Glucose-alanine cycle　B). α-oxidation of fatty acids. (10%)
6. Explain following terms: (20 %)
   (A) Ti plasmid
   (B) Transposon tagging
   (C) Dominant negative
   (D) DNA microchip
7. What is the evidence that DNA and histones are held together by ionic bonds in a nucleosome unit? (5 %)

8. A research wants to study an important protein involved in plant cell death. Because the protein is very difficult to prepare in sufficient quantities from plant cells, he decides to clone its gene so that, if all goes well, he can use bacteria to make large batches of the protein. The amino acid sequence of the protein's single polypeptide chain has already been established. Briefly explain how he might clone the desired gene. (10 %)

(背面仍有題目,請繼續作答)

(B) Multiple choices (12%)

1. The role of amino transferase enzymes in amino acid metabolism is to convert:
A). ammonia to amino acids B). keto acids to amino acids
C). amino acids to keto acids D). Both A and B
E). Both B and C.

2. An infant who appeared normal at birth began to develop lethargy, hypothermia and apnea at 36 hours. The infant was found to have high levels of blood ammonium and low levels of blood urea nitrogen (BUN). The infant was treated with arginine supplements. What enzyme deficiency did this infant most likely have?
A). Glutamine synthase B). Arginase C). Arginine synthase
D). Argininosuccinate lyase E). Argininosuccinate synthase

3. Via enzymes of the urea cycle, aspartate
A). provides nitrogen for the synthesis of arginine.
B). provides the carbon found in urea.
C). is converted to malate.
D). is converted to oxaloacetate.
E). combines with ornithine to produce citrulline.

4. Liver damage and liver disease cause jaundice, a build-up of bilirubin in the blood. Which of the following correctly describes the normal metabolism of bilirubin.
A). Bilirubin is produced by the breakdown of heme, is transported to and conjugated in the liver, and is then secreted with other bile components into the small intestine.
B). Bilirubin is a by-product of heme synthesis that is conjugated with glucuronic acid in the liver.
C). Bilirubin is produced when heme metabolism is blocked due to liver dysfunction.
D). Bilirubin is a small protein that gets glycosylated in the liver before it can be disposed of.
E). Bilirubin is produced by the breakdown of heme and is transported to the liver where it is further metabolized to TCA cycle intermediates.

5. Which of the following best describes the function of the urea cycle?
A). The urea cycle maintains blood pH by disposing of NH_4^+ ions.
B). The urea cycle functions in the kidney to produce urea for excretion in the urine.
C). The urea cycle disposes of ammonium, a potentially lethal neurotoxin.
D). The urea cycle produces uric acid that is released from amino acid breakdown.
E). The urea cycle allows nitrogen to be salvaged for utilization in amino acid synthesis.

6. Ribonucleotide reductase (RNR or ribonucleoside diphosphate reductase) is allosterically regulated by ATP and by each of the dNTPs. A point mutation in the RNR gene that disrupts the ability of dGTP to down-regulate the use of GDP as a substrate causes an increased mutation rate in cells. Which of the following is the best explanation for this finding?
A). Excessive dGTP will unbalance nucleotide pools.
B). De novo purine synthesis will be inhibited at the step of producing PRPP.
C). Nucleoside diphosphate kinase will become overwhelmed.
D). Thymidylate synthase is inhibited by dGDP.
E). Adequate levels of dTMP will not be made in these cells.