國立嘉義大學 100 學年度
應用化學系碩士班（乙組）招生考試試題

科目：生物化學

I. Single choice questions (每小題 5 分，共 40 分)

1. Watson and Crick proposed the B-form double helix model for DNA structure. What is the best nucleotide to be complementary to adenosine, A?
   (a) G (b) T (c) U (d) C (e) A
2. Which of the following amino acids contain an aromatic residue:
   (a) tryptophan (b) serine (c) praline (d) Lysine (e) methionine
3. In general, a newly synthesized messenger RNA, called primary RNA or pre-mRNA, contains introns and exons. What is the process in which the introns are removed and the exons are joined to form a matured mRNA?
   (a) signal transduction (b) translocation (c) transcription (d) translation (e) splicing
4. In aerobic organism, fatty acids are ultimately oxidized to CO_2 and H_2O via TCA cycle (Krebs cycle). What compound will fatty acids be degraded into before entering the TCA cycle?
   (a) acetyl-CoA (b) isocitrate (c) succinate (d) malate (e) citrate
5. In study of enzyme kinetics, turnover number is defined as the number of substrate molecules converted to product in a given time on a single enzyme molecule when enzyme is saturated with substrate. Which of the following terms is equivalent to turnover number?
   (a) *K*m (b) *k*d (c) *K*a (d) *V*max (e) *k*cat
6. When one says a protein contain β-sheets structure, the β-sheets structure is one feature of (a)primary structure (b)secondary structure (c)tertiary structure (d) quaternary structure (e) none of the above.
7. G-protein plays an important role on the signal transduction. Which of the following descriptions is true for G-protein:
   (a) it is a membrane protein (b) it can generate second messenger
   (c) it is synthesized in mitochondria (d) it contains a GTP-binding domain
   (e) it has a great affinity with GMP.
8. There are approximately 57,000 genes in rice. How many genes are in human beings?
   (a) 5,000~10,000 (b) 12,000~18,000 (c) about 25000 (d) about 60,000
   (e) 90,000~100,000

II. Please clearly answer the following questions: (每小題 15 分，共 60 分)

1. The *lac* operon is the first operon discovered. It has been employed in protein over-expression in *E.coli*. The operon contains three genes coding for the enzymes that are required for *E.coli* cells to use lactose. Please clearly describe how the expression of the *lac* operon, in transcription level, is regulated in the presence and absence of lactose.
2. Standard PCR and reverse transcriptase PCR (RT-PCR) are frequently used as bio chemical tools in the lab. Describe how they work out.
3. Provide any method or technique to prove the RNA polymerase can melt local double-stranded DNA upon it binds to promoters.
4. The process of initiation step for protein translation in prokaryotic and eukaryotic cells is similar but somewhat differently. Explain how ribosomes bind to mRNA and reach to the start codon in prokaryotic and eukaryotic cells, respectively.