

1. Please briefly describe the following terms (3 points each)
  - (a) Euchromatin
  - (b) Holliday junction
  - (c) Transposition
  - (d) Drosha
  - (e) Processivity
  - (f) Transversions
  
2. Please describe the two types of mechanisms that act to ensure the fidelity of replication in prokaryotes and eukaryotes. What is the relative contribution of each of these mechanisms to the accuracy of replication? (6 points)
  
3. The charge of a histone becomes more negative if it is phosphorylated by kinases. How does the phosphorylation of histones affect its interaction with DNA? (2 points) What is the effect on transcription if histone acetyl transferases (HAT) are removed in a cell through mutations? (3 points)
  
4. List distinct activities provided by proteins within the replisome. (5 points) What are some of the advantages of having multiple proteins working together to carry out the various aspects of the replication process? (3 points)
  
5. Please describe the DNA cleavage mechanism of the site-specific recombinase. (3 points) List two proteins sharing the DNA cleavage mechanism with the site-specific recombinase and briefly describe functions of them. (4 points)
  
6. What are similarities and differences between microRNAs (miRNAs) and small interfering RNAs (siRNAs)? (6 points)
  
7. 填充題：(15%)(請將答案填寫於答案卷上)
  - (a) \_\_\_\_\_ is a kind of enzymatic, protein posttranslational modification process in which proteins are degraded via proteasome.
  - (b) \_\_\_\_\_ proteins bind to sequences within the exons and recruit spliceosome components to the 5' end and 3' splice sites.
  - (c) During the lysogenic cycle, the bacteriophage lambda expresses more \_\_\_\_\_ from the promoter P<sub>RM</sub>.
  - (d) The \_\_\_\_\_ and \_\_\_\_\_ proteins of the bacteriophage lambda are antiterminators.
  - (e) TFIID is a multisubunit complex that consists of \_\_\_\_\_ and \_\_\_\_\_.
  - (f) In eukaryotic translation, \_\_\_\_\_ (eIF4F, eIF4E, eIF4G, or eIF4A) recognizes 5' cap of the mRNA; \_\_\_\_\_ (eIF4F, eIF4E, eIF4G, or eIF4A) unwinds any secondary structures (such as hairpins) that may have formed at the end of the mRNA.
  - (g) \_\_\_\_\_ is the first identified genetic code by using synthetic polyribonucleotide.
  
8. 解釋名詞：(15%)
  - (a) Heterogeneous nuclear ribonucleoprotein (hnRNP)
  - (b) Exon junction complex (EJC)
  - (c) Internal ribosome entry site (IRES)
  - (d) Barrier insulator
  - (e) RNA polymerase of *E. coli*
  
9. Please describe the characteristics of a typical Pol II promoter? (10%)
  
10. Histone code plays a crucial role in transcriptional regulation in eukaryotes. Posttranslational modifications of Lys-9 (K9) and Ser-10 (S10) on the tail of histone H3 are well known. Please describe how chromatin modification of K9 and S10 influence each other. You may need to mention HP1. (10%)