系所組別：生命科學系乙組
考試科目：分子生物學 考試日期：0223，節次：3

※ 考生請注意：本試題不可使用計算機。 請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

一. 單選題 20%

1. The term peptidyltransferase relates to
   A. base additions during mRNA synthesis.
   B. peptide bond formation during protein synthesis.
   C. elongation factors binding to the large ribosomal subunit.
   D. discontinuous strand replication.
   E. 5' capping of mRNA.

2. One form of posttranslational modification of a protein includes
   A. removal of introns.
   B. shuffling of exons.
   C. removal or modification of terminal amino acids.
   D. removal of exons.
   E. self-splicing

3. A short segment of an mRNA molecule is shown below. The polypeptide it codes for is also shown:
   5' -AUGGUGCUGAAG : methionine-valine-leucine-lysine
Assume that a mutation in the DNA occurs so that the fourth base (counting from the 5' end) of the messenger RNA now reads A rather than G. What sequence of amino acids will the mRNA now code for? (You do not need a copy of the genetic code to answer the question.)
   A. methionine-valine-leucine-lysine
   B. methionine-lysine-leucine-lysine
   C. methionine-leucine-leucine-lysine
   D. methionine-valine-methionine-lysine
   E. methionine-methionine-leucine-lysine

4. When considering the initiation of transcription, one often finds consensus sequences located in the region of the DNA where RNA polymerase(s) bind. Which are common consensus sequences?
   A. CAAT, TATA
   B. GGTTC, TTAT
   C. TTTTAAAA, GGGGCCCC
   D. any trinucleotide repeat
   E. satellite DNAs

(背面仍有題目,請繼續作答)

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5. Select three posttranscriptional modifications often seen in the maturation of mRNA in eukaryotes.

A. 5'-capping, 3'-poly(A) tail addition, splicing

B. 3'-capping, 5'-poly(A) tail addition, splicing

C. removal of exons, insertion of introns, capping

D. 5'-poly(A) tail addition, insertion of introns, capping

E. heteroduplex formation, base modification, capping

6. A class of mutations that results in multiple contiguous (side-by-side) amino acid changes in proteins is probably caused by the following type of mutation:

A. frameshift.

B. transversion.

C. transition.

D. base analog.

E. recombinant.

7. What is the name given to the three bases in a messenger RNA that bind to the anticodon of tRNA to specify an amino acid placement in a protein?

A. protein

B. anti-anticodon

C. cistron

D. rho

E. codon

8. An intron is a section of

A. protein that is clipped out posttranslationally.

B. RNA that is removed during RNA processing.

C. DNA that is removed during DNA processing.

D. transfer RNA that binds to the anticodon.

E. carbohydrate that serves as a signal for RNA transport.

9. The genetic code is fairly consistent among all organisms. The term often used to describe such consistency in the code is

A. universal.

B. exceptional.

C. trans-specific.

D. overlapping.

E. none of the above

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10. Which of the following are among the major components of prokaryotic ribosomes?

A. 12S rRNA, 5.8S rRNA, and proteins
B. 16S rRNA, 5.8S rRNA, and 28S rRNA
C. 16S rRNA, 5S rRNA, and 23S rRNA
D. lipids and carbohydrates
E. 18S rRNA, 5.8S rRNA, and proteins

二.問答題 80%

1. What is the advantage of having each amino acid specified by a sequence of three nucleotides but not 2 or 4 nucleotides? (5%)

2. Please explain the biological significance for why uracil is found in RNA but not in DNA. (5%)

3. What is shotgun sequencing? (5%)

4. What are the role played by histone modification in epigenetic effect? (5%)

5. How is methylation involved in the control of timing of replication in *E. coli*? (5%)

6. Please describe the Base excision repair in *E. coli*. (5%)

7. Please describe the role played by RecABCD proteins in *E. coli*. (5%)

8. How does a retrovirus complete its life cycle? (5%)

9. Explain why *E. coli* lacZ is often used as a reporter gene in yeast cells but not in *E. coli* cells. (5 %)

10. Describe the role of DNA methylation in gene expression in mammalian cells. (10 %)

11. Can *S. cerevisiae* be used as a model to study many human diseases? Explain. (10 %)

12. Define the following terms: (15 %)

a. temperature sensitive mutant

b. iPS cells

c. small RNA