

※ 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。

Multiple choices (at least one of the answers provided is correct) (15 points; 3 points/each)

1. Please find the correct description[s] about protein translation in eukaryotes

- (A) Small ribosome unit with several initiation factors (IFs) binds directly to a translational initiation site.
- (B) All IFs are released when 30S ribosome units associate with 50S ribosome units to generate 70S ribosomes.
- (C) For peptide bond formation, the polypeptide chain is transferred from peptidyl-tRNA to aminoacyl-tRNA.
- (D) In general, termination codons are recognized by protein factors.
- (E) After posttermination reaction, the complete ribosome directly joins to the next translation event.

2. Please find the correct description[s] about RNA splicing in eukaryotes

- (A) A branch site just upstream of the 5' splice site.
- (B) Small nuclear RNAs are required for splicing.
- (C) After the 3' exon is cleaved off, then it is joined to the 5' exon.
- (D) Binding of U1 snRNA to the 5' splice site is the final step in splicing.
- (E) Splicing in the nucleus can influence mRNA translation in the cytoplasm.

3. Please find the correct description[s] about gene expression in prokaryotes

- (A) Translation starts before the termination of transcription.
- (B) mRNA degradation starts after the termination of transcription.
- (C) Rho factor is important for the transcriptional initiation.
- (D) Prokaryotic mRNA can be polycistronic.
- (E) 5' capping prevents mRNA degradation.

4. Please find the correct description[s] about tRNA

- (A) Some bacteria tRNAs acts as an mRNA.
- (B) The triplet sequence CCA in the 3' end are sometimes not encoded in the genome.
- (C) Modified bases of tRNA are not involved in wobble pairing
- (D) tRNA can interact with ribosomal RNAs
- (E) During transcription, suppressor tRNAs have mutated anticodons to recover the genomic mutation.

5. Which of the following is not involved in RNA surveillance system?

- (A) TRAMP
- (B) Processing body
- (C) Stabilizing elements
- (D) Exosome
- (E) Exon junction complex

Please describe the following terms (20 points; 2 points/each)

1. Oncogene
2. Shine-Dalgarno sequence
3. Transactivator
4. Cognate tRNAs
5. Interactomics

6. Telomere
7. Replicon
8. Semiconservative replication
9. Licensing factor
10. Chromatin

Essay question

1. What are the ribozymes? (2 points) Please explain which/how ribozyme is involved in polypeptide synthesis? (3 points)
2. What's the difference between polyadenylation of mRNA in prokaryotes and eukaryotes? (5 points)
3. Please describe how microRNA is involved in the regulation of gene expression. (5 points)
4. How do histone modification affect gene expression? (5 points)
5. How do one gene produce several protein isoforms? (5 points)
6. What is site-specific recombination? What is somatic recombination? Please explain and give an example. (10 points)
7. What are transformation, transfection and transduction? Please explain and give an example. (10 points)
8. What are helicase, primase, SSB, and DNA polymerase holoenzyme? And how they are work in the DNA replication? (10 points)
9. What are pseudogene, gene duplication? And their role in plant and vertebrate evolution? (10 points)