

Quiz 5 Key (Average 81, High 100 (3), Low 44)
BI-102-2, Fall '06, Dr. C. S. Tritt

1. Explain what the term “semi-conservative replication” means.

When a DNA double helix is replicated in a cell, each of the two resulting double helices contains one completely new and one completely old strand.

2. Name **or** briefly describe each of the three stages of DNA replication.

Initiation – Formation of replication forks by an initiator protein at *OriC* site.

Elongation – Addition of successive nucleotides to the new strands.

Termination – Completion of replication requiring the disentanglement of the two newly created DNA double helices.

Half credit given for describing transcription or translation.

3. **Describe** the overall process of **translation** (including each of its major steps or stages).

Initiation – Initiation factors assemble a ribosome at a start codon in the mRNA.

Elongation – Additional amino acids are added one at a time to the growing peptide chain based on matching codons in the mRNA with anticodons in individual tRNA molecules.

Translocation – Shifting the ribosome 3 bases after the addition of an amino acid to the growing peptide. (Not a required part of the answer. I consider translocation to be part of elongation).

Termination – Release factors bind with stop codons and cause the release of the new formed peptide from the ribosome.

Half credit given for describing replication or transcription. Just naming the steps -5. Not enough detail -2 or 3. Note that translation is done by ribosomes that consist of a combination of rRNA and proteins (not a required part of the answer).

4. Briefly describe the role of tRNA in translation.

tRNA brings (or transfers) specific amino acids to the ribosomes where they are placed into the growing peptide chain based on matching codons in the mRNA with anticodons in the tRNA. Describing mRNA was -8.

5. Name or describe the three ways in which mRNA is typically modified (processed) in eukaryotes.

Addition of the 5' cap (a methylated GTP residue).

Removal of introns.

Addition of a 3' poly-A tail.

Worth about 3 points each.

6. Briefly explain how can DNA be “read” without being unwound?

Proteins containing DNA binding motifs and RNA can interact with and “recognize” bases and base sequences in the DNA double helix via the major groove (from the side or edge). For full credit, you generally needed to say or imply the “major groove” **or** provide a reasonable description of the DNA binding motifs.

7. Briefly describe the role of DNA methylation in the control of gene expression.

Methylation appears to keep inactivated genes switched off. Half credit given for describing the interaction between methylation and the DNA binding motifs (this is the mechanism that keeps the genes switched off). Describing the role methylation plays in marking old (versus new) strands in DNA proofreading was -2 (because it didn't relate to gene expression).