

## RNA and Protein Synthesis Quiz Answer Key PDF

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**Which of the following mutations involves a single nucleotide change that does not alter the amino acid sequence?**

- A. Missense mutation
- C. Nonsense mutation
- D. Frameshift mutation
- C. Silent mutation ✓**

**Which process converts mRNA into a polypeptide chain?**

- A. Transcription
- C. Replication
- D. Splicing
- C. Translation ✓**

**In which cellular location does transcription occur in eukaryotic cells?**

- A. Cytoplasm
- C. Ribosome
- D. mitochondria
- C. Nucleus ✓**

**Which of the following is NOT a stop codon?**

- A. UAA ✓**
- C. UGA ✓**
- D. AUG
- C. UAG ✓**

**What is the start codon for protein synthesis?**

- A. UAA
- C. UGA
- D. UAG
- C. AUG ✓**

**What is the primary function of tRNA?**

- A. To carry genetic information
- C. To form the ribosome
- D. To replicate DNA
- C. To transport amino acids ✓**

**Which steps are involved in the process of transcription? (Select all that apply)**

- A. Initiation ✓**
- C. Termination ✓**
- D. Translation
- C. Elongation ✓**

**Explain the process of translation, including the roles of mRNA, tRNA, and ribosomes.**

During translation, mRNA is read by ribosomes, which facilitate the binding of tRNA molecules that carry specific amino acids. The ribosome moves along the mRNA, matching tRNA anticodons to mRNA codons, and catalyzing the formation of peptide bonds between the amino acids, ultimately producing a polypeptide chain that folds into a functional protein.

**How do epigenetic factors influence gene expression without altering the DNA sequence?**

Epigenetic factors influence gene expression through mechanisms like DNA methylation and histone modification, which affect how tightly DNA is wound and its accessibility for transcription.

**Explain the central dogma of molecular biology and its significance in protein synthesis.**

The central dogma of molecular biology states that genetic information flows from DNA to RNA through transcription, and from RNA to protein through translation, which is fundamental for protein synthesis.

Describe the differences between prokaryotic and eukaryotic gene expression regulation.

Prokaryotic gene expression regulation typically occurs at the transcriptional level through mechanisms like operons, whereas eukaryotic gene expression involves multiple regulatory layers, including chromatin structure, transcription factors, and post-transcriptional modifications.

Which elements are involved in the regulation of gene expression in eukaryotes? (Select all that apply)

- A. Enhancers ✓**
- C. Operons
- D. Transcription factors ✓**
- C. Silencers ✓**

During transcription, which enzyme is responsible for synthesizing RNA?

- A. DNA polymerase
- C. Ligase
- D. Helicase
- C. RNA polymerase ✓**

Which of the following are types of point mutations? (Select all that apply)

- A. Silent mutation ✓**
- C. Nonsense mutation ✓**
- D. Frameshift mutation
- C. Missense mutation ✓**

Which of the following are components of a ribosome? (Select all that apply)

- A. mRNA
- C. Proteins ✓**
- D. tRNA

**C. rRNA** ✓

**What are the characteristics of the genetic code? (Select all that apply)**

**A. Universal** ✓

C. Ambiguous

**D. Specific** ✓

**C. Redundant** ✓

**Which type of RNA carries genetic information from DNA to the ribosome?**

A. rRNA

**C. mRNA** ✓

D. siRNA

**C. mRNA** ✓

**Discuss how a frameshift mutation can affect protein synthesis and provide an example.**

**A frameshift mutation can drastically change protein synthesis by shifting the reading frame of codons, which can result in a completely different amino acid sequence and often a nonfunctional protein. An example is the deletion of a nucleotide in the BRCA1 gene, which can lead to breast cancer.**

**Describe the role of RNA polymerase during transcription and how it interacts with DNA.**

**RNA polymerase binds to the promoter region of the DNA, unwinds the double helix, and catalyzes the addition of RNA nucleotides complementary to the DNA template strand, ultimately producing a single-stranded RNA molecule.**

**What are the functions of RNA in the cell? (Select all that apply)**

**A. Catalyzing protein synthesis** ✓

C. Replicating DNA

**D. Transport amino acids** ✓

**C. Carrying genetic information** ✓