What is Protein Synthesis by Ribosomes?

Worksheet

Ribosomes read mRNA codons and use transfer RNA (tRNA) to link amino acids together in the correct order, a process called translation, which produces functional proteins.

Questions

1. What is the direct template ribosomes use to build a protein?

A) DNA
B) mRNA
C) tRNA
D) rRNA

2. What does a codon specify?

A) A whole gene
B) One amino acid (or start/stop)
C) A chromosome
D) An entire protein

3. Which molecule brings amino acids to the ribosome?

A) DNA polymerase
B) tRNA
C) Golgi vesicle
D) Lysosome

4. What happens when the ribosome reaches a stop codon?

A) Translation speeds up
B) The polypeptide is released and translation ends
C) A new amino acid is added
D) The mRNA is duplicated

5. An mRNA strand reads AUG-GGC-UUA-UAG. How many amino acids does the finished polypeptide contain?

6. A ribosome is translating a codon for leucine. Which molecule delivers leucine to the ribosome?

7. Where would you expect to find the ribosomes making a protein destined for secretion outside the cell?

8. Define: What is a ribosome?

9. Define: What is translation?

10. Define: What is a codon?

Answer Key

1. B) mRNA - Ribosomes translate the mRNA sequence into a protein.

2. B) One amino acid (or start/stop) - Each three-nucleotide codon codes for one amino acid or a start/stop signal.

3. B) tRNA - tRNA matches its anticodon to the codon and delivers the amino acid.

4. B) The polypeptide is released and translation ends - Stop codons don't code for an amino acid; they signal termination.

5. AUG is the start codon, coding for the first amino acid (Methionine). GGC and UUA each code for one amino acid. UAG is a stop codon and does not code for an amino acid, so it ends translation. Total amino acids = 3 (from AUG, GGC, UUA).

6. Each amino acid is carried to the ribosome by a specific transfer RNA (tRNA). The tRNA has an anticodon complementary to the mRNA codon for leucine. That tRNA binds the ribosome's A site and hands off leucine to the growing chain.

7. Secreted proteins must enter the endomembrane system for processing. This means their ribosomes must be attached to the rough ER, not free in the cytoplasm. As the polypeptide is synthesized, it's threaded directly into the ER lumen.

8. A molecular machine made of rRNA and protein that translates mRNA into a polypeptide chain.

9. The process of reading mRNA codons to assemble amino acids into a protein.

10. A sequence of three mRNA nucleotides that specifies one amino acid (or a start/stop signal).