

What Are the Types of Mutations?

Worksheet

Mutations are permanent changes in a DNA sequence, classified by size (point vs. chromosomal) and effect on the reading frame (substitution, insertion, deletion) - their impact ranges from silent to lethal.

Questions

1. Which mutation type does NOT change the amino acid sequence?
 - A) Missense
 - B) Nonsense
 - C) Silent
 - D) Frameshift
2. A single-base insertion in a coding sequence causes a
 - A) Silent mutation
 - B) Point substitution
 - C) Frameshift mutation
 - D) No mutation
3. Sickle-cell anemia results from which type of mutation?
 - A) Nonsense
 - B) Frameshift
 - C) Missense (point) mutation
 - D) Chromosomal deletion
4. A mutation that creates a premature stop codon is called a
 - A) Silent mutation
 - B) Missense mutation
 - C) Nonsense mutation
 - D) Neutral mutation
5. A single base substitution changes codon GAA to GAG (both code for glutamic acid). What type of mutation is this, and what's the effect?
6. A substitution changes codon AAA (Lys) to UAA (Stop). Classify it and predict the effect.
7. An insertion of 1 nucleotide occurs in the middle of a gene's coding sequence. Predict the downstream effect.
8. Define: What is a point mutation?
9. Define: What is a silent mutation?
10. Define: What is a missense mutation?

Answer Key

1. C) Silent - A silent mutation changes the codon but codes for the same amino acid due to genetic code redundancy.
2. C) Frameshift mutation - Insertions/deletions not divisible by 3 shift the reading frame.
3. C) Missense (point) mutation - A single base substitution changes glutamic acid to valine in hemoglobin - a missense mutation.
4. C) Nonsense mutation - Nonsense mutations convert an amino-acid codon into a stop codon, truncating the protein.
5. Compare the codons: GAA GAG Both code for glutamic acid (Glu) - the same amino acid This is a silent (synonymous) mutation no change in the protein
6. AAA = Lysine, UAA = Stop codon This is a nonsense mutation Protein synthesis terminates early a truncated, likely non-functional protein
7. Insertion length = 1, not divisible by 3 This causes a frameshift mutation All codons downstream of the insertion are misread usually a non-functional or truncated protein
8. A change involving a single nucleotide base pair, e.g., a substitution.
9. A substitution that doesn't change the amino acid, due to codon redundancy.
10. A substitution that changes the codon to a different amino acid.

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