



Here's a practice worksheet to help students understand and practice generating DNA mutations. This worksheet includes various types of mutations and questions to test their knowledge.

Name: _____ Date: _____

DNA Mutations Practice Worksheet

Instructions: For each question, read the provided DNA sequence and answer the questions that follow. Identify the type of mutation (substitution, insertion, deletion, or frameshift) and its impact on the resulting protein.

1. Substitution Mutation

DNA Sequence (Original): TACGATCGA

DNA Sequence (Mutated): TACCATCGA

- a) Identify the type of mutation.
- b) What is the impact of this mutation on the resulting protein, if any?

2. Deletion Mutation

DNA Sequence (Original): AGCTAGCTA

DNA Sequence (Mutated): AGCTCTA

- a) Identify the type of mutation.
- b) What is the impact of this mutation on the resulting protein, if any?

3. Insertion Mutation

DNA Sequence (Original): GAGCGTACC

DNA Sequence (Mutated): GAGTGCAACC

- a) Identify the type of mutation.
- b) What is the impact of this mutation on the resulting protein, if any?



4. Frameshift Mutation (Deletion)

DNA Sequence (Original): ATGCGCTGCA

DNA Sequence (Mutated): ATGCGGCA

- a) Identify the type of mutation.
- b) What is the impact of this mutation on the resulting protein, if any?

5. Frameshift Mutation (Insertion)

DNA Sequence (Original): TTACGTAGCA

DNA Sequence (Mutated): TTACGCTAGCA

- a) Identify the type of mutation.
- b) What is the impact of this mutation on the resulting protein, if any?

6. Multiple Mutations

DNA Sequence (Original): ATGCATCGATCG

DNA Sequence (Mutated): ATGCACTAGTTTCG

- a) Identify the type(s) of mutation(s).
- b) What is the impact of these mutations on the resulting protein, if any?

7. Silent Mutation

DNA Sequence (Original): TGGCATCTA

DNA Sequence (Mutated): TGGCACCTA

- a) Identify the type of mutation.
- b) Does this mutation have any impact on the resulting protein? Explain.

8. Nonsense Mutation

DNA Sequence (Original): ATGTTAGCAA

DNA Sequence (Mutated): ATGTGAGCAA

- a) Identify the type of mutation.
- b) What is the impact of this mutation on the resulting protein?



9. Missense Mutation

DNA Sequence (Original): GATACGGTCA

DNA Sequence (Mutated): GATACGGCCA

- a) Identify the type of mutation.
- b) What is the impact of this mutation on the resulting protein?

10. Regulatory Mutation

DNA Sequence (Original): TATAAAAGTCA

DNA Sequence (Mutated): TATAGAAGTCA

- a) Identify the type of mutation.
- b) How might this mutation affect gene regulation?

Bonus Question: Chromosomal Mutation

Describe what a chromosomal mutation is and provide an example.



Answers:

a) Substitution Mutation

b) This mutation results in the replacement of "T" with "C," causing a change from tyrosine to histidine at that position in the protein.

a) Deletion Mutation

b) This mutation results in the deletion of "G" from the sequence, causing a frameshift and altering the entire sequence of amino acids in the protein.

a) Insertion Mutation

b) This mutation results in the insertion of "TGC" into the sequence, causing a frameshift and altering the entire sequence of amino acids in the protein.

a) Frameshift Mutation (Deletion)

b) This mutation results in the deletion of "G" from the sequence, causing a frameshift and altering the entire sequence of amino acids in the protein.

a) Frameshift Mutation (Insertion)

b) This mutation results in the insertion of "C" into the sequence, causing a frameshift and altering the entire sequence of amino acids in the protein.

a) Deletion and Substitution Mutations

b) These mutations result in the deletion of "TGA" and the substitution of "T" with "A," causing a frameshift and changing the entire sequence of amino acids in the protein.

a) Silent Mutation

b) This mutation changes the DNA sequence but does not alter the amino acid sequence since both "C" and "T" code for the same amino acid, proline.

a) Nonsense Mutation

b) This mutation introduces a premature stop codon (TGA), leading to the termination of protein synthesis.



a) Missense Mutation

b) This mutation results in the substitution of "T" with "C," causing a change from aspartic acid to proline at that position in the protein.

a) Regulatory Mutation

b) This mutation affects the promoter region of the gene and may alter the binding of transcription factors, potentially leading to changes in gene expression.

Bonus Question Answer:

A chromosomal mutation is a type of mutation that involves changes to the structure or number of whole chromosomes or large segments of chromosomes. Examples of chromosomal mutations include:

Deletion: Loss of a portion of a chromosome.

Duplication: The presence of an extra copy of a chromosome segment.

Inversion: Reversal of the orientation of a chromosome segment.

Translocation: Movement of a chromosome segment to a non-homologous chromosome.

These mutations can lead to significant genetic changes and may result in genetic disorders or other biological effects.