**Genetic Mutations Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ # \_\_\_\_**

**Directions**: To help you learn about genetic mutations, complete the following tasks.

# Watch a short video on mutations: <https://www.youtube.com/watch?v=eDbK0cxKKsk> or search Bozeman Mutations

# Take a few notes on the following terms using the video and PPt. With your group, come up with descriptions in your own words.

**Gene Mutations**

# Substitution (Point)

# Insertion (frameshift)

# Deletion (frameshift)

# Chromosome Mutations

# Duplication

# Deletion

# Inversion

# Translocation

Transcribe and translate the original DNA sequence (template strand is given). Then, do the same for each mutated DNA sequence. Then, determine the consequence, if any, for each mutation, by circling your choice for each question. **You will need a Genetic Code Chart.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Original DNA sequence:** | **TAC** | **ACC** | **TTG** | **GCG** | **ACG** | **ACT** |  |
| mRNA transcript: |  |  |  |  |  |  |  |
| amino acids: |  |  |  |  |  |  |  |

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| **Mutated DNA sequence #1:** | | **TAC** | | | **ATC** | | **TTG** | | **GCG** | | **ACG** | | | **ACT** |  | |  | |
| mRNA transcript: | |  | | |  | |  | |  | |  | | |  |  | | ***Circle any changes*** | |
| amino acids: | |  | | |  | |  | |  | |  | | |  |  | |  | |
| **Type of mutation**  (Circle one.) | Point ⇨ | | Substitution | | | | |  | | Frameshift ⇨ | | | Insertion | | | or | | Deletion |
| **How did the mutation affect the amino acid sequence (protein)?**  (Circle one.) | No change | | | 1 amino acid changed | | Premature stop signal | | | | No stop signal | | 1 amino acid added/ deleted | | | | All the amino acids changed after the point of mutation | | |
| **Mutated DNA sequence #2:** | | **TAC** | | | **GAC** | | **CTT** | | **GGC** | | **GAC** | | | **GAC** | **T** | |  | |
| mRNA transcript: | |  | | |  | |  | |  | |  | | |  |  | | ***Circle any changes*** | |
| amino acids: | |  | | |  | |  | |  | |  | | |  |  | |  | |
| **Type of mutation**  (Circle one.) | Point ⇨ | | Substitution | | | | |  | | Frameshift ⇨ | | | Insertion | | | or | | Deletion |
| **How did the mutation affect the amino acid sequence (protein)?**  (Circle one.) | No change | | | 1 amino acid changed | | Premature stop signal | | | | No stop signal | | 1 amino acid added/ deleted | | | | All the amino acids changed after the point of mutation | | |

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| **Mutated DNA sequence #3:** | | **TAC** | | | **ACC** | | **TTA** | | **GCG** | | **ACG** | | | **ACT** |  | |  | |
| mRNA transcript: | |  | | |  | |  | |  | |  | | |  |  | | ***Circle any changes*** | |
| amino acids: | |  | | |  | |  | |  | |  | | |  |  | |  | |
| **Type of mutation**  (Circle one.) | Point ⇨ | | Substitution | | | | |  | | Frameshift ⇨ | | | Insertion | | | or | | Deletion |
| **How did the mutation affect the amino acid sequence (protein)?**  (Circle one.) | No change | | | 1 amino acid changed | | Premature stop signal | | | | No stop signal | | 1 amino acid added/ deleted | | | | All the amino acids changed after the point of mutation | | |

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| **Mutated DNA sequence #4:** | | **TAC** | | | **ACC** | | **TTG** | | **GCG** | | **ACT** | | | **ACT** |  | |  | |
| mRNA transcript: | |  | | |  | |  | |  | |  | | |  |  | | ***Circle any changes*** | |
| amino acids: | |  | | |  | |  | |  | |  | | |  |  | |  | |
| Type of mutation  (Circle one.) | Point ⇨ | | Substitution | | | | |  | | Frameshift ⇨ | | | Insertion | | | or | | Deletion |
| How did the mutation affect the amino acid sequence (protein)?  (Circle one.) | No change | | | 1 amino acid changed | | Premature stop signal | | | | No stop signal | | 1 amino acid added/ deleted | | | | All the amino acids changed after the point of mutation | | |

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| **Mutated DNA sequence #5:** | | **TAC** | | | **ACC** | | **TTG** | | **GGA** | | **CGA** | | | **CT** |  | |  | |
| mRNA transcript: | |  | | |  | |  | |  | |  | | |  |  | | ***Circle any changes*** | |
| amino acids: | |  | | |  | |  | |  | |  | | |  |  | |  | |
| **Type of mutation**  (Circle one.) | Point ⇨ | | Substitution | | | | |  | | Frameshift ⇨ | | | Insertion | | | or | | Deletion |
| **How did the mutation affect the amino acid sequence (protein)?**  (Circle one.) | No change | | | 1 amino acid changed | | Premature stop signal | | | | No stop signal | | 1 amino acid added/ deleted | | | | All the amino acids changed after the point of mutation | | |

**Debrief Questions**

1. Which type of mutation is responsible for new variations (alleles) of a trait?

2. Which type of mutation results in an abnormal amino acid sequence?

3. Which type of mutation stops the translation of the mRNA?

2. A geneticist found that a particular mutation had no effect on the protein coded by a gene. What do you think is the most likely type of mutation in this gene? Why?

5. Look at the following sequence: THE FAT CAT ATE THE RAT. Delete the first H and regroup the letters in groups of three- write out the new groups of three. Does the sentence still make sense? What type of mutation is this an example of?

6. Given the following three mRNA sequences, determine which two code for the same protein. Circle them.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **mRNA #1** | **mRNA #2** | **mRNA #3** |
| Transcript | AGU UUA GCA ACG AGA UCA | UCG CUA GCG ACC AGU UCA | AGC CUC GCC ACU CGU AGU |
| Translate |  |  |  |

**BONUS**: You have a DNA sequence that codes for a protein and is 105 nucleotides long. A frameshift mutation occurs at the 85th base - how many amino acids will be correct in this protein? **SHOW YOUR WORK.**