

## Mutations Worksheet - Deletion, Insertion & Substitution

There are several types of mutations:

- **DELETION** (a base is lost/deleted)
- **INSERTION** (an extra base is added/inserted)
  - Deletion & insertion may cause what's called a **FRAMESHIFT** mutation, meaning the reading "frame" changes, thus changing the amino acid sequence from this point forward
- **SUBSTITUTION** (one base is substituted for another)
  - If a substitution **changes** the amino acid, it's called a **MISSENSE** mutation
  - If a substitution **does not change** the amino acid, it's called a **SILENT** mutation
  - If a substitution **changes the amino acid to a "stop,"** it's called a **NONSENSE** mutation



Complete the boxes below. Classify each as **Deletion, Insertion or Substitution** AND as either **frameshift, missense, silent or nonsense** (Hint: Deletion & Insertion will always be frameshift).

**Original DNA Sequence:** T A C A C C T T G G C G A C G A C T ...  
**mRNA Sequence:** A U G, U G G, A A C, C G C, U G C, U G A  
**Amino Acid Sequence:** Met Try Asp Arg Cys Stop

**Mutated DNA Sequence #1** T A C A T C T T G G C G A C G A C T ...

What's the mRNA sequence? A U G, U A G, A A C, C G C, U G C, U G A (Circle the change)

What will be the amino acid sequence? Met STOP Asp Arg Cys Stop....

Will there likely be effects? **YES** What type of mutation is this? **Base substitution of T for C causing a NONSENSE mutation.**

**Mutated DNA Sequence #2** T A C G A C C T T G G C G A C G A C T ...

What's the mRNA sequence? A U G, C U G, G A A, C C G, C U G, C U G, A (Circle the change)

What will be the amino acid sequence? Met Leu Glu Pro Leu Leu

Will there likely be effects? **YES** What type of mutation is this? **Insertion of G after TAC on DNA causing a FRAMESHIFT mutation**

**Mutated DNA Sequence #3** T A C A C C T T A G C G A C G A C T ...

What's the mRNA sequence? A U G, U G G, A A U, C G C, U G C, U G A (Circle the change)

What will be the amino acid sequence? Met Try Asp Arg Cys Stop

Will there likely be effects? **NO** What type of mutation is this? **Base substitution of A for G on DNA causing SILENT mutation: no change in arrangement of amino acids.**

**Mutated DNA Sequence #4** T A C A C C T T G G C G A C T A C T ...

What's the mRNA sequence? A U G, U G G, A A C, C G C, U G A, U G A (Circle the change)

What will be the amino acid sequence? Met Try Asp Arg STOP Stop

Will there likely be effects? **Yes** What type of mutation is this? **Base substitution of T for G in next to last codon, making another "Stop" codon. NONSENSE mutation.**