

## Mutations - Goal 3.01

Mermaid

<http://www.youtube.com/watch?v=IAOhSUQomVg>

### Mutations

- A change in the DNA sequence
- It's a mistake that's made during Replication or Transcription
- Can be harmful: Diseases or Deformities
- Can be helpful: organism is better able to Survive
- Neutral: organism is Unaffected
  
- If a mutation occurs in a sperm or Egg cell, that mutation is passed to Offspring
- If a mutation occurs in a Body cell, that mutation affects only the organism and is NOT passed on to the offspring



## Types of Mutations

1. **Point** Mutations: bases are mismatched
  - a. Harmful when: a mistake in DNA is carried into **mRNA** and results in the wrong **Amino Acids**
  - b. Not harmful when: a mistake in DNA is carried into **mRNA** but still results in the **Correct** amino acid

Normal/Correct Process	
DNA Strand	GAG
mRNA	CUC
Correct Amino Acid	<b>Leucine</b>

Point Mutation Process	
Mutant DNA Strand	GCG
Mutant mRNA	<b>CGC</b>
Wrong Amino Acid	<b>ARGININE</b>

Wild-type hemoglobin DNA

mRNA

5' G A A 3'

Normal hemoglobin

Glu

Mutant hemoglobin DNA

mRNA

5' G U A 3'

Sickle-cell hemoglobin

Val

First Letter	Second Letter				Third Letter
	<b>U</b>	<b>C</b>	<b>A</b>	<b>G</b>	
<b>U</b>	phenylalanine	serine	tyrosine	cysteine	<b>U</b>
	phenylalanine	serine	tyrosine	cysteine	<b>C</b>
	leucine	serine	stop	stop	<b>A</b>
	leucine	serine	stop	tryptophan	<b>G</b>
<b>C</b>	leucine	proline	histidine	arginine	<b>U</b>
	leucine	proline	histidine	arginine	<b>C</b>
	leucine	proline	glutamine	arginine	<b>A</b>
	leucine	proline	glutamine	arginine	<b>G</b>
<b>A</b>	isoleucine	threonine	asparagine	serine	<b>U</b>
	isoleucine	threonine	asparagine	serine	<b>C</b>
	isoleucine	threonine	lysine	arginine	<b>A</b>
	(start) methionine	threonine	lysine	arginine	<b>G</b>
<b>G</b>	valine	alanine	aspartate	glycine	<b>U</b>
	valine	alanine	aspartate	glycine	<b>C</b>
	valine	alanine	glutamate	glycine	<b>A</b>
	valine	alanine	glutamate	glycine	<b>G</b>

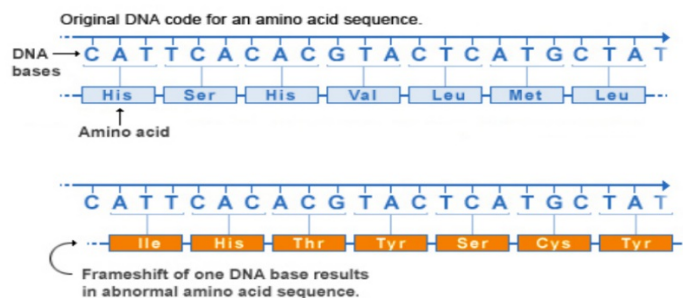
2. **Frameshift** Mutations: bases are **inserted** or **deleted**  
 a. Are usually **harmful** because a mistake in DNA is carried into mRNA and results in **many** wrong amino acids

**Note:** Extra inserted **base** shifts affect how we read the **codons** (3 bases), which changes the **amino acids**

Normal/Correct Process			
Correct DNA	ATA	CCG	TGA
Correct mRNA	UAU	<b>GGC</b>	ACU
Correct Amino Acid	<b>TYROSINE</b>	Glycine	<b>THREONINE</b>

Frameshift Mutation			
Frameshift Mutation in DNA	ATG	ACC	GTG
Mutated mRNA	UAC	<b>UGG</b>	CAC
Wrong Amino Acid	<b>TYROSINE</b>	tryptophan	<b>HISTIDINE</b>

Frameshift mutation

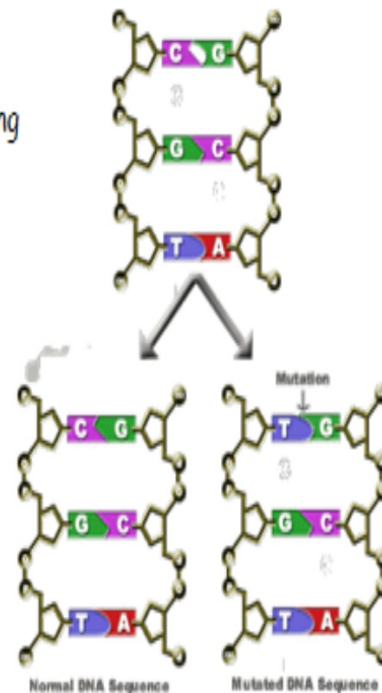


### 3. Chromosomal Mutations

- Chromosomes break or are lost during mitosis or meiosis
- Broken chromosomes may rejoin incorrectly
- Almost always lethal when it occurs in a zygote

#### Causes of Mutations

- Mutagens: anything that causes a change in DNA
- Examples: X rays, UV light, nuclear radiation, asbestos, cigarette smoke



<http://www.youtube.com/watch?v=7jJq6y4pdPA&feature=relmfu>

Giant

Practice EOC Questions

1. A strand of DNA with the sequence AAC AAG CCC undergoes a mutation, and the first A is changed to a C. How will this mutation affect the amino acid sequence?

- A. one amino acid will change
- B. two amino acids will change
- C. all of the amino acids will change
- D. the amino acids will remain the same

First Letter	Second Letter				Third Letter
	U	C	A	G	
<b>U</b>	phenylalanine	serine	tyrosine	cysteine	<b>U</b>
	phenylalanine	serine	tyrosine	cysteine	<b>C</b>
	leucine	serine	stop	stop	<b>A</b>
	leucine	serine	stop	tryptophan	<b>G</b>
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	valine	alanine	glutamate	glycine	<b>A</b>
	valine	alanine	glutamate	glycine	<b>G</b>

2. Transcription of the DNA sequence below: **AAGCTGGGA** would most directly result in which of the following:

- A. a sequence of 3 amino acids, linked by peptide bonds
- B. a DNA strand with the base sequence **TTCGACCCT**
- C. a mRNA strand with the sequence **TTCGACCCT**
- D. a mRNA strand with the sequence **UUCGACCCU**

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