

Genetic Mutations

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

1. Watch a short video on mutations, <https://www.youtube.com/watch?v=GieZ3pk9YVo> or search “Amoeba Sisters Mutations: The Potential Power of a Small Change”
2. Read or skim the mutation section in our textbook,, pp. 186-187
3. Take a few notes on the following terms using the video and reading. With your group, come up with descriptions in your own words.

Gene Mutations

- a. Substitution (Point) _____
- b. Insertion (frameshift) _____
- c. Deletion (frameshift) _____

Chromosome Mutations

- d. Duplication _____
- e. Deletion _____
- f. Inversion _____
- g. 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:						

Mutated DNA sequence #1:	TAC	ATC	TTG	GCG	ACG	ACT
mRNA transcript:	<i>Circle any changes</i>					
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:		<i>Circle any changes</i>					
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 #3:		TAC ACC TTA GCG ACG ACT					
mRNA transcript:		<i>Circle any changes</i>					
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 #4:		TAC ACC TTG GCG ACT ACT					
mRNA transcript:		<i>Circle any changes</i>					
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 #5:		TAC ACC TTG GGA CGA CT					
mRNA transcript:		<i>Circle any changes</i>					
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.**