

Write each codon per line and circle the mutated DNA base where the mutation took place.

Original DNA TAC GGA CGA TCT CAG GAG CCT ATA ATC

Deletion DNA _____

Mutated mRNA _____

Mutated Amino Acids _____

Original Amino Acid Met Pro Ala Arg Val Leu Gly Try STOP

Usually a frameshift mutation results in the synthesis of a nonfunctional protein.
Why do you think your mutated proteins might not be functional?

BASE SUBSTITUTION MUTATIONS

A different type of gene mutation is called base substitution. It is the simplest type of mutation where a nucleotide pair is replaced with a different nucleotide pair.

Base Substitution GAC → GGC

One type of base substitution is called *transversion mutation*. Transversion mutation is when one purine (A, G) is swapped with a pyrimidine (C, T).

Purine → Pyrimidine GAC → TAC
Pyrimidine → Purine GAC → GAG

Use the DNA code below to demonstrate a purine → pyrimidine transversion mutation. All you have to do is change one DNA base.

Write each codon per line and circle the mutated amino acid.

Original DNA TAC CAT GCA GAT CTG GCC CAG TTC ATC

Transversion DNA _____

Mutated mRNA _____

Mutated Amino Acid _____

Original Amino Acid Met Val Arg Leu Asp Arg Val Lys STOP

The opposite of transversion mutations is *transition mutations*. A transition mutation happens when one purine is swapped with the other purine or pyrimidine with pyrimidine.

Purine → Purine	GAC → AAC
Pyrimidine → Pyrimidine	GAC → GAT

Use the DNA code below to demonstrate a purine → purine transition mutation. All you have to do is change one DNA base.

Write each codon per line and circle the mutated amino acid.

Original DNA TAC GTC GCT CAA CGG GAC CTG ACC ACT

Transition DNA _____

Mutated mRNA _____

Mutated Amino Acid _____

Original Amino Acid Met Gln Arg Val Ala Leu Asp Trp STOP

A third type of base substitution is called *silent mutation*. Silent mutation happens when one base in a codon is changed but both code for the same amino acid.

DNA	CTT → CTG
Amino Acid	Leu → Leu

Use the DNA code below to demonstrate a silent mutation. All you have to do is change one DNA base but the amino acid stays the same.

Write each codon per line and circle the mutated DNA base.

Original DNA TAC CAT TCT CGG TGT AAA AGG GCG ATT

Silent DNA _____

Mutated mRNA _____

Mutated Amino Acid _____

Original Amino Acid Met Val Arg Ala Thr Phe Ser Arg STOP

A base mutation that creates a new stop codon in place of an amino acid is called a *nonsense mutation*.

DNA	TGT → TGA
Amino Acid	Cys → STOP

Use the DNA code below to demonstrate a nonsense mutation. All you have to do is change one DNA base to create a new stop codon.

Write each codon per line and circle the mutated amino acid.

Original DNA TAC GGT AAT CAA ATA GAA CCT GAG ACT

Nonsense DNA _____

Mutated mRNA _____

Mutated Amino Acid _____

Original Amino Acid Met Pro Leu Val Tyr Gln Gly Leu STOP

Please explain the difference between a frameshift mutation and a base substitution mutation.

Codon Table

1 s t B a s e	U	Phe Phe Leu Leu	Ser Ser Ser Ser	Tyr Tyr STOP STOP	Cys Cys STOP Trp	U C A G	3 r d B a s e
	C	Leu Leu Leu Leu	Pro Pro Pro Pro	His His Gln Gln	Arg Arg Arg Arg	U C A G	
	A	Ile Ile Ile Met	Thr Thr Thr Thr	Asn Asn Lys Lys	Ser Ser Arg Arg	U C A G	
	G	Val Val Val Val	Ala Ala Ala Ala	Asp Asp Glu Glu	Gly Gly Gly Gly	U C A G	
		U	C	A	G		
2nd Base							