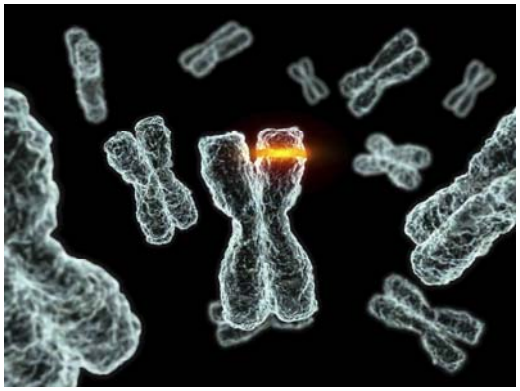
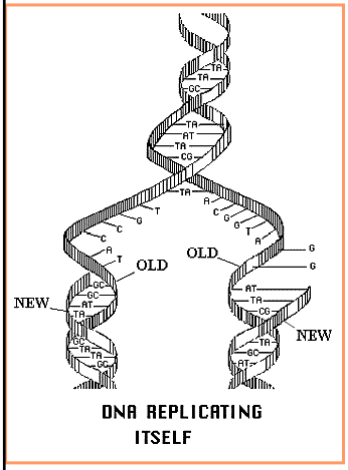
Section 12-4
Mutations



What are mutations?

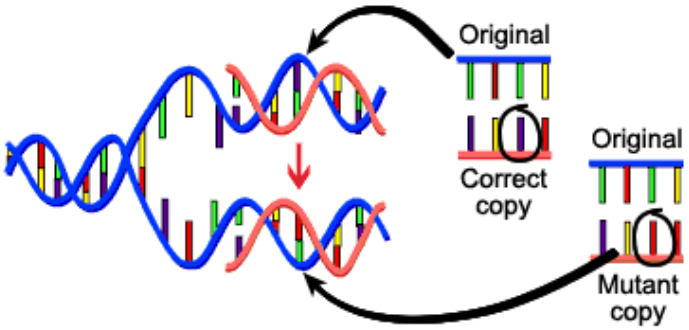


DNA REPLICATING ITSELF

- Changes in DNA that happen when cells make a mistake in copying their own DNA.
- Can happen in body cells (somatic cells) – will not be passed on to offspring.
- Can happen in gametes (egg or sperm cells) – and could be passed on to offspring.

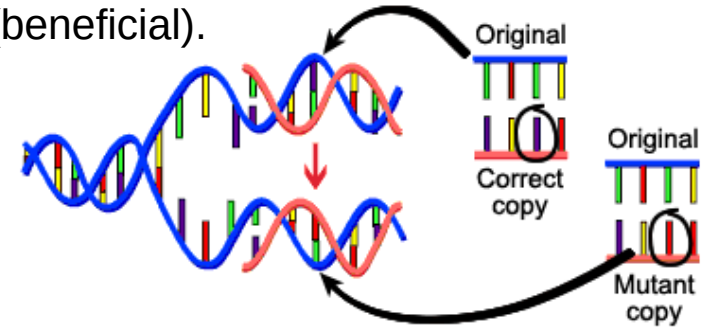
Are Mutations Harmful or Beneficial?

- Mutations happen regularly
- Most of the time mutations are neither harmful nor beneficial.
- Many mutations are repaired by enzymes.



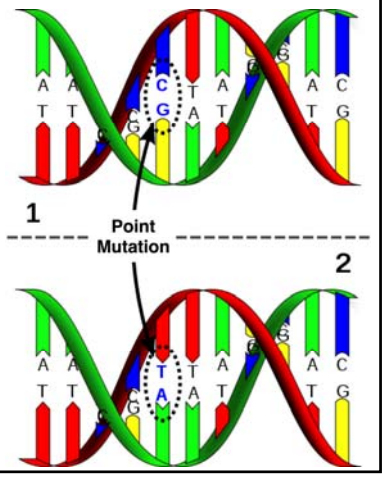
Mutations: Harmful or Beneficial?

- Mutations can be caused by chemicals and UV radiation.
- Some types of skin cancers and leukemia result from somatic mutations.
- Some mutations may improve an organism's survival (beneficial).



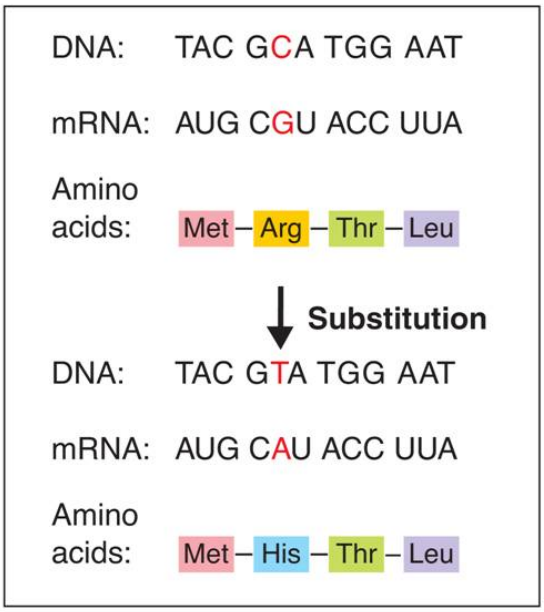
Point Mutations

- Point Mutations: gene mutations involving a change in one or a few nucleotides.
- Occur at one point in the DNA
- Include:
  - Substitutions
  - Insertions
  - Deletions



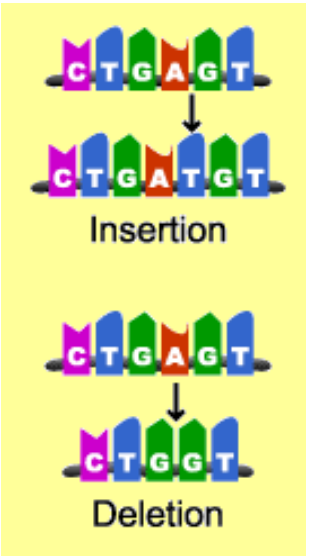
Types of Point Mutations

- Substitution: a single base in the DNA sequence is replaced with a different base.
- What happens to the sequence of amino acids?
  - The wrong amino acid could be added to the protein.



Frameshift Mutations

- **Frameshift Mutations** (like insertions or deletions) are point mutations that may change every amino acid that follows the point of the mutation.
- Frameshift mutations can change a protein so much that it is unable to perform its normal functions.



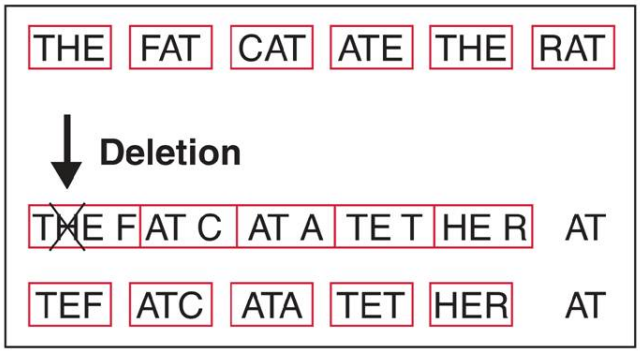
Types of Point Mutations - Insertions

- **Insertion:** an extra base is inserted into a base sequence.
- What happens to the sequence of amino acids?
  - All amino acids coded for after the insertion are changed.

DNA:	TAC GCA TGG AAT
mRNA:	AUG CGU ACC UUA
Amino acids:	Met – Arg – Thr – Leu
	↓ Insertion
DNA:	TAT CGC ATG GAA T
mRNA:	AUA GCG UAC CUU A
Amino acids:	Ile – Ala – Tyr – Leu

Types of Point Mutations - Deletions

- **Deletion:** a single base is deleted and the reading frame is shifted.



- What happens to the sequence of amino acids?
  - All amino acids coded for after the deletion are changed.

Practice! Identify the type of mutation:

Normal	Substitution
DNA: TAC G**CA TGG AAT** mRNA: AUG CGU ACC UUA Amino Acids: Met-Arg-Thr-Leu	DNA: TAC G **A**A TGG AAT mRNA: AUG CUU ACC UUA Amino Acids: Met-Leu-Thr-Leu

Normal	Insertion
DNA: TAC G**CA TGG AAT** mRNA: AUG CGU ACC UUA Amino Acids: Met-Arg-Thr-Leu	DNA: TA**G** C GCA TGG AAT mRNA: AUC GCG UAC CUU A Amino Acids: Ile-Ala-Tyr-Leu

Practice Protein Synthesis and Identify the Type of Mutation:

Normal	Deletion
DNA: TAC G**CA TGG AAT** mRNA: AUG CGU ACC UUA Amino Acids: Met-Arg-Thr-Leu	DNA: TAC GA TGG AAT mRNA: AUG CU ACC UUA Amino Acids: Met-Leu-Pro-