

# Mutations

# Review

- Ready, set, codon
- DNA ... TAC ATT
- RNA ... AUG UAA
- A. A. ... start stop

- Cells have checkpoints to repair damage that was missed earlier.
- Sometimes the cell doesn't repair the damage.
- If the damage goes unrepaired it can result in mutation.



All are caused by

DNA Mutations.



# What is mutation?

- ⦿ A permanent change in a cell's DNA. This leads to mistakes in Protein Synthesis.
- ⦿ **What are some causes of mutation?**
  - > Radiation (X rays)
  - > UV light
  - > Mutagens (chemicals)

# Types of mutation

- Some mutations cause large changes, some cause small changes, and some cause no change at all.
- **Point mutations** involve a chemical change in just one base pair.
- **Frameshift mutations** change the entire amino acid sequence after the point of the mutation.
- **Silent mutations** involve a chemical change in one base, but do not change the protein.

# Point Mutations

- ◉ **Missense** mutation
- ◉ = DNA codes for the wrong **Amino Acid**
- ◉ A single base pair is changed to cause substitution of a different amino acid.



1 Amino Acid is **REPLACED**  
with another!

# Point Mutations

- Nonsense mutation ○
- Cause translation to **terminate early** ○
- results in a premature stop codon. ○



Protein is **terminated** early!

# Point Mutations

- ◉ **Silent** mutation
- ◉ Changed DNA still produces the **proper** amino acid
- ◉ does **NOT** result in a change in protein
- ◉ DNA = TAC GAG AGC CCA ATT
- ◉ RNA = AUG CUC UCG GGU UAA
- ◉ A.A. = Start leucine serine glycine stop
- ◉ DNA = TAC GAG AGC CCG ATT
- ◉ RNA = AUG CUC UCG GGC UAA
- ◉ A.A. = Start leucine serine glycine stop

No Change!



# Frameshift mutations

- A nucleotide is **lost** or **gained**, causing the 3-letter codons to **shift** up or down 1 letter for the remainder of the DNA sequence
- = A mutation in which part of the DNA is missing or extra has been added.

# Frameshift mutations

- **Insertion** mutation
- An **extra** nucleotide is **inserted** into the DNA
- bases are added to the DNA sequence



The rest are **changed!**

mutation **because it alters the “reading frame”** of the 3 base codons !!

# Frameshift mutations

- **Deletion** mutation
- A nucleotide is **removed** from the DNA
- part of the DNA is missing.



The rest are **changed**

# Other Mutations

- Some mutations involve larger sections of DNA that are **translocated**, **deleted**, or **repeated**.
  - > **Translocation** – a section from one DNA strand is moved to an entirely different DNA strand (from one chromosome to another)

# Mutation...Good?

- Can mutations be beneficial to us?
- **Evolution** – The *changes* seen in the inherited traits of a population from one generation to the next.

