TYPES OF MUTATIONS = change in the genetic code
Can be due to :

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| Substitution |  | One letter is replaced by a different letter  |
| deletion |  | Piece of DNA is deleted and lost |
|  |  | Piece of DNA is added |
| insertion |  | Extra copies of a section of DNA areAdded |

GENE MUTATIONS= change in a single gene

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- Change in just a few nucleotides in DNA sequence

 If change codes for same amino acid = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mutation
 GGC and GGA BOTH code for glycine = ”WOBBLE”

 If change codes for a different amino acid = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mutation
 May change function of protein
 EX: Sickle cell mutation: A → T

 If change codes for a STOP instead of an amino acid = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mutation
 Protein sequence will be terminated early (shorter) and NONFUNCTIONAL.



Because messages are read in groups of 3 letters (CODON)
 insertions/deletions can cause a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

A shift in the reading frame changes every codon after the mutation.
Can result in NONSENSE or MISSENSE mutations.
Frameshift mutations at beginning of a gene change more of the code than at the end.

CHROMOSOMAL MUTATIONS –changes in number or structure of chromosomes



\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

LETHAL in mammals
rare in most animals

 Beneficial in plants