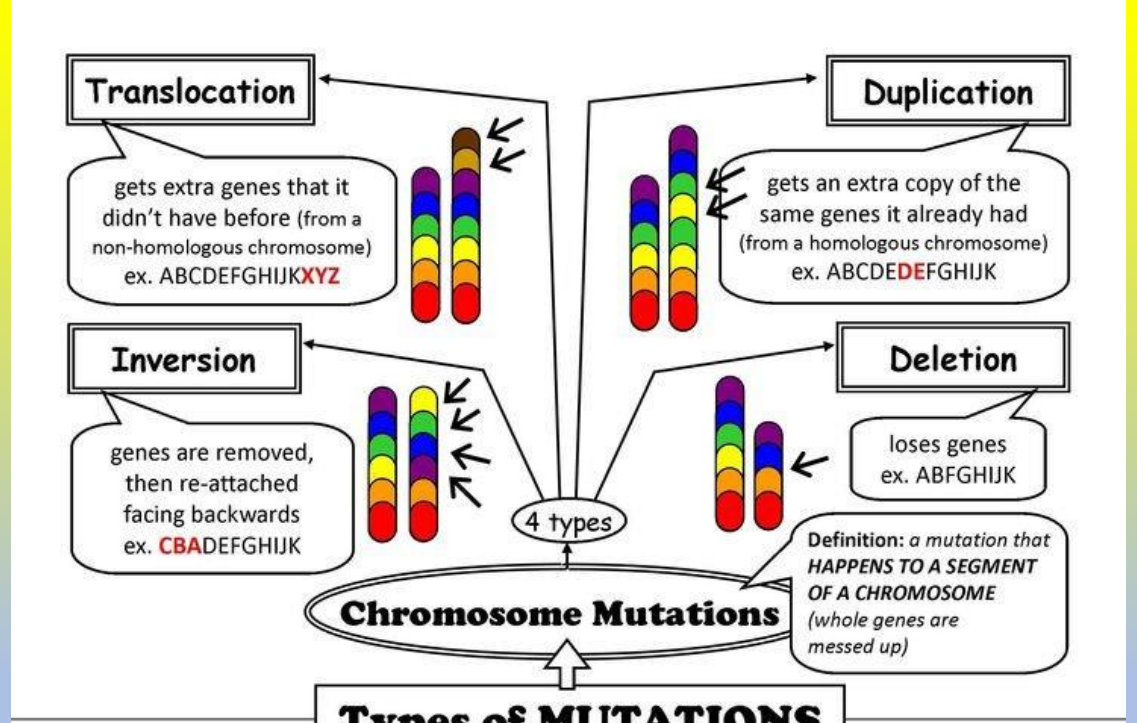
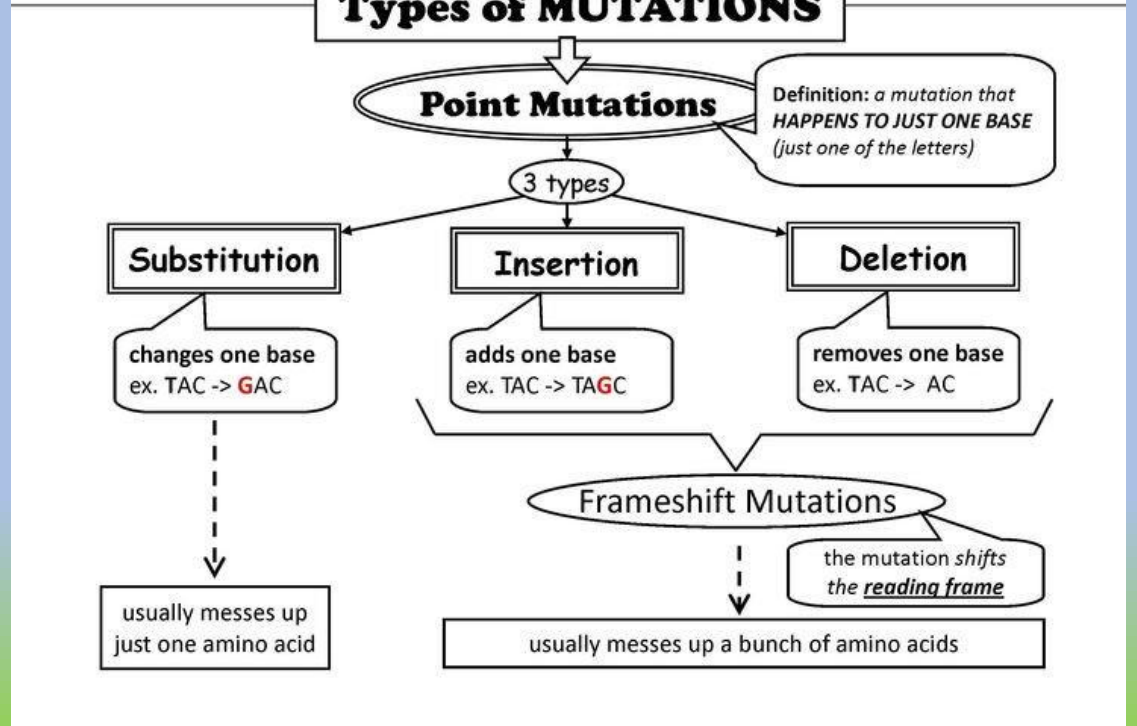
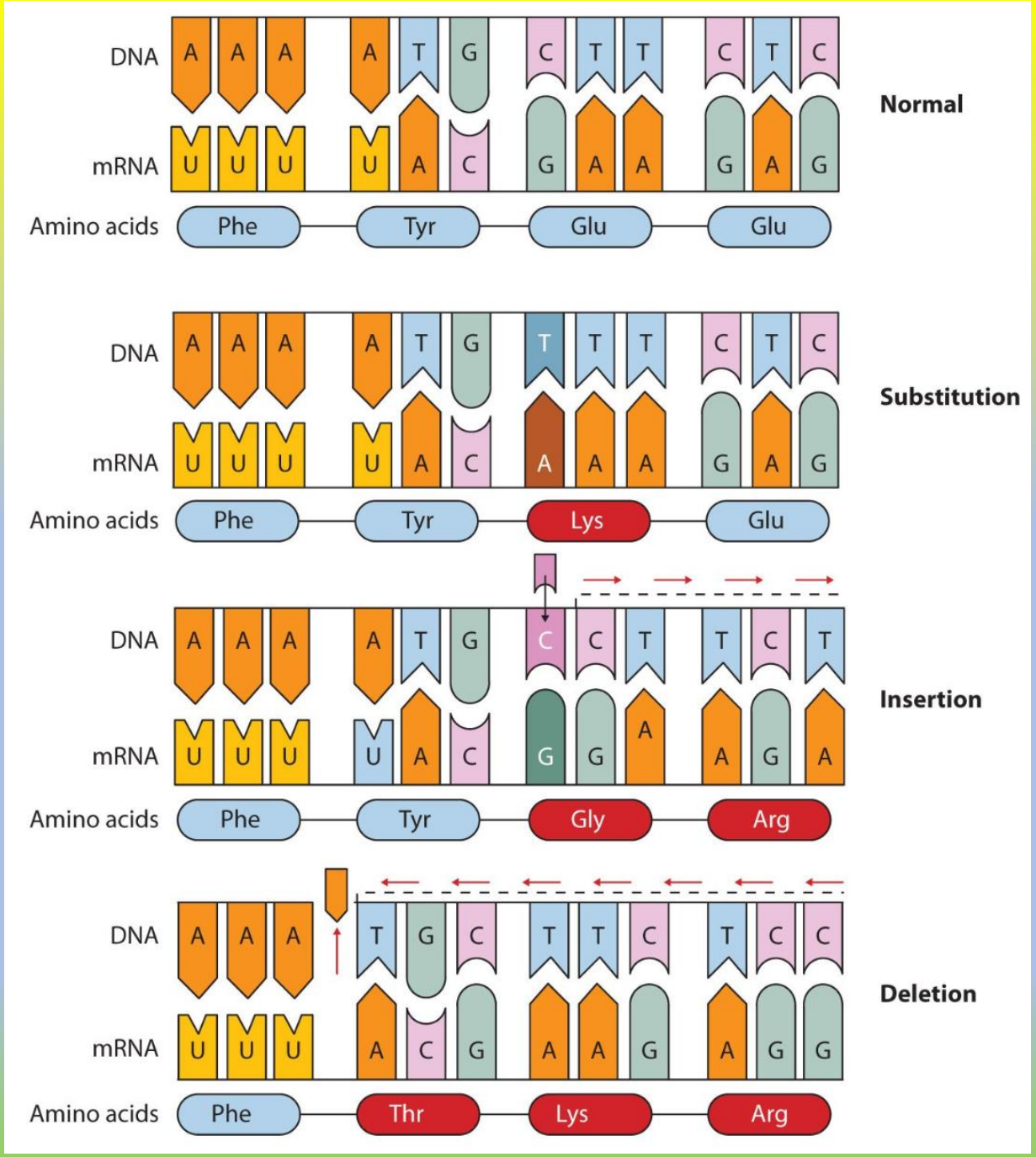

Translocation
gets extra genes that it didn't have before (from a non-homologous chromosome) ex. ABCDEFGHIJKXYZ
Duplication
gets an extra copy of the same genes it already had (from a homologous chromosome) ex. ABCDEDEFGHIJK
Inversion
genes are removed, then re-attached facing backwards ex. CBADEFGHIJK
Deletion
loses genes ex. ABFGHIJK
4 types
Chromosome Mutations
Definition: a mutation that HAPPENS TO A SEGMENT OF A CHROMOSOME (whole genes are messed up)

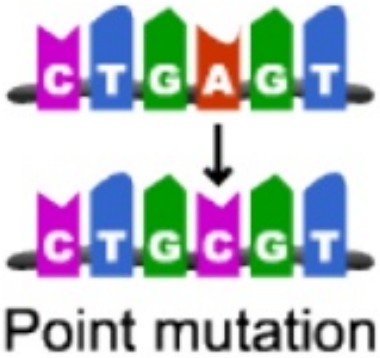

Types of MUTATIONS
Point Mutations
Definition: a mutation that HAPPENS TO JUST ONE BASE (just one of the letters)
3 types
Substitution
changes one base ex. TAC -> GAC
usually messes up just one amino acid
Insertion
adds one base ex. TAC -> TAGC
Deletion
removes one base ex. TAC -> AC
Frameshift Mutations
the mutation shifts the reading frame
usually messes up a bunch of amino acids


DNA
mRNA
Amino acids
Normal
Phe
Tyr
Glu
Glu
Substitution
Phe
Tyr
Lys
Glu
Insertion
Phe
Tyr
Gly
Arg
Deletion
Phe
Thr
Lys
Arg

Mutations of a **single base** in DNA & **how it alters the protein** coded for by the gene

Gene Mutations

- Point Mutations – changes in one or a few nucleotides
  - Substitution
    - THE FAT CAT ATE THE RAT
    - THE FAT HAT ATE THE RAT
  - Insertion
    - THE FAT CAT ATE THE RAT
    - THE FAT CAT XLW ATE THE RAT
  - Deletion
    - THE FAT CAT ATE THE RAT
    - THE FAT ATE THE RAT



Point mutation

Normal vs. mutated DNA

When compared, was….

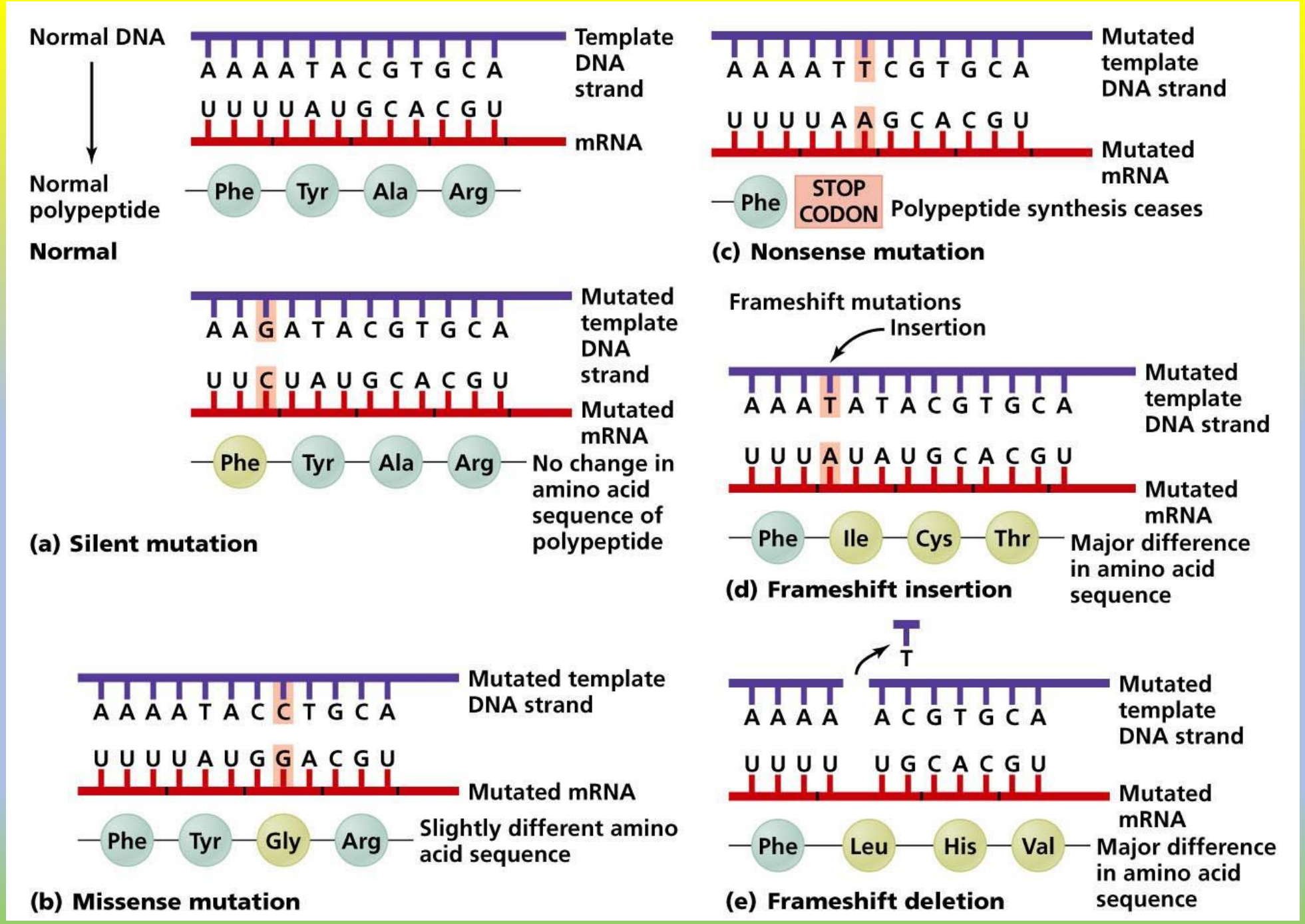
A base added?

Removed?

Switched out?

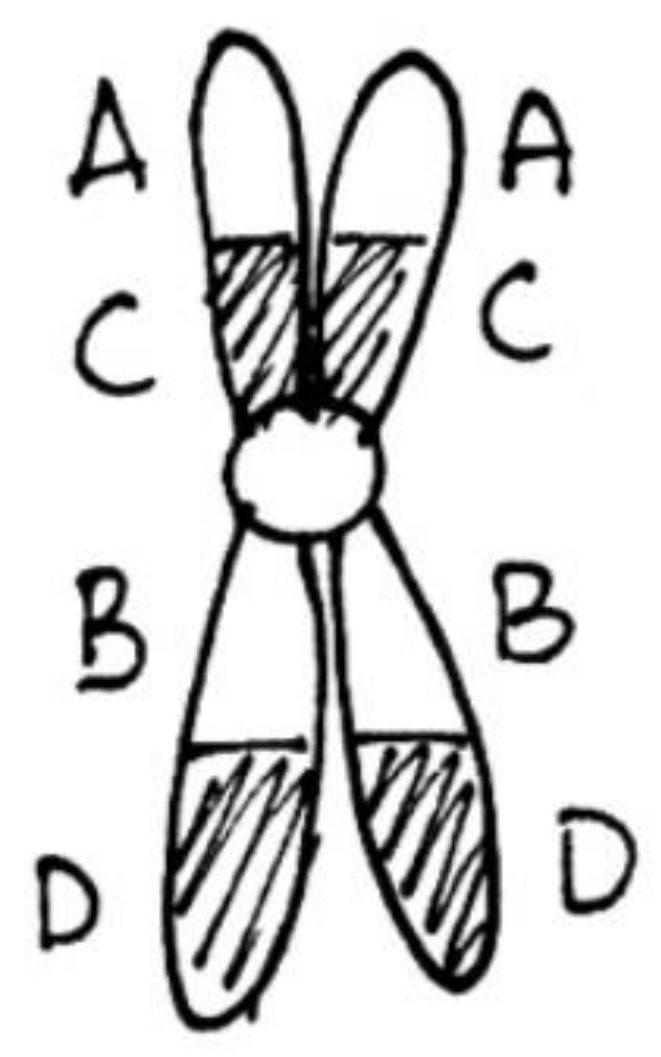
Point mutation → ONE BASE of reading frame has been changed on template strand of DNA during S1.

FRAMESHIFT occurs if reading frame changes.


Normal DNA
A A A A T A C G T G C A
Template DNA strand
U U U U A U G C A C G U
mRNA
Normal polypeptide
Phe
Tyr
Ala
Arg
Normal
A A G A T A C G T G C A
Mutated template DNA strand
U U C U A U G C A C G U
Mutated mRNA
Phe
Tyr
Ala
Arg
No change in amino acid sequence of polypeptide
(a) Silent mutation
A A A A T A C C T G C A
Mutated template DNA strand
U U U U A U G G A C G U
Mutated mRNA
Phe
Tyr
Gly
Arg
Slightly different amino acid sequence
(b) Missense mutation
A A A A T T C G T G C A
Mutated template DNA strand
U U U U A A G C A C G U
Mutated mRNA
Phe
STOP CODON
Polypeptide synthesis ceases
(c) Nonsense mutation
Frameshift mutations
Insertion
A A A T A T A C G T G C A
Mutated template DNA strand
U U U A U A U G C A C G U
Mutated mRNA
Phe
Ile
Cys
Thr
Major difference in amino acid sequence
(d) Frameshift insertion
T
A A A A
A C G T G C A
Mutated template DNA strand
U U U U
U G C A C G U
Mutated mRNA
Phe
Leu
His
Val
Major difference in amino acid sequence
(e) Frameshift deletion

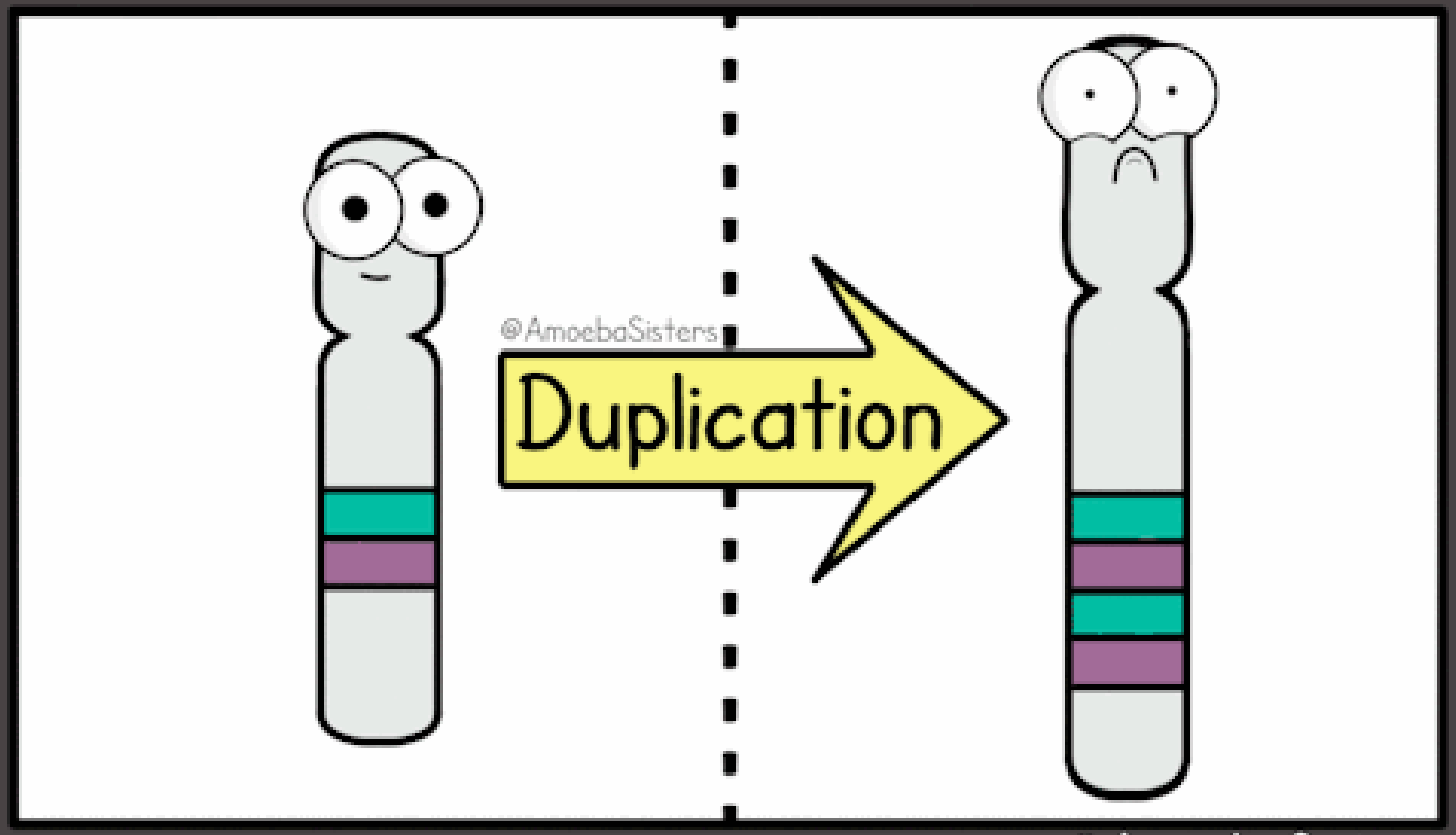
Summary:

Point mutation involves only ONE BASE and can cause a frameshift (insertion or deletion) or not silent mutation



Mutations of whole genes & **how it alters the protein** and the **chromosome**.

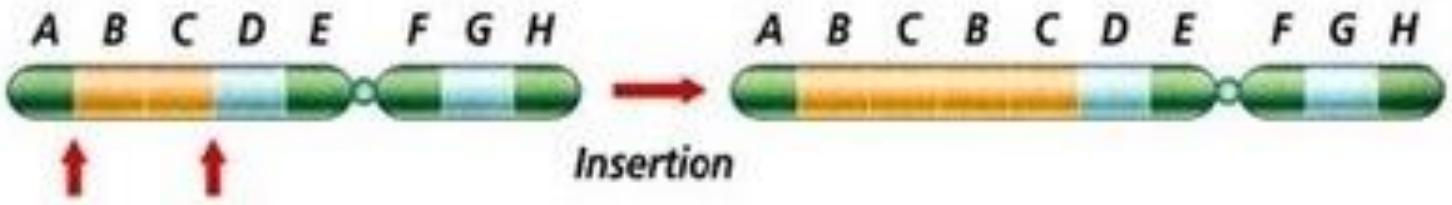
Chromosome Mutations

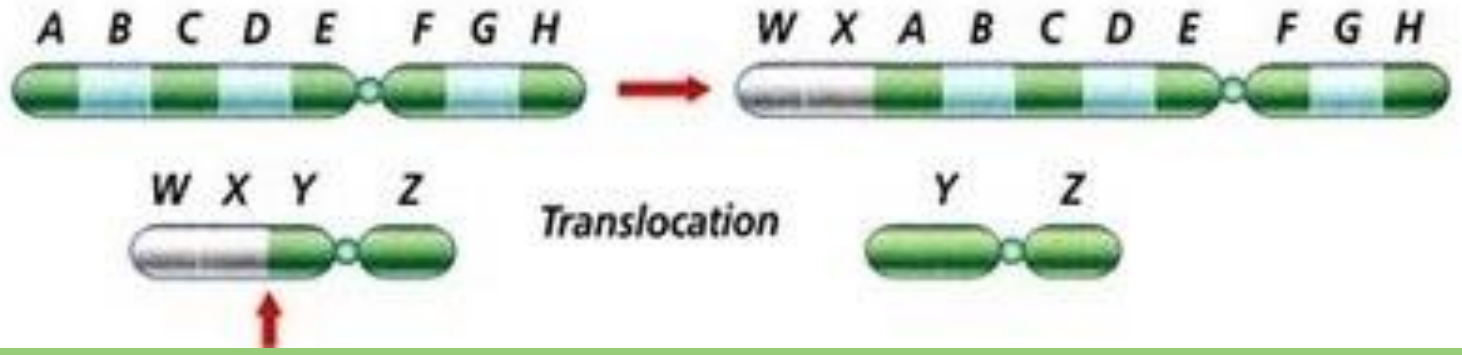


@AmoebaSisters

A When a part of a chromosome is left out, a deletion occurs.

B When part of a chromatid breaks off and attaches to its sister chromatid, an insertion occurs. The result is a duplication of genes on the same chromosome.



C When part of a chromosome breaks off and reattaches backwards, an inversion occurs.

D When part of one chromosome breaks off and is added to a different chromosome, a translocation occurs.