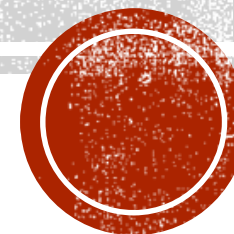


MUTATIONS



WHAT ARE MUTATIONS?

- Changes in the **nucleotide sequence** of DNA
- May occur in **somatic cells** (aren't passed to offspring)
- May occur in **gametes** (eggs & sperm) and be passed to offspring



ARE MUTATIONS HELPFUL OR HARMFUL?

- Mutations happen **regularly**
- Almost all mutations are **neutral**
- **Chemicals & UV** radiation cause mutations
- Many mutations are **repaired** by enzymes



ARE MUTATIONS HELPFUL OR HARMFUL?

- Some type of **skin cancers and leukemia** result from **somatic** mutations
- Some mutations may **improve** an organism's **survival** (beneficial)



TYPES OF MUTATIONS



CHROMOSOME MUTATIONS

- May Involve:
 - **Changing the structure** of a chromosome
 - **The loss or gain** of part of a chromosome



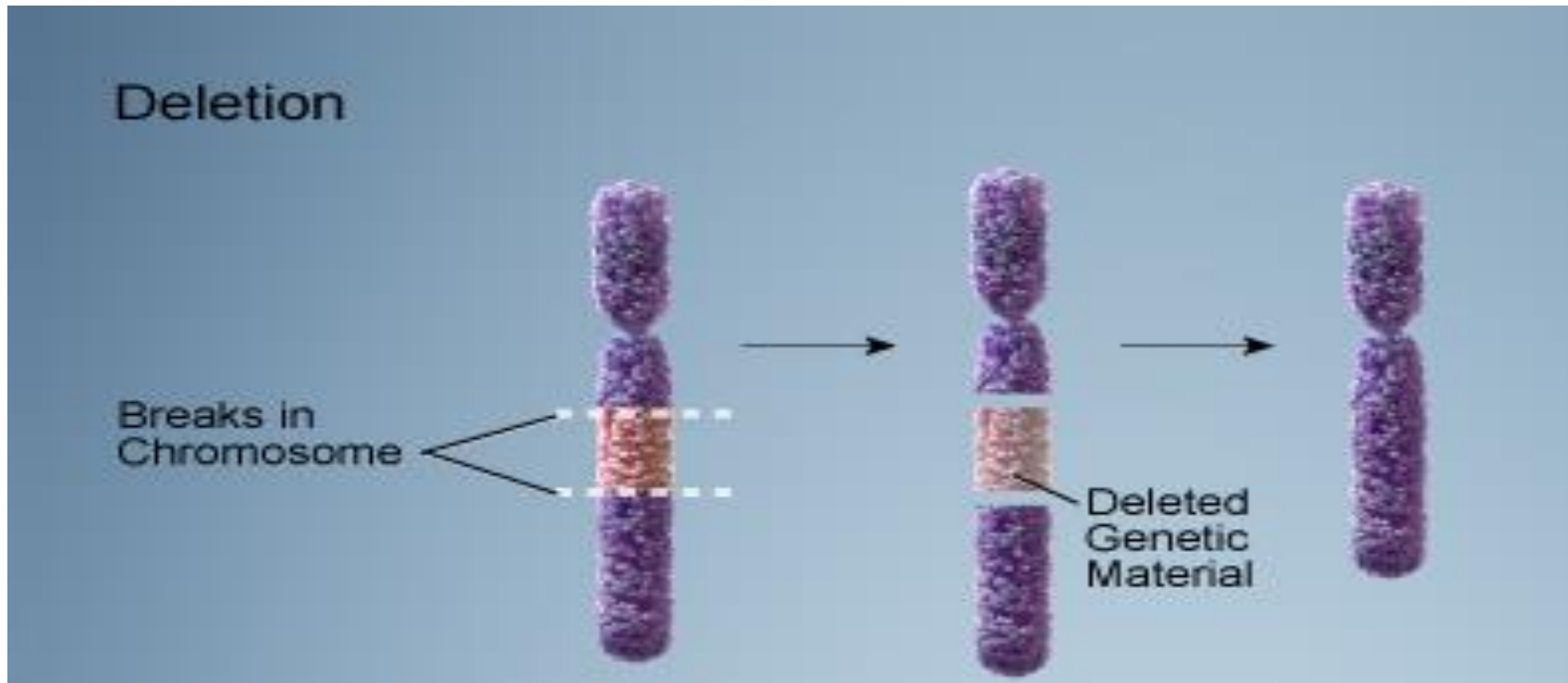
CHROMOSOME MUTATIONS

- Five types exist:
 - **Deletion**
 - **Inversion**
 - **Translocation**
 - **Nondisjunction**
 - **Duplication**



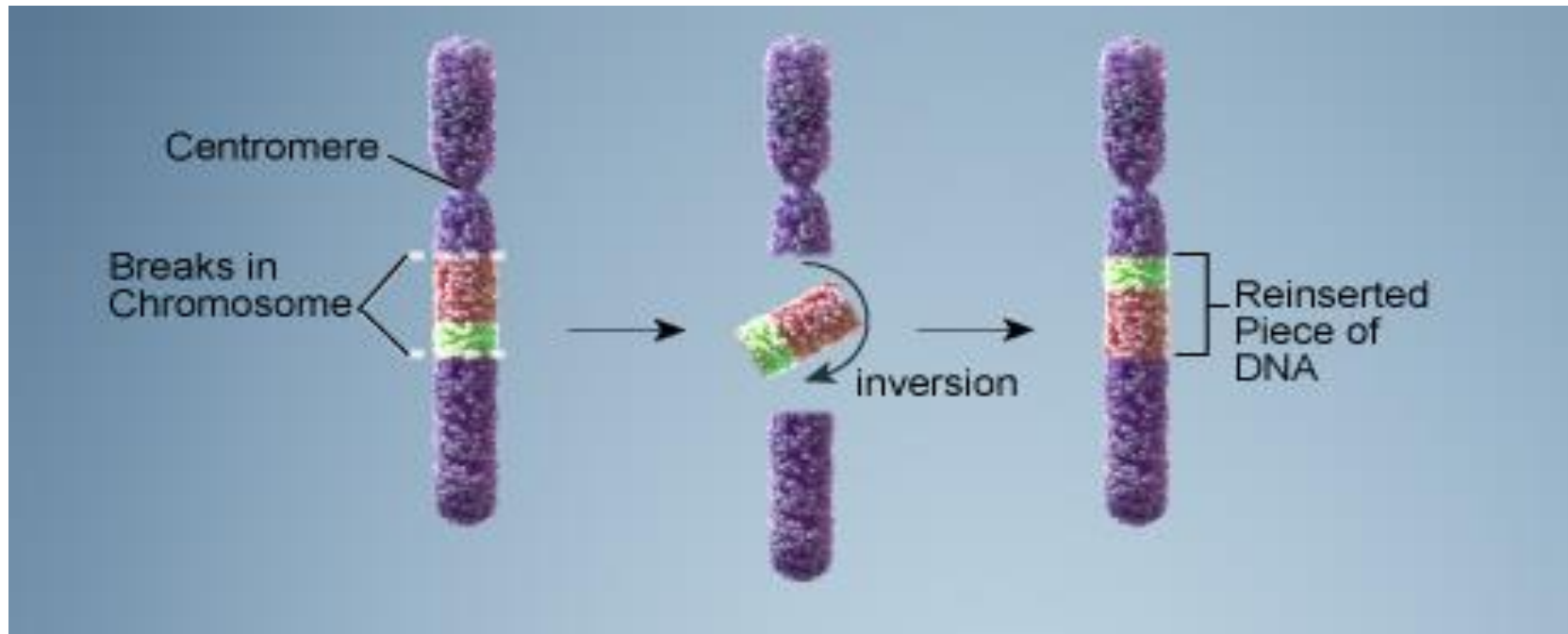
DELETION

- Due to **breakage**
- A **piece** of a chromosome is **lost**



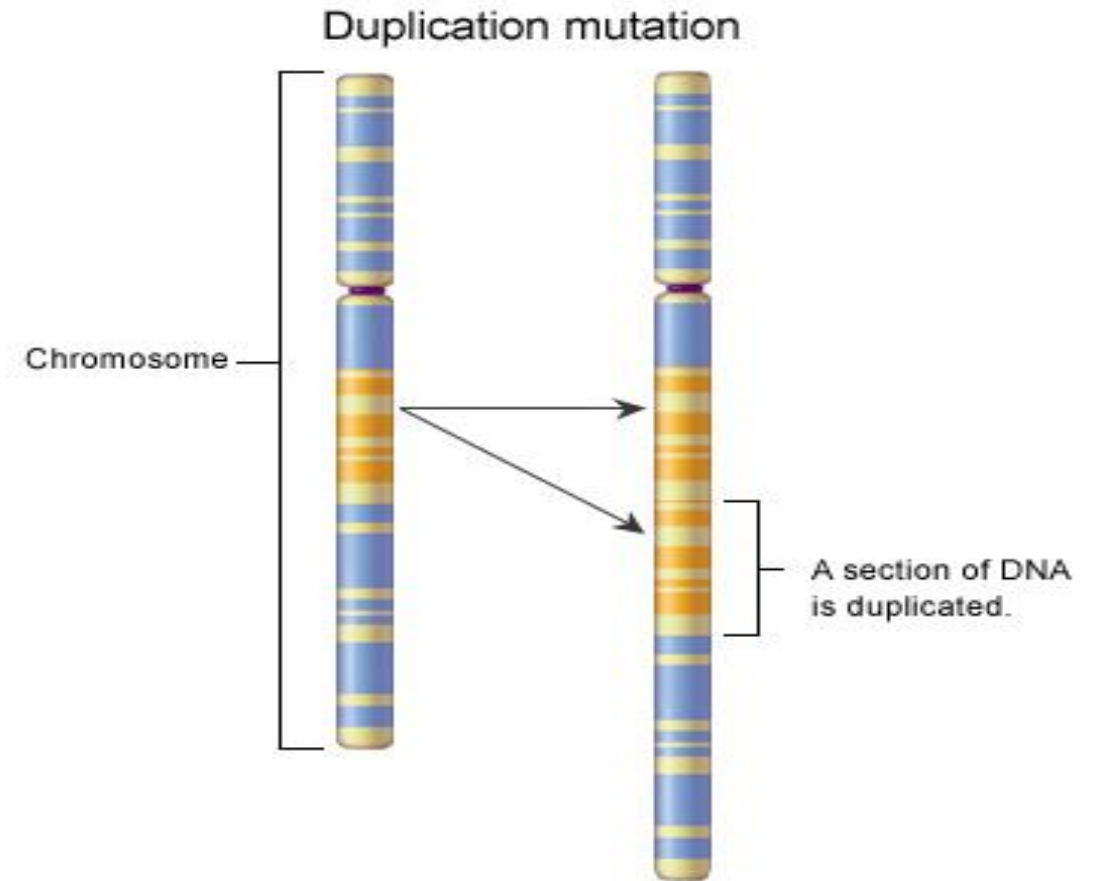
INVERSION

- Chromosome segment **breaks off**
- Segment flips around **backwards**
- Segment **reattaches**



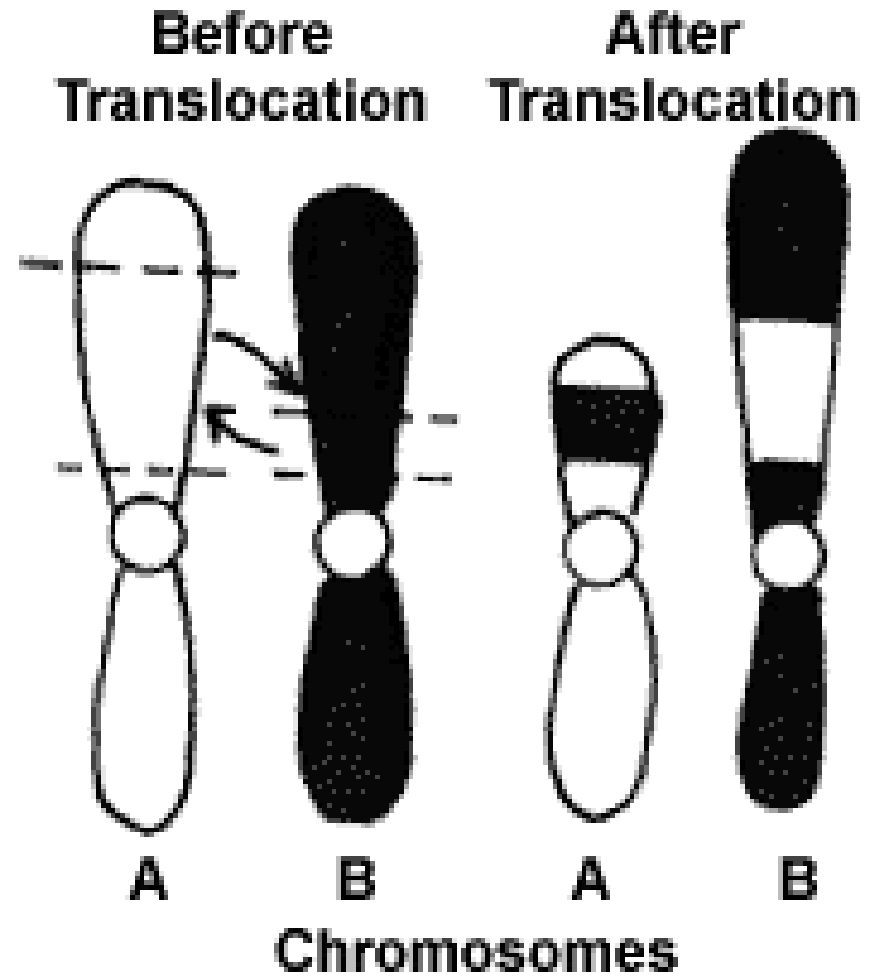
DUPLICATION

- Occurs when a gene **sequence is repeated**



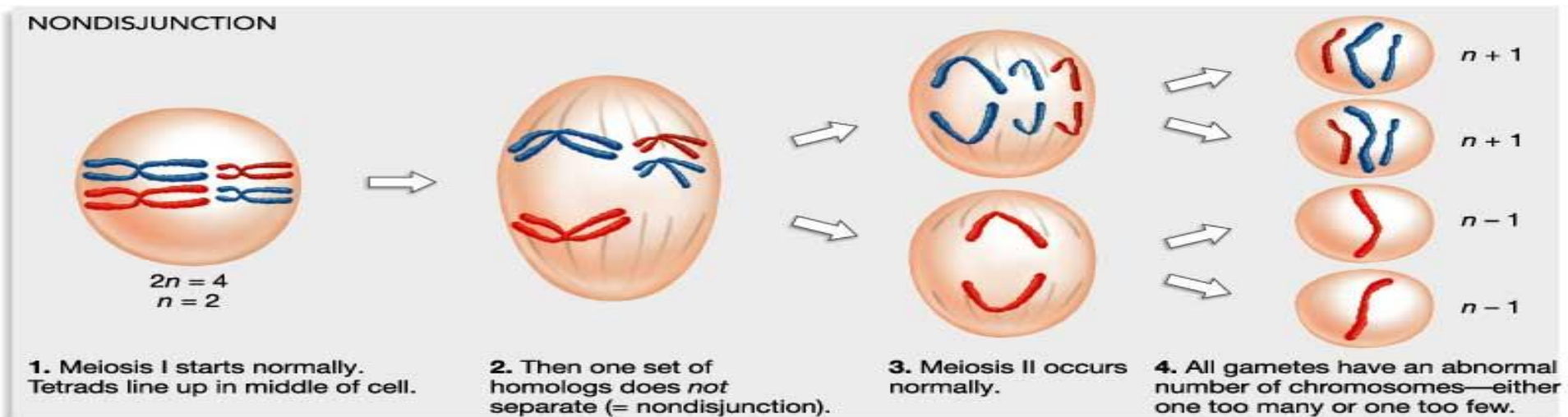
TRANSLOCATION

- Involves **two chromosomes** that aren't homologous
- **Part** of one chromosome is **transferred to another** chromosomes



NONDISJUNCTION

- **Failure** of chromosomes **to separate** during meiosis
- Causes gamete to have **too many or too few chromosomes**



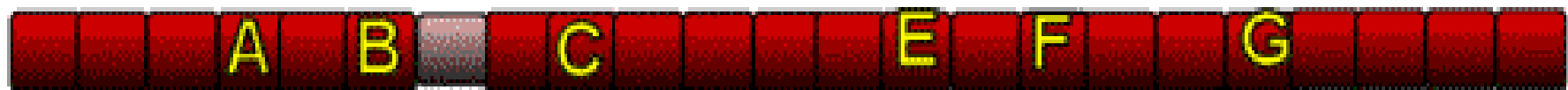
Original Chromosome



Duplication



Deletion



Inversion



Inversion



GENE MUTATIONS

- Change in the **nucleotide sequence** of a **gene**
- May only involve a **single nucleotide**
- May be due to **copying errors, chemicals, viruses, etc.**



TYPES OF GENE MUTATIONS

- **Include:**
 - **Point Mutations**
 - **Substitutions**
 - **Insertions**
 - **Deletions**
 - **Frameshift**



POINT MUTATION

- Change of a **single** nucleotide
- Includes the deletion, insertion, or substitution of **ONE** nucleotide in a gene
- **Sickle Cell disease** is the result of one nucleotide substitution
- Occurs in the **hemoglobin gene**



FRAMESHIFT MUTATION

- **Inserting or deleting** one or more nucleotides
- Changes the “**reading frame**” like changing a sentence
- **Proteins built incorrectly**
- Original:
 - **The fat cat ate the wee rat.**
- Frame Shift (“a” added):
 - **The fat caa tet hew eer at.**



AMINO ACID SEQUENCE CHANGED

