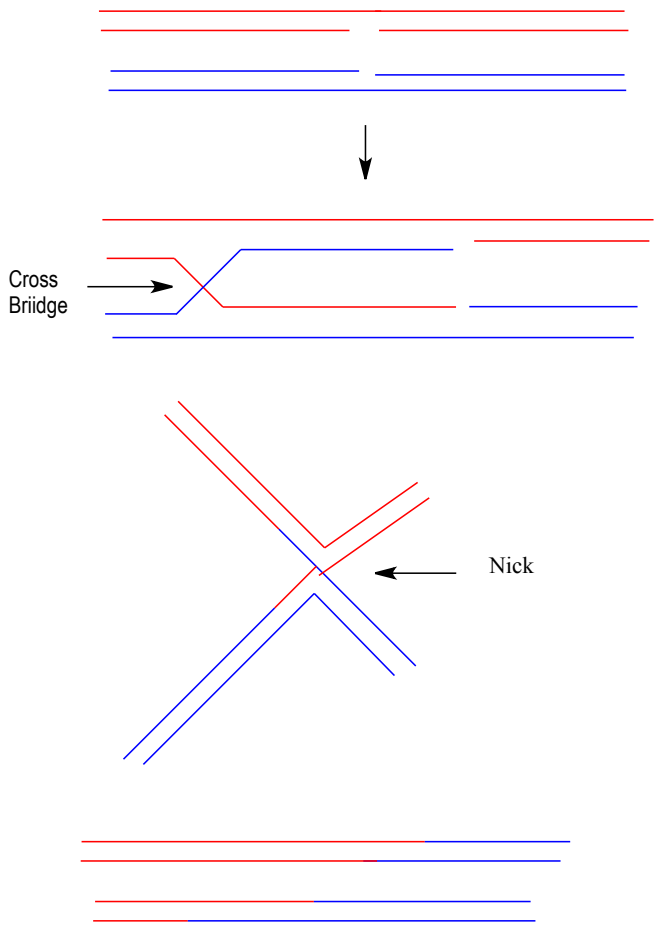
CONCEPT: RECOMBINATION

Recombination

- **Homologous recombination** is an exchange that occurs at equivalent positions along 2 homologous chromosomes
  - □ It can be _____ by single strand breaks or double strand breaks
  - □ Single strand breaks follow certain steps
    - DNA duplex pairs together and there is a nick on a single strand of both homologous chromosomes
    - The nicked strands are displaced, and paired with the other nicked strands. Complex is sealed by a *ligase*
    - **Branch migration** occurs when the paired cross-bridge structures moves down the chromosome
      - Hydrogen bonds are broke and reformed
    - A nick occurs in the other, non-paired, strands
    - A recombinant duplex is formed

EXAMPLE:



Recombinant Duplexes

Double Strand Breaks

□ Double strand breaks follow certain _____

- *Endonucleases* remove nucleotides at the place where the DNA break has occurred

  - Creates a 3' overhang, which is protected by **RecA**

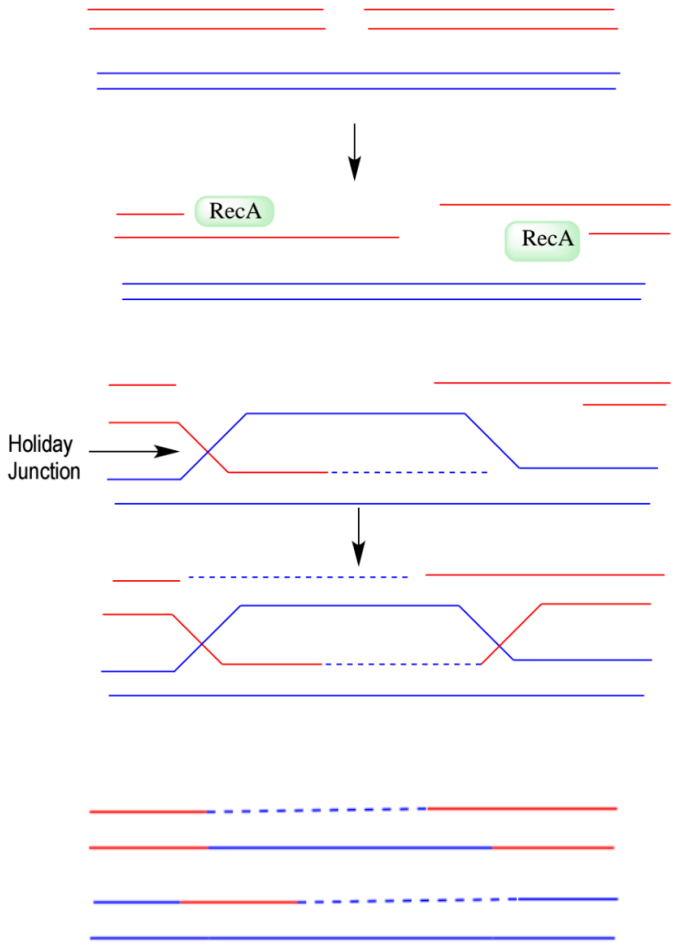
- Broken strands invade the other double helix on the homolog

- DNA repair fills the gaps

  - Forms **holiday junctions**, which are structures made from four DNA strands

- End result: recombination between two strands

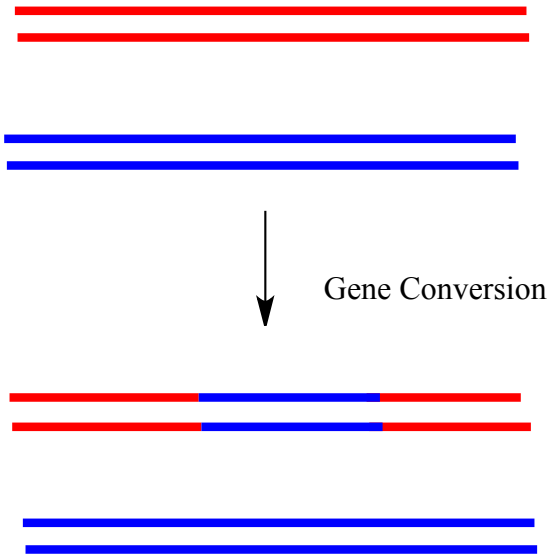
EXAMPLE:



Gene Conversion

- **Gene Conversion** is the nonreciprocal genetic exchange between two closely linked genes
  - □ Caused due to a _____ of base pairs during the duplex formation
    - Has the ability to convert one allele into another allele
  - □ Normal allocation of Aa genotype into gametes: ½ get A and ½ get a
    - Gene conversion will cause ¾ to get A and ¼ to get a (or vise versa)

EXAMPLE:



PRACTICE

1. Homologous recombination is defined as what?
    a. Exchange of alleles from two different genes
    b. Exchange of regulatory regions from two different genes
    c. Exchange that occurs at equivalent positions in two non-homologous chromosomes
    d. Exchange that occurs at equivalent positions in two homologous chromosomes

2. True or False: Homologous recombination repairs double-strand breaks only
    a. True
    b. False

3. Gene conversion can cause a Aa genotype to be sorted into gametes in which way?
    a. All gametes get A allele
    b. All gametes get a allele
    c. ½ gametes get A and ½ gametes get a
    d. ¾ gametes get a and ¼ gametes get A