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M. Sc. III Semester

Paper - II (Unit - IV)

Recombination -
 (1) concept and types of Recombination -
 (2) molecular mechanism of Recombination -
 (3) Site specific recombination -

Recombination -
 (1) What is -
 (2) (R) is the process of formation of new recombinant chromosomes by combining the genetic material from two organisms. The new recombinant show changes in phenotypic characters.

(Kla) → DNA rearrangement: | new gene combination -

Process bring about genetic variation in population. (mutation) -
 (1) mutation - new genetic inf. -
 (2) Recombination - to rearrange the existing genetic inf. -

Genetic Variation

Its Significance -
 (The evolutionary benefit)

- to DNA repair
- accurate chromosome segregation
- Gene conversion
- Regulate the expression of certain gene
- How recombination formed.

to produce Genetic Variation -
 (1) due to DNA rearrangement, the timing and level of expression of gene altered. this type of genetic variation crucial to allow orgⁿ to evolve in response to a changing envt

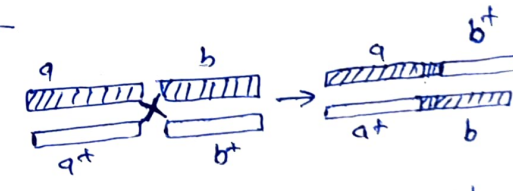
(2) it is essential for every proliferating cell. (during replication) accidentally breakage of strand. it need General Recombination to repair.

(3) Essential for accurate chromosome segregation. that occur during meiosis in fungi, plant & animal.

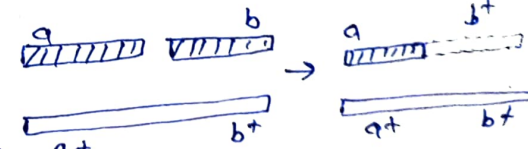
(3) Mechanism of Recombination -
 these are (3) theories that explain the mechanism of recombination.

does not require new DNA synthesis -
 it is used to explain G.R.

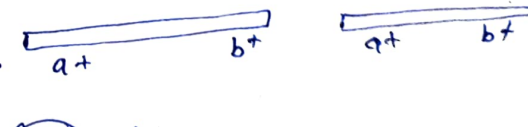
(A) Breakage and Reunion -



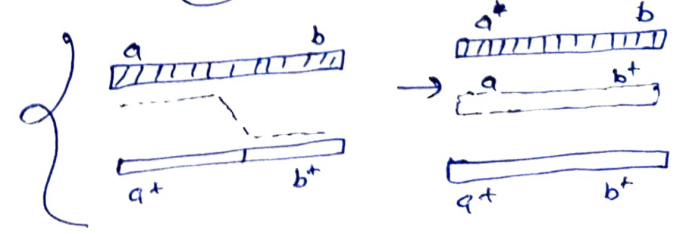
(B) Breakage and Copying -



(C) Complete copy choice -



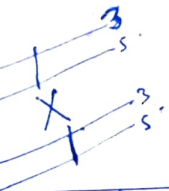
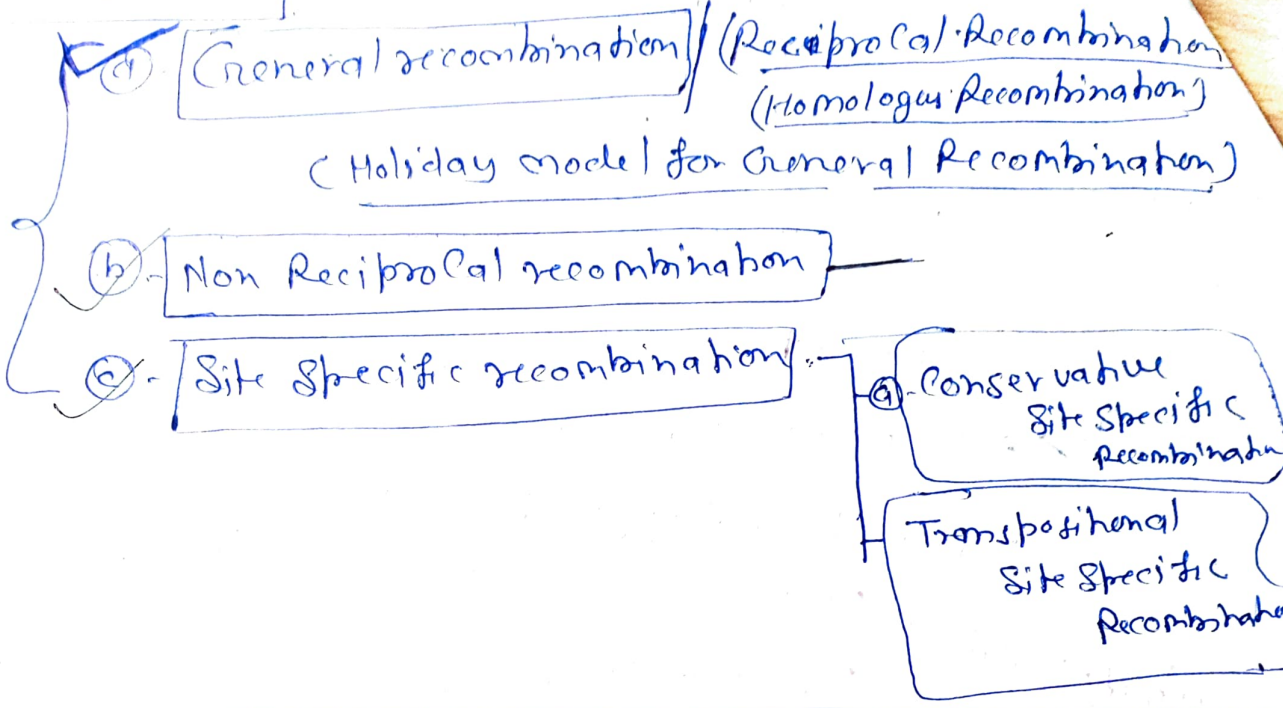
(1931) Beiling



Genetic variation is crucial to allow to organism to evolve in response to a changing envt -

The DNA rearrangement are caused by a set of mechanism that are collectively called genetic recombination -

Types of Recombination -



(a) General Recombination - occurs only b/w complementary strand of two homologous DNA molecules.
 (during crossing over)
 • Rec A Gene (Protein) Bacteria/Virus.

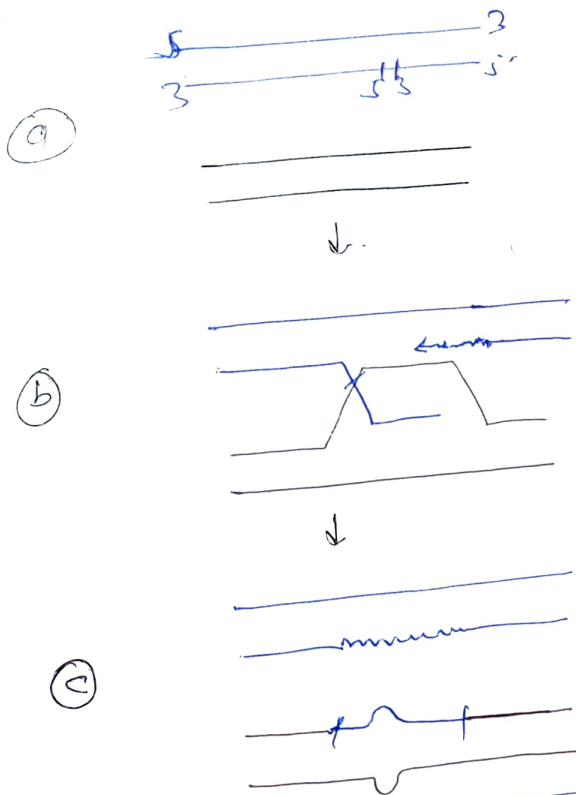
• Holiday model for General Recombination - (1974) -

• According to this model (a) occurs in following steps -

Steps

- 1 (a) Strand Breakage -
- 2 (b) strand pairing -
- 3 (c) strand invasion/assimilation
- 3 (d) Branch migration
- 4 (e) chiasma or crossing over formation
- 5 (f) Breakage and reunion
- 5 (g) mismatch repair (Mismatch proof reader System).

Non Reciprocal Recombination - (Gene Conversion)



Helicase.
DNA Poly.
DNA Ligases.

(Recombinant DNA)

SSR alter the relative position of nucleotides

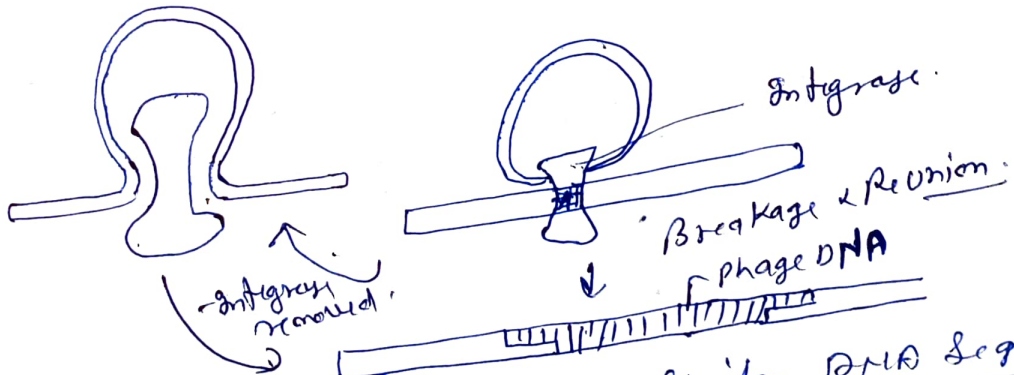
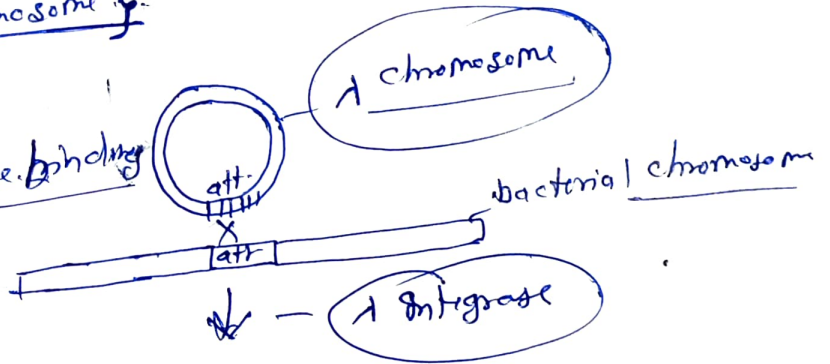
(iii) Site-Specific Recombination

Sequence in chromosome

Phage λ

λ Integrase

Catalyze the binding



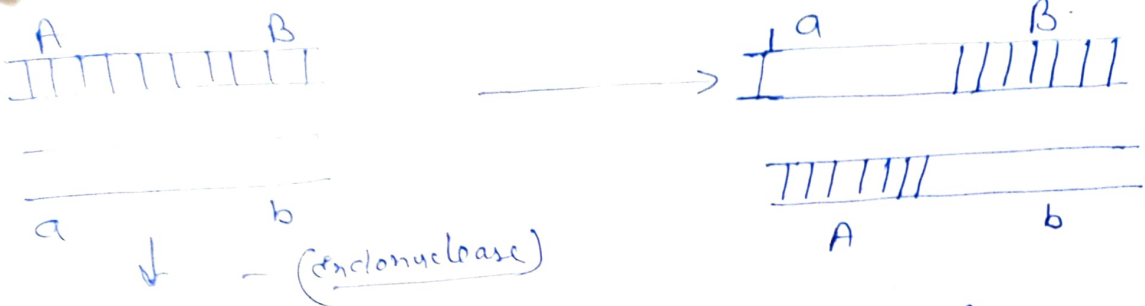
two types

(a) Conservative Site Specific (R)

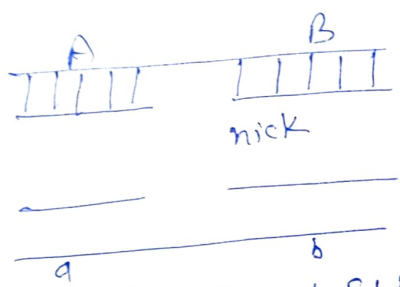
Require similar DNA Sequence

(b) Transpositional Site Specific (R)

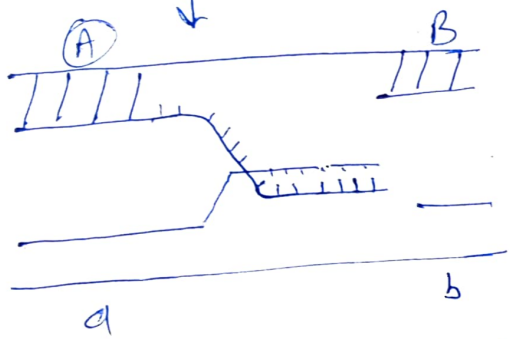
(A. Ray, Pandey) - Law



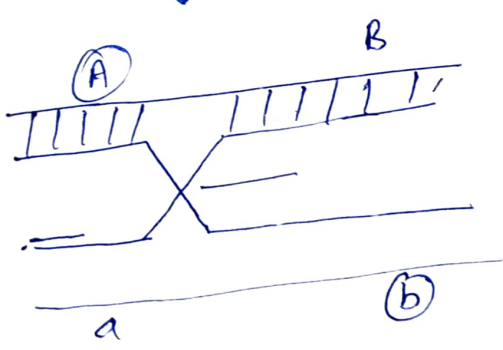
(A) - Pairing of H.C.



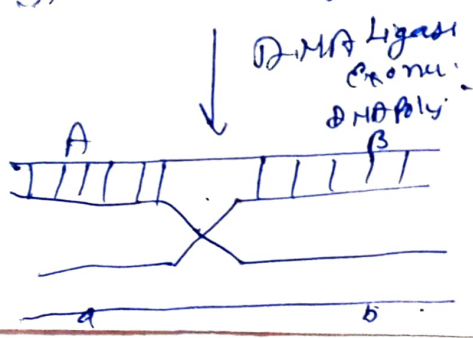
(B) - formation of ss nick
Helicase / ss BP



(C) - strand displacement (Reciprocal)

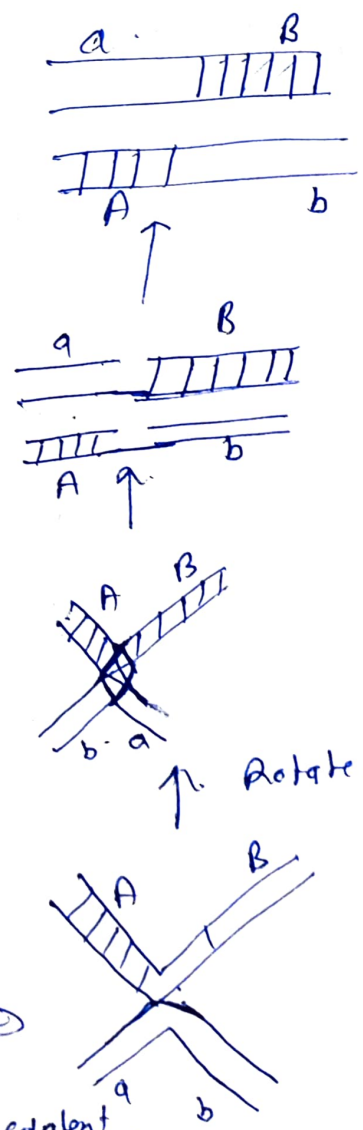


(D) - strand exchange



DNA Ligase
Exonu-
DNA Pol

(E) formation of catenant single base



Rotate 180° Lower End

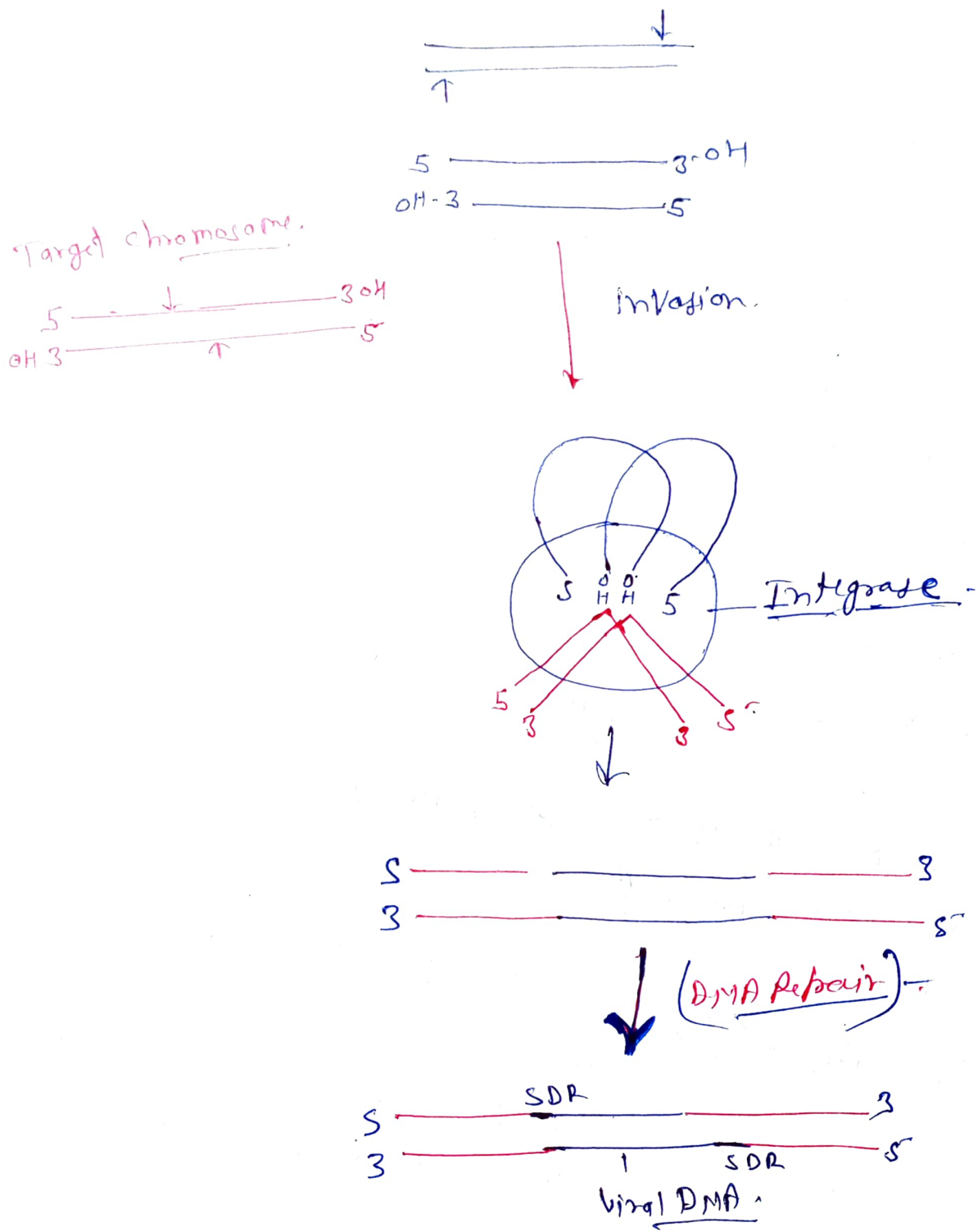


Fig. Mechanism of transpositional Site-Specific recombination
SDR (short Direct Repeat) of target DNA
Sequence.