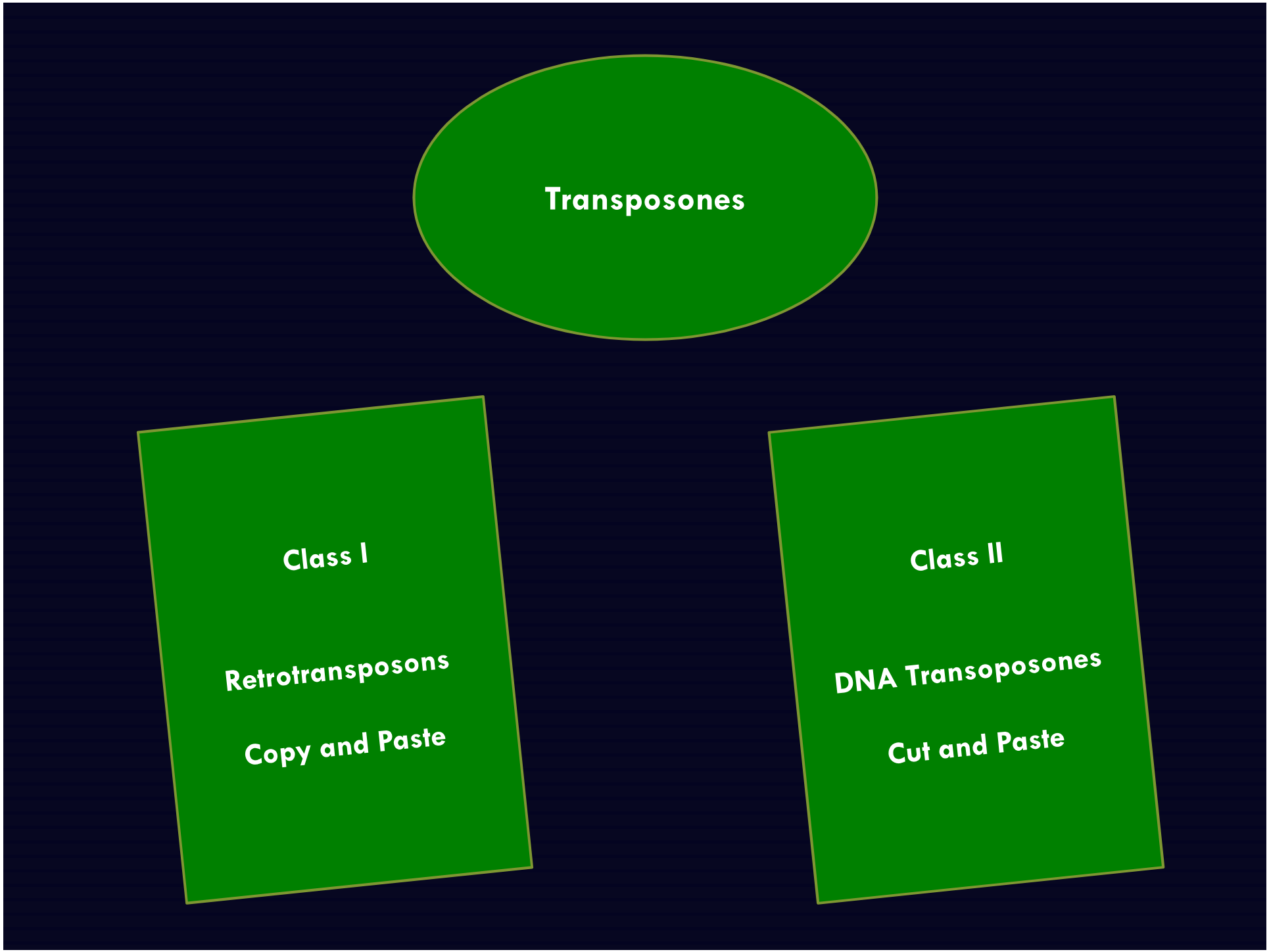
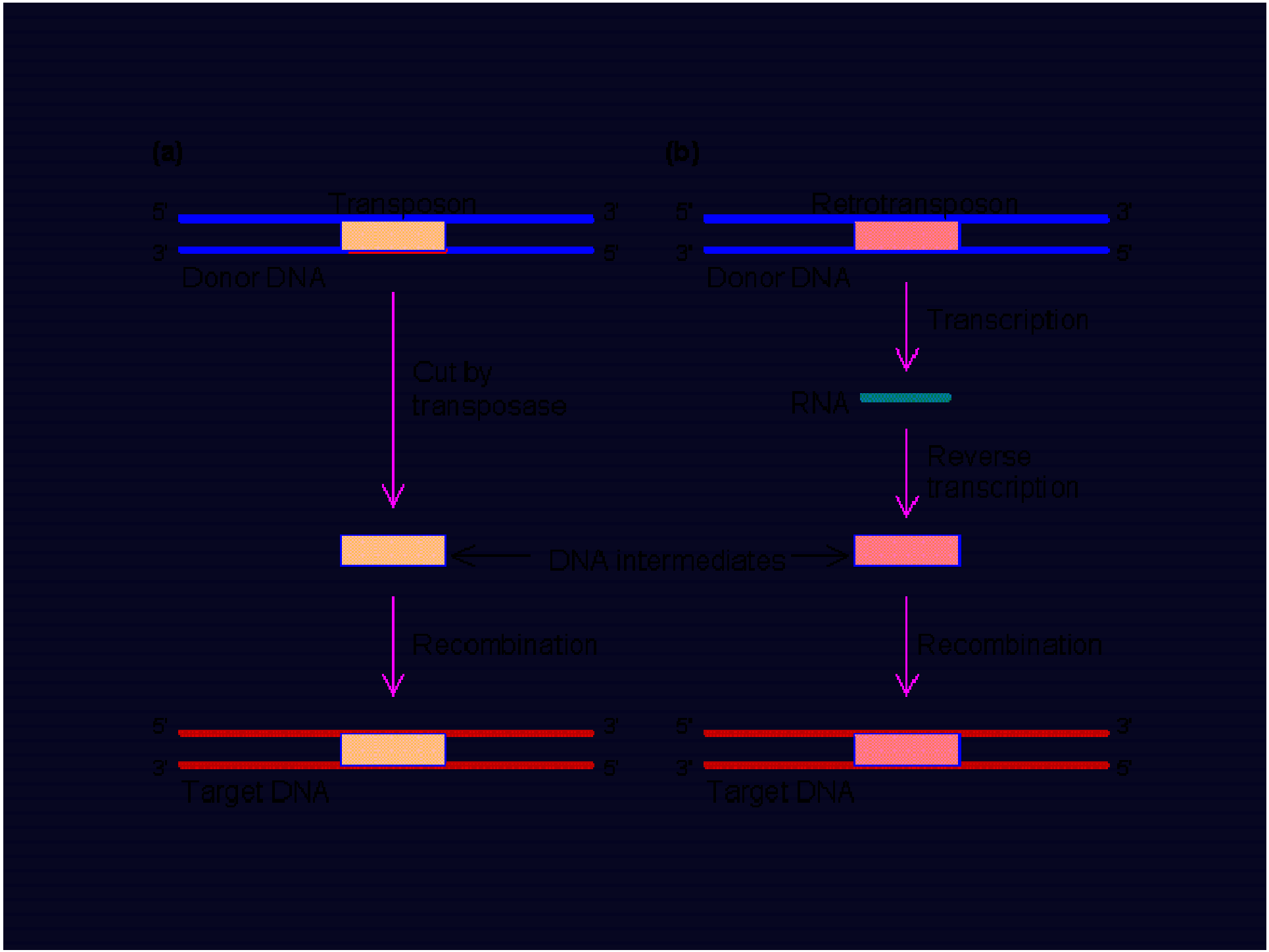
TRANSPOSONS

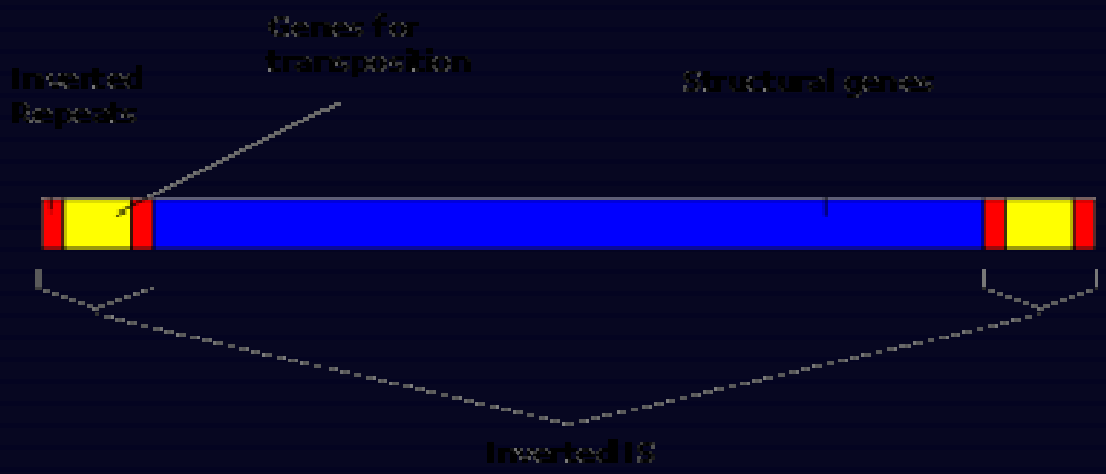
By
PRAMOD KUMAR MAHISH
Asst. Professor (Biotechnology)
Govt. Digvijay PG College Rajnandgaon (C.G.)
pramod.mahish@rediffmail.com

What are Transposons?

- A transposable element (TE) is a DNA sequence that can change its position within the genome.
- The first TEs were discovered in maize (*Zea mays*), *by Barbara McClintock in 1948, for which she was* awarded a Nobel Prize in 1983.
- She noticed insertions, deletions, and translocations, caused by these elements. These changes in the genome could, for example, lead to a change in the color of corn kernels.

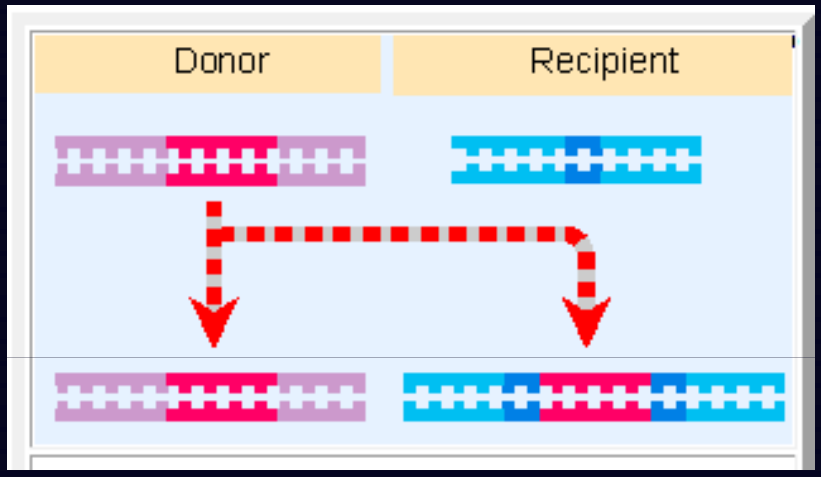

Transposones
Class I
Retrotransposons
Copy and Paste
Class II
DNA Transoposones
Cut and Paste

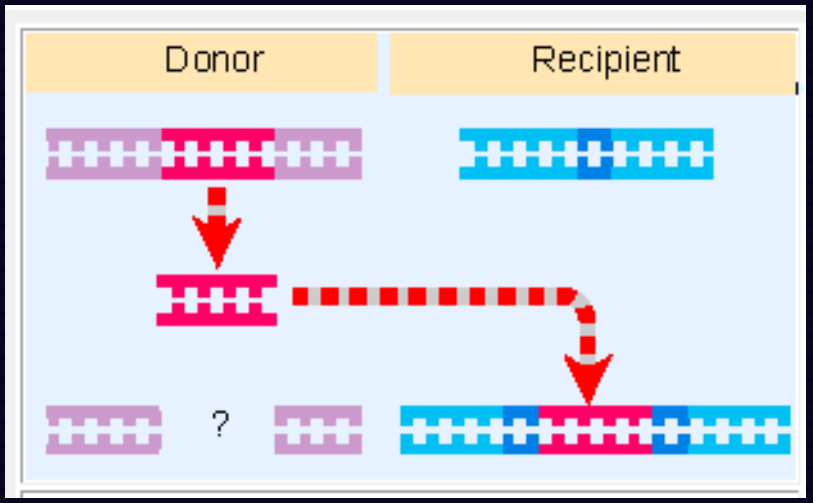

(a)
5'
Transposon
3'
3'
5'
Donor DNA
Cut by
transposase
Recombination
5'
3'
3'
5'
Target DNA
(b)
5'
Retrotransposon
3'
3'
5'
Donor DNA
Transcription
RNA
Reverse
transcription
DNA intermediates
Recombination
5'
3'
3'
5'
Target DNA


Genes for
transposition
Inserted
Repeats
Structural genes
Inverted IS

Transposition

- Replicative Transposition
- Non Replicative transposition





Retrotransposons

- They copy themselves in two stages, first from DNA to RNA by transcription, then from RNA back to DNA by reverse transcription.

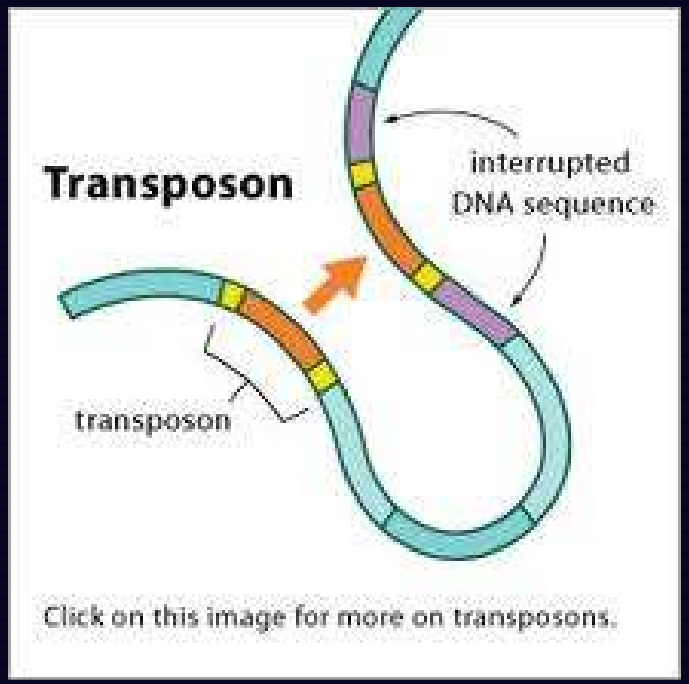
- The DNA copy is then inserted into the genome in a new position. Reverse transcription is catalyzed by a reverse transcriptase, which is often coded by the TE itself

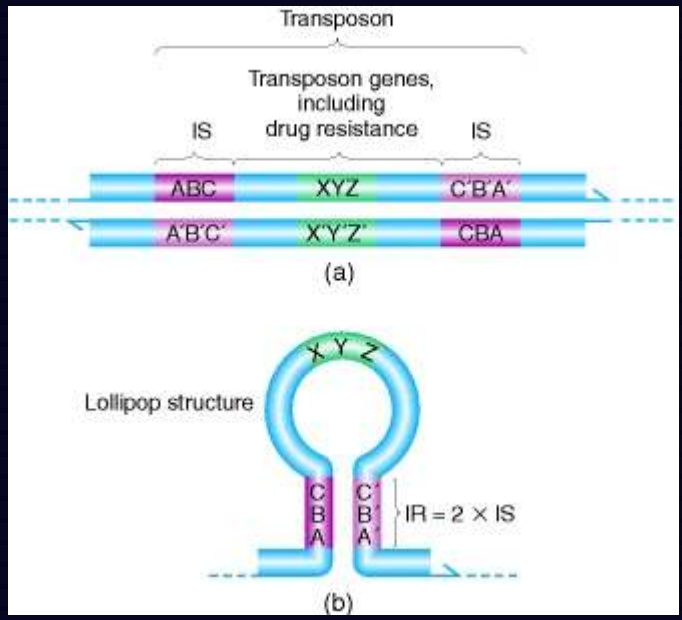
Types of Retrotransposons

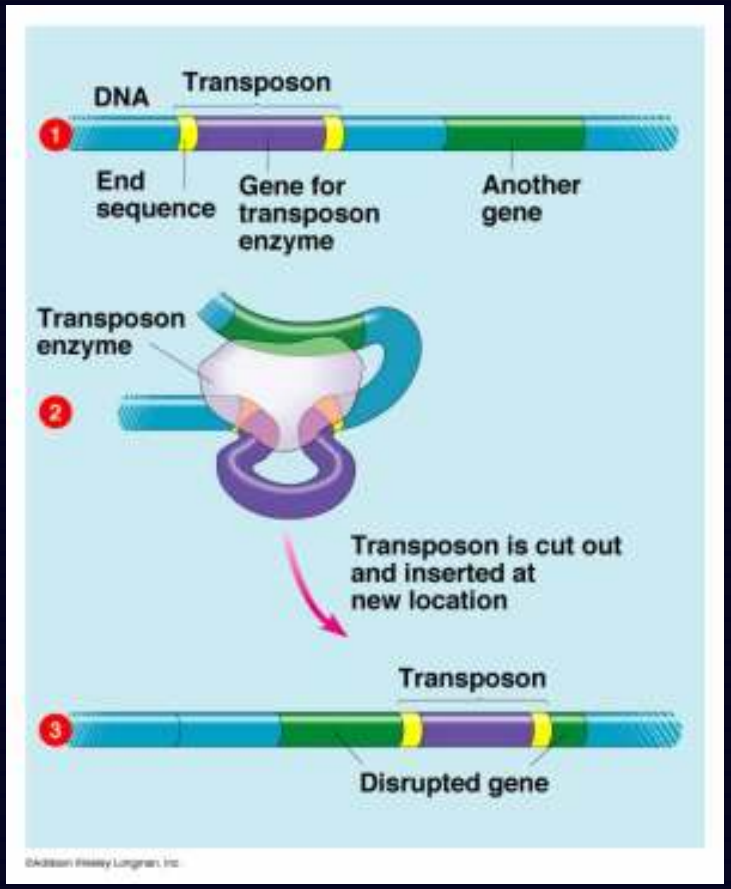
- Long terminal repeats (LTRs)
- Long interspersed elements (LINEs)
- Short interspersed elements (SINEs).

Mechanism of transposition

- The transpositions are catalyzed by various types of transposase enzymes.
- Transposase makes a cut at the target site producing sticky ends.
- Transposition takes plce from origin site to target site.
- A DNA polymerase fills in the resulting gaps from the sticky ends and DNA ligase closes the sugar-phosphate backbone.


Transposon
interrupted
DNA sequence
transposon
Click on this image for more on transposons.


Transposon
Transposon genes,
including
drug resistance
IS
IS
ABC
XYZ
C′B′A′
A′B′C′
X′Y′Z′
CBA
(a)
Lollipop structure
X Y Z
C B A
C B A
IR = 2 × IS
(b)


DNA
Transposon
1
End
sequence
Gene for
transposon
enzyme
Another
gene
Transposon
enzyme
2
Transposon is cut out
and inserted at
new location
Transposon
3
Disrupted gene

Applications

- Evolution
- Translocation of Mutant gene
- Translocation of cancer gene


Thankyou