

R-DNA TECHNOLOGY TOOLKIT

The Molecular Workbench for Genetic Engineering



RESTRICTION ENZYMES

Isolate the gene of interest.



POLYMERASE ENZYMES

Amplify the DNA to workable quantities.



LIGASES

Paste the gene into a delivery system.



VECTORS & HOST ORGANISMS

Transport and manufacture the final product.

Tool 01 | Restriction Enzymes



Primary Function

Molecular Scissors

Technical Specs

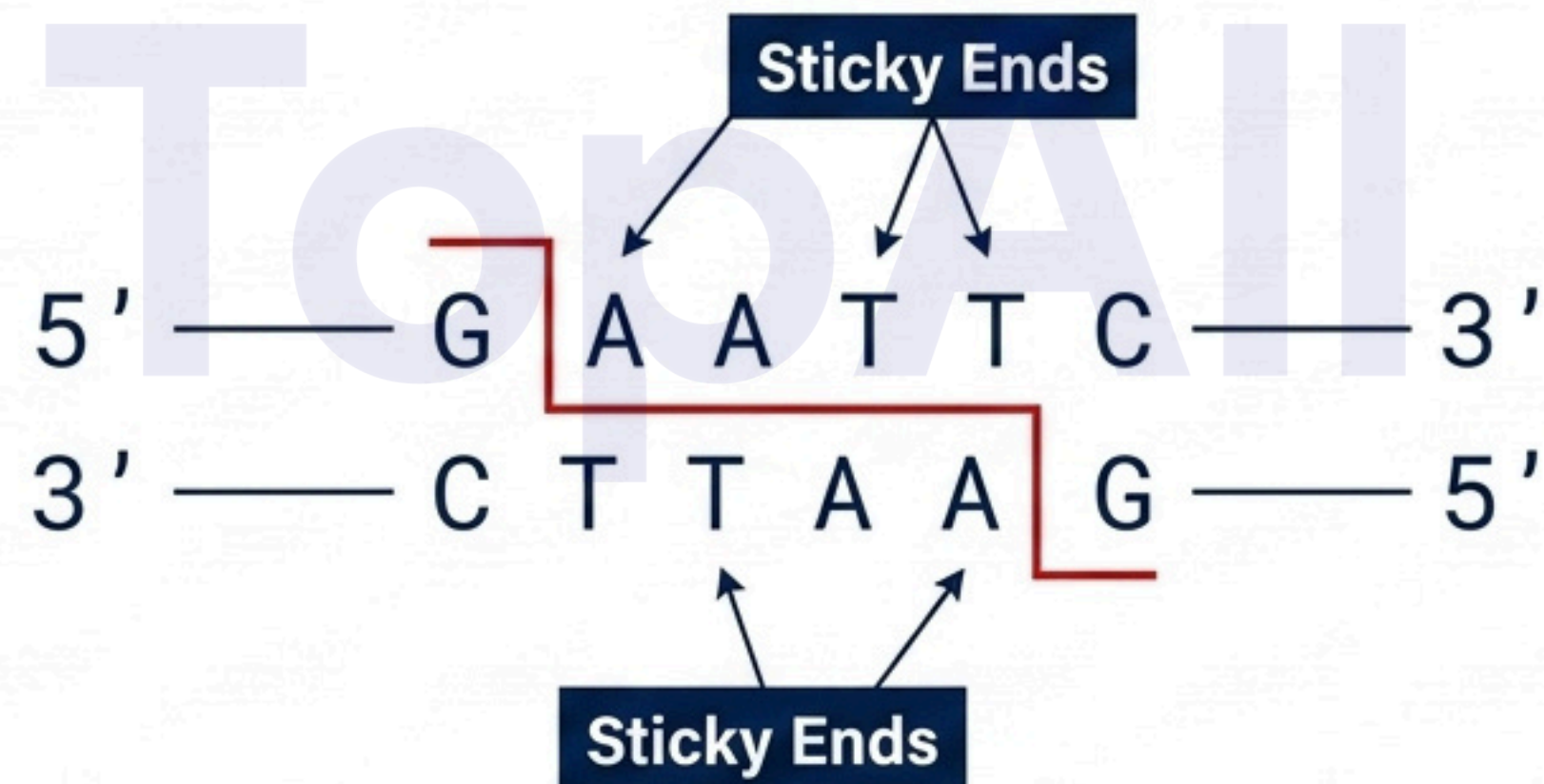
Origin Example: EcoRI (from *Escherichia coli* RY 13)

First Discovered: Hind II

Nuclease Types

Exonucleases	Cut nucleotides at the ends.
Endonucleases	Cut at specific positions within the DNA.

Scans DNA for palindromic sequences, cutting the sugar-phosphate backbone to leave overhanging "sticky ends".





You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



Turn theory into marks with **unlimited MCQs, smart analysis, and focused revision.**

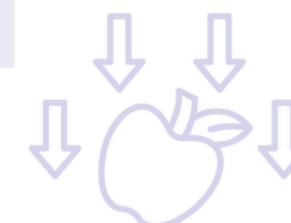
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Key Highlights

- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter



Tool 02 | Polymerase Enzymes



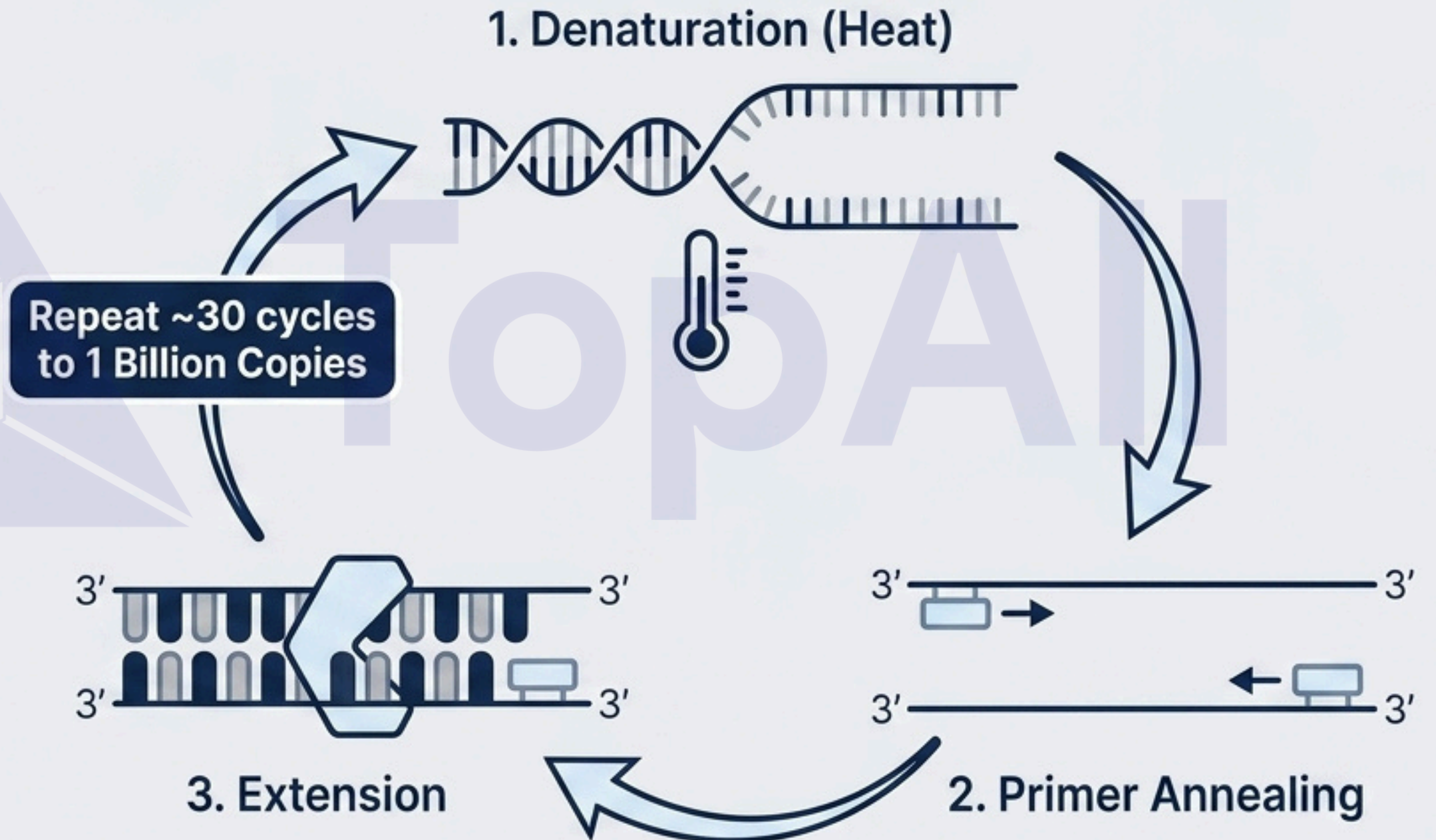
Primary Function

Molecular Photocopier
(Amplification)

Technical Specs

- Key Enzyme: Taq Polymerase
- Source: *Thermus aquaticus* (heat-resistant bacterium)
- Output: ~1 billion copies from a single segment

PCR Flow



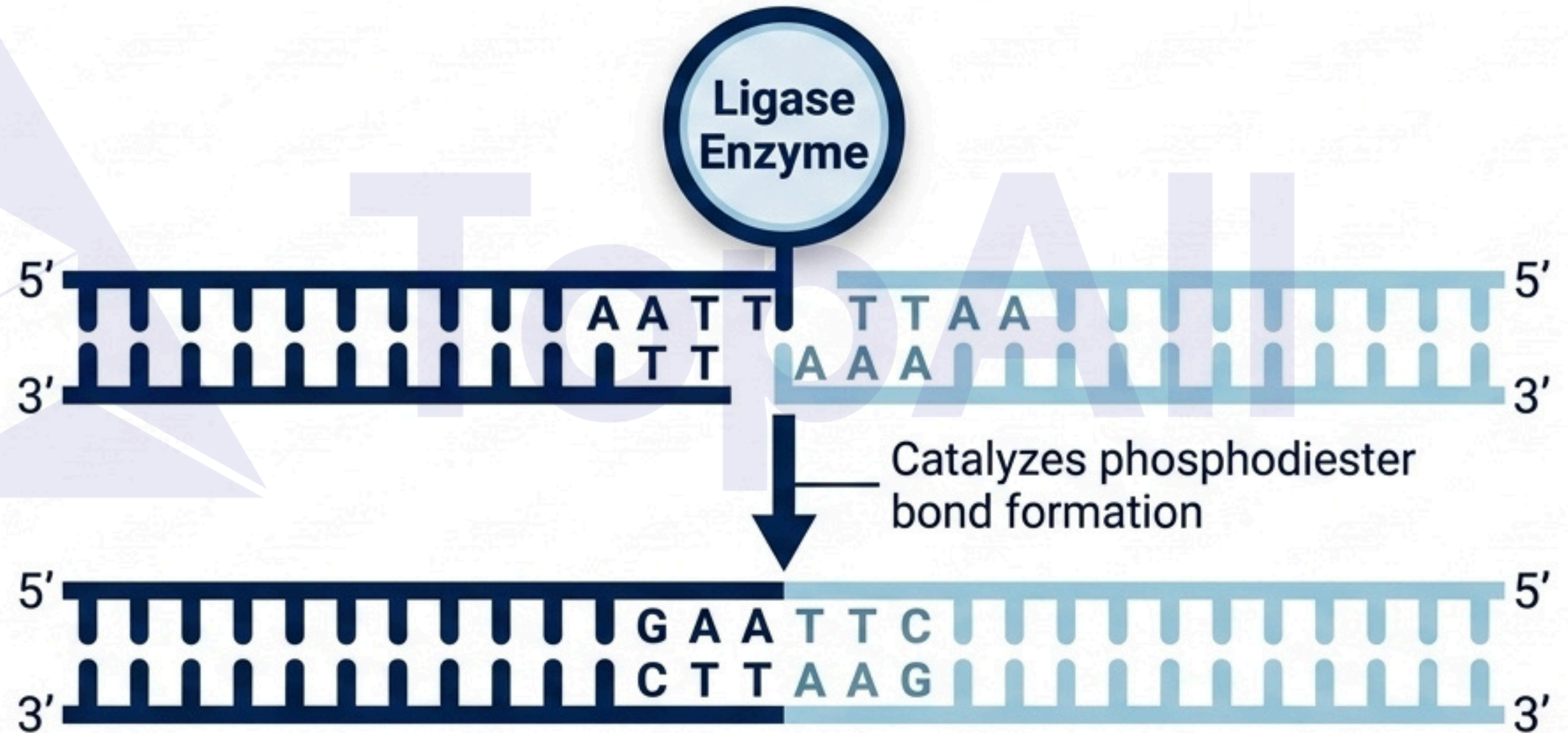
Tool 03 | Ligases



Primary Function
Molecular Glue

Output
in vitro Recombinant
DNA (rDNA)

Capitalizes on hydrogen bonding between complementary sticky ends, permanently sealing the sugar-phosphate backbones.



Recombinant DNA Molecule

Tools 04 & 05 | Vectors + Host Organism

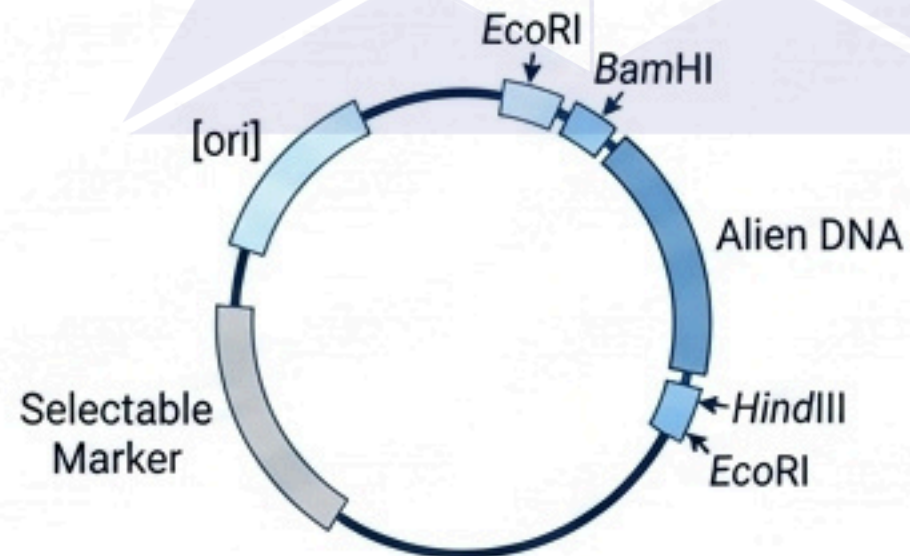


Vectors

Ferries alien DNA into the host

Mandatory Features

- ✓ **[ori] Origin of replication** (controls copy number)
- ✓ **Selectable Markers** (e.g., *ampR*, *tetR* to identify transformants)
- ✓ **Cloning Sites** (recognition sites for restriction enzymes)



Examples: Plasmid pBR322, *Agrobacterium* Ti plasmid



Host Organisms

Takes up the vector and multiplies the recombinant protein

Mechanism of Entry (Transformation)

1. **Competency:** Treat cells with divalent cations (Calcium).
2. **Heat Shock:** Incubate on ice → 42°C → back to ice (forces DNA through cell wall pores).

Alternative Delivery Methods:
Biolistics (Gene gun) or Micro-injection.

Example: *E. coli* cultivated in large-scale Bioreactors



You've Learned the Theory.

Now Let's Test It.

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Practicing MCQs gets you marks.

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