

BIOLOGY • CLASS 12

9

CHAPTER

Biotechnology – Principles and Processes

CHAPTER NOTES

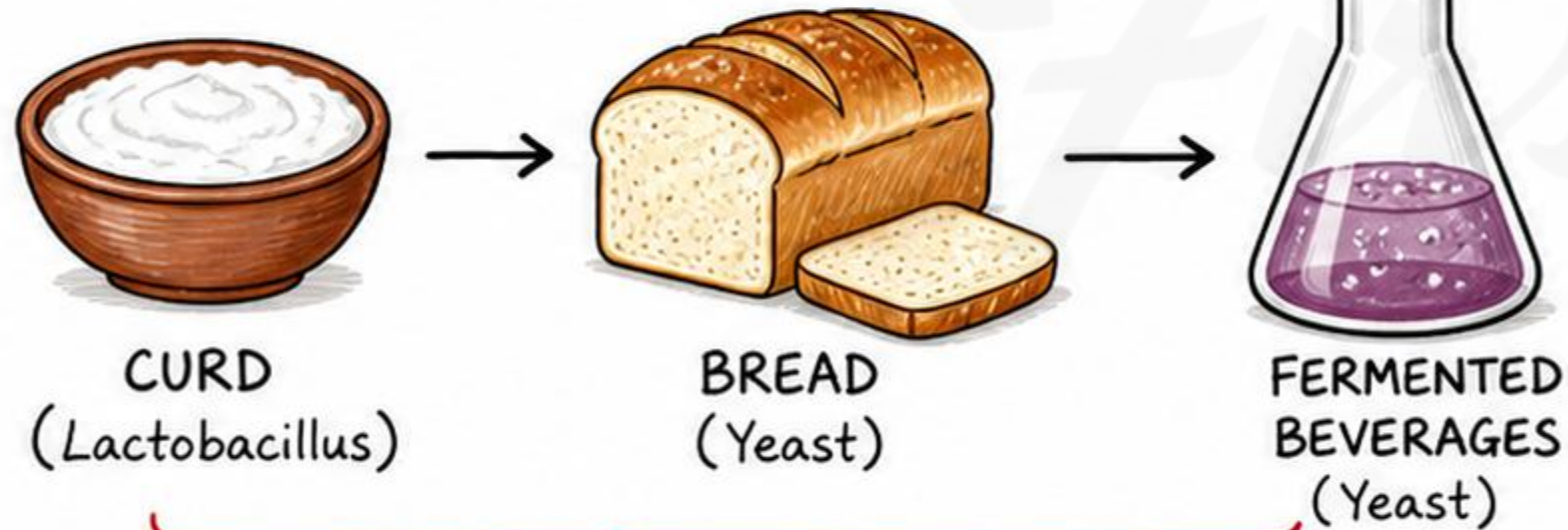


BIOTECHNOLOGY: MEANING & SCOPE

- Biotechnology uses living organisms, cells or their components to make useful products and processes.
- Traditional examples: curd, bread and fermented beverages.
- Modern biotechnology manipulates DNA and grows engineered cells under controlled conditions.

TRADITIONAL BIOTECHNOLOGY

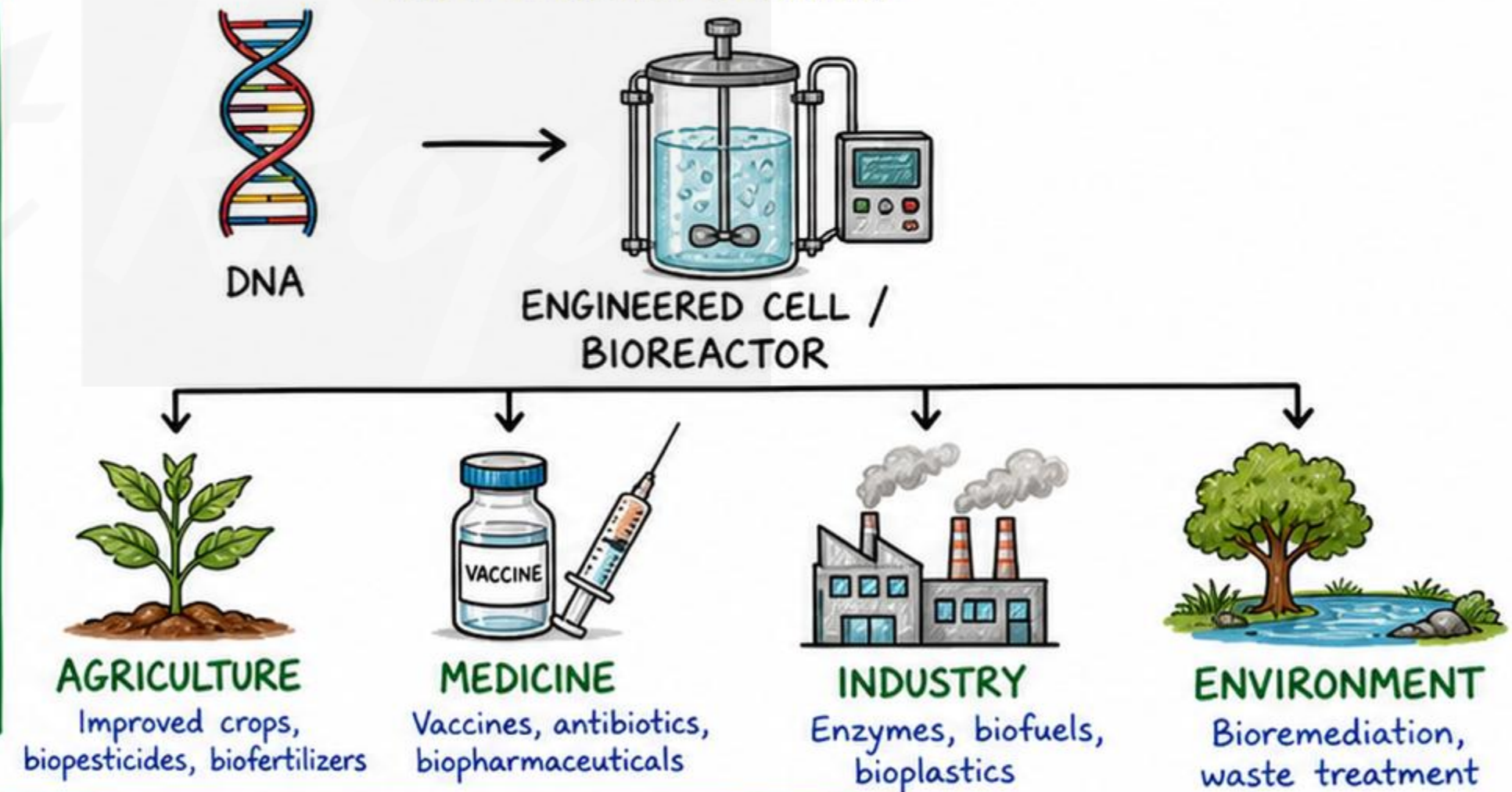
Uses natural microorganisms and simple processes like fermentation.



Made by fermentation using beneficial microorganisms.

MODERN BIOTECHNOLOGY

Manipulates DNA and grows engineered cells under controlled conditions.

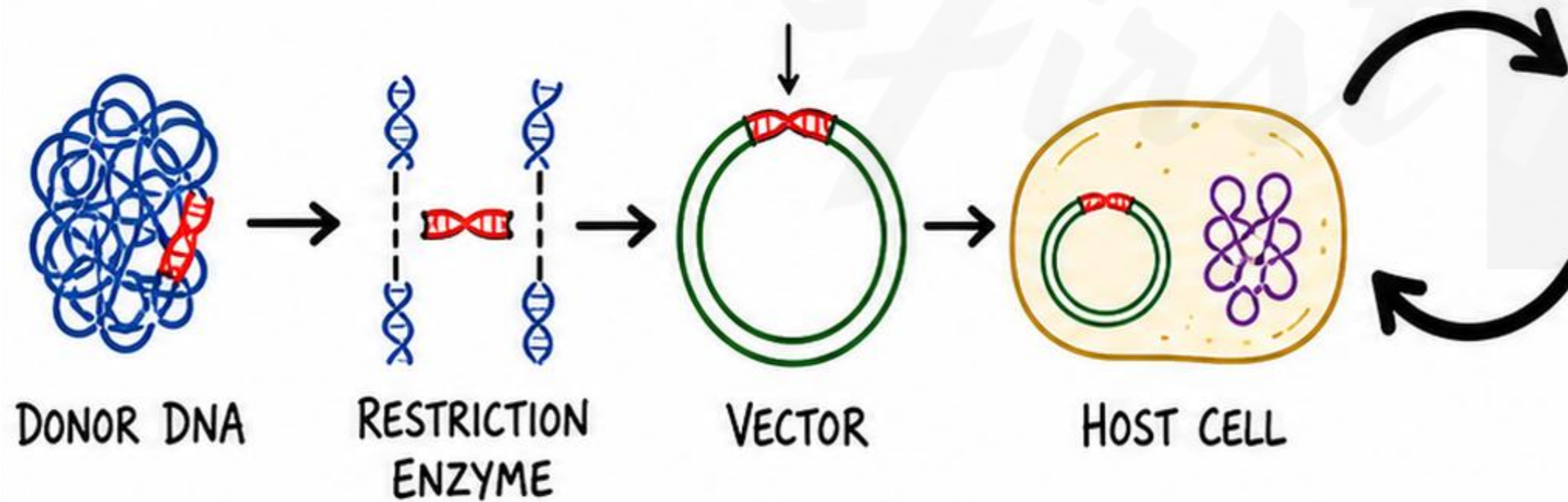


BIOTECHNOLOGY = use of living systems or their components to make useful products and processes.

CORE TECHNIQUES OF MODERN BIOTECHNOLOGY

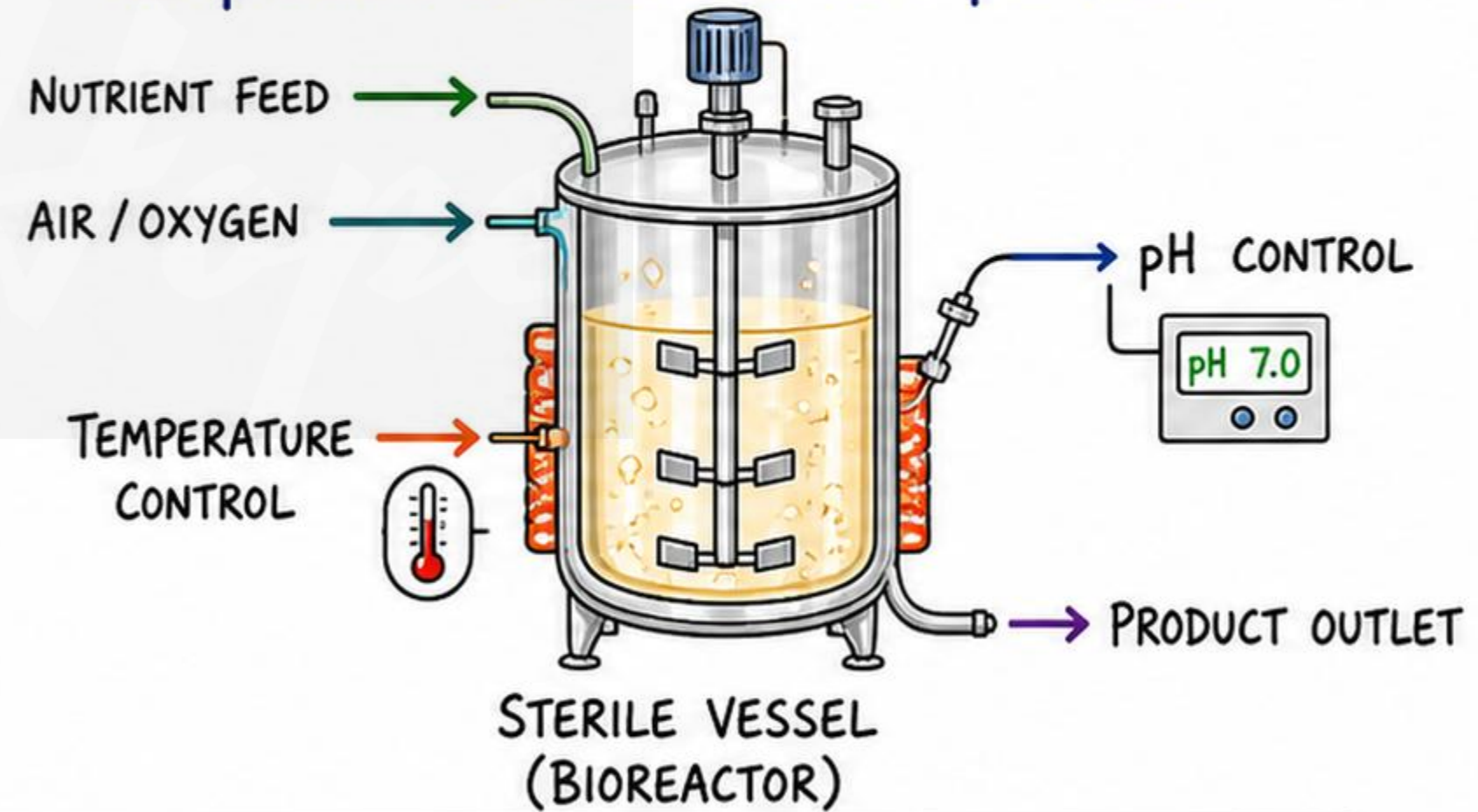
1. GENETIC ENGINEERING

- DNA is cut, joined and introduced into a host to change its genetic material.
- A chosen gene can be cloned or expressed as a useful product.



2. BIOPROCESS ENGINEERING

- Only the desired microbe or cell is grown under sterile conditions.
- Temperature, pH, oxygen and nutrients are controlled at large scale.
- The product is recovered and purified.



GENETIC ENGINEERING
makes the desired organism

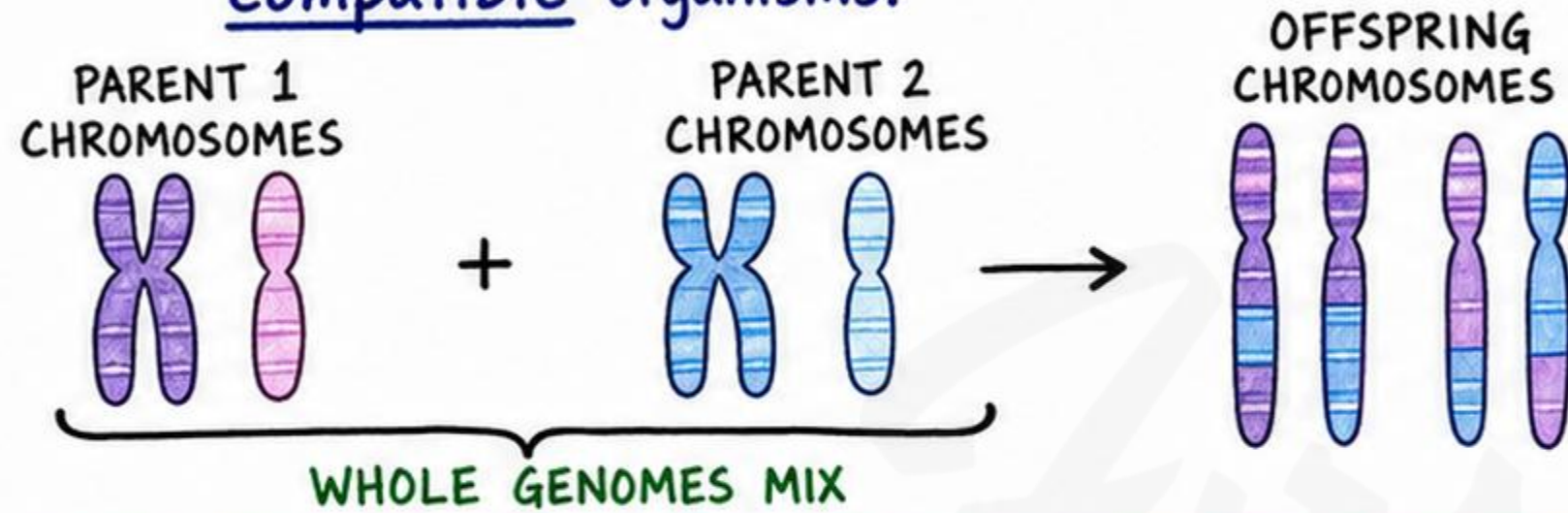


BIOPROCESS ENGINEERING
grows it and obtains the product.

WHY RECOMBINANT DNA TECHNOLOGY?

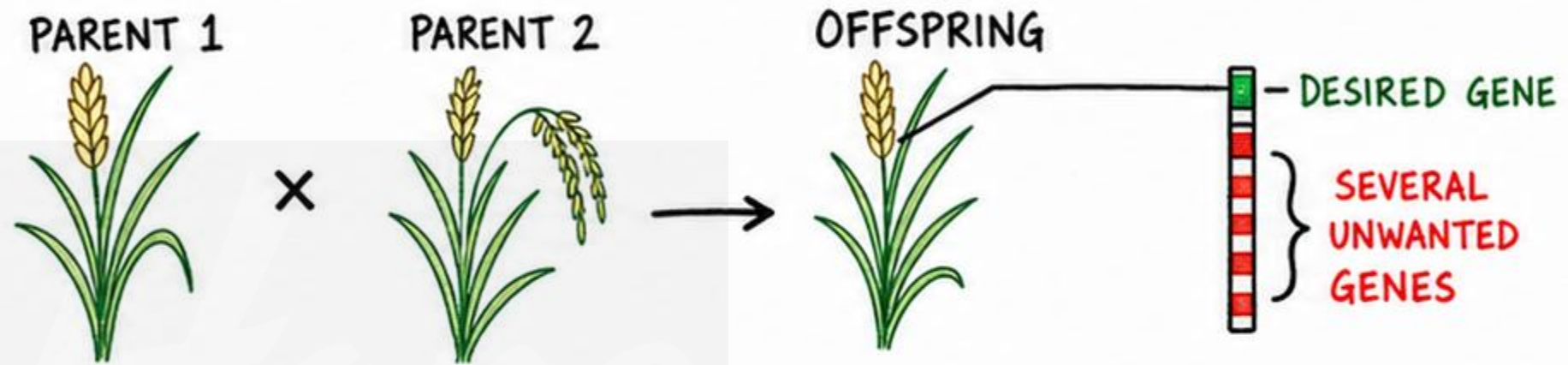
SEXUAL REPRODUCTION

- Recombines whole genomes.
- Usually works only between compatible organisms.

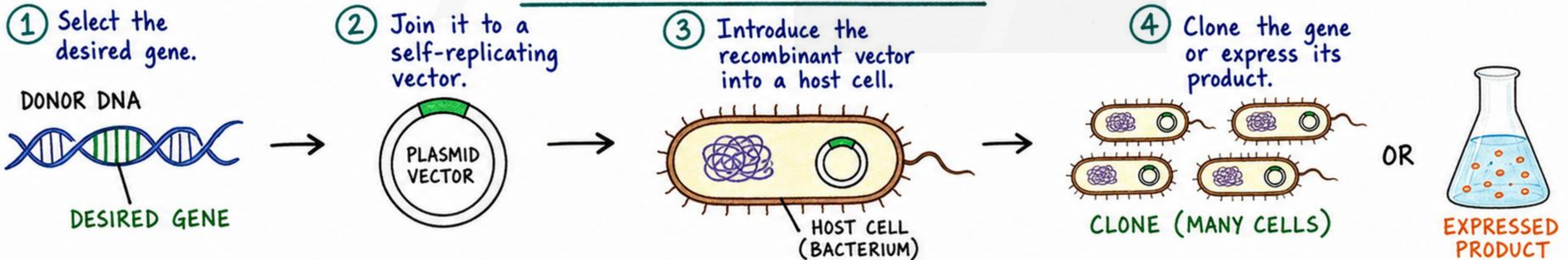


TRADITIONAL HYBRIDISATION

- It can transfer desired and unwanted genes together.
- A precise gene cannot easily be moved between unrelated species.



RECOMBINANT DNA SOLUTION

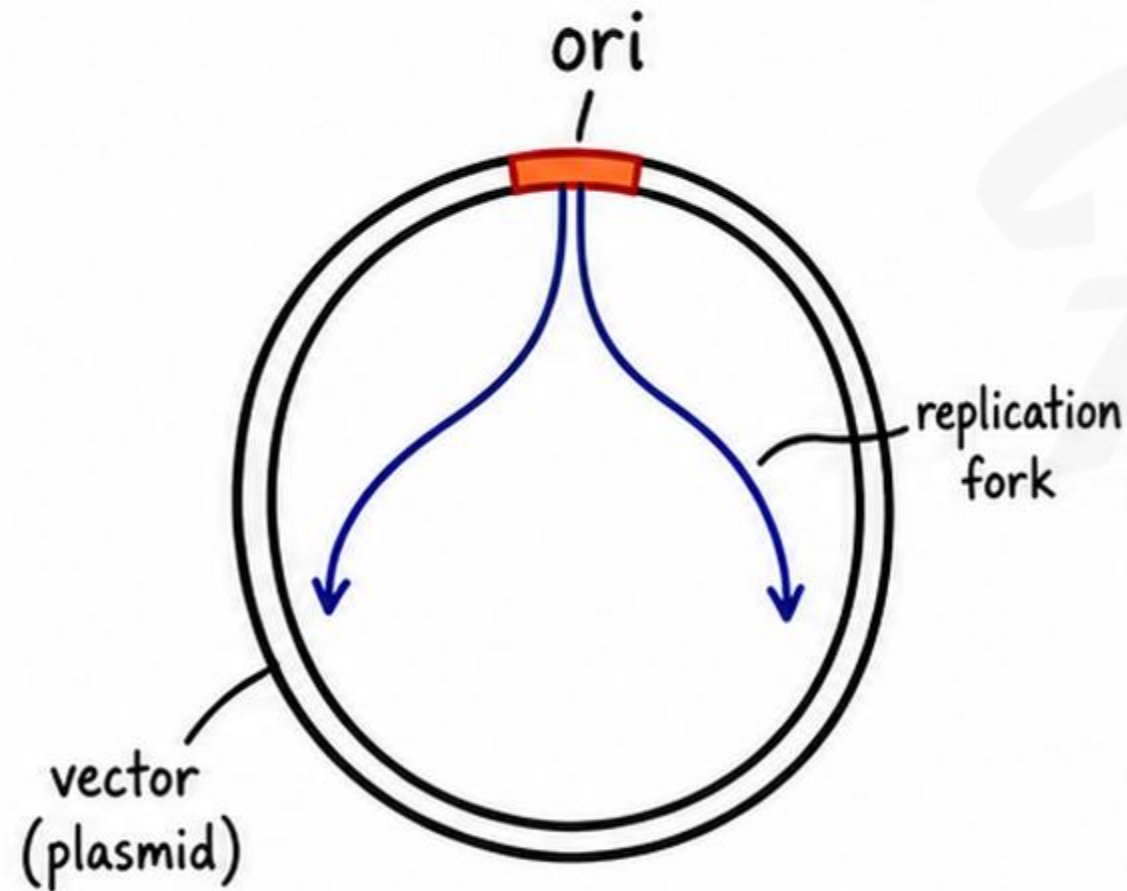


RECOMBINANT DNA TECHNOLOGY moves a selected DNA fragment precisely and allows it to be cloned or expressed.

ORIGIN OF REPLICATION & CLONING LOGIC

ORIGIN OF REPLICATION (ori)

- ori is the DNA site where replication begins.
- A vector must have an ori recognised by the host cell.

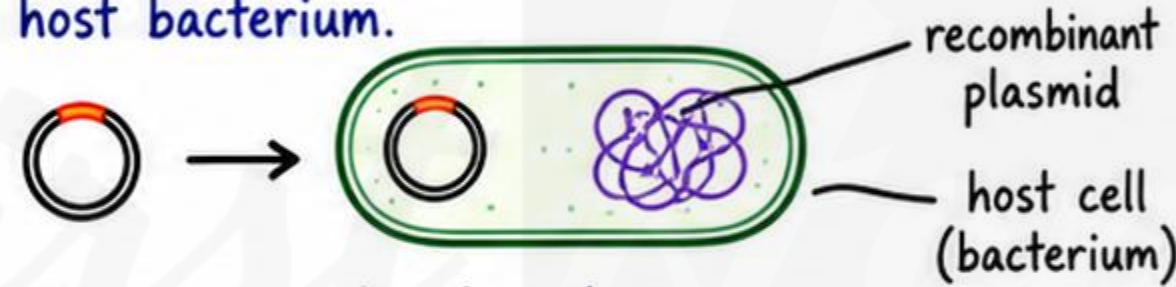


HOW CLONING WORKS

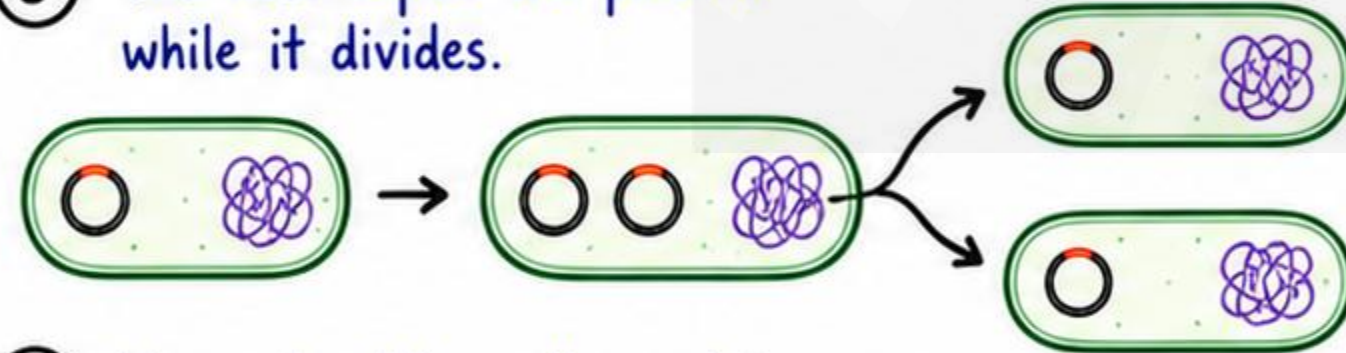
- ① Desired gene is joined to the vector.



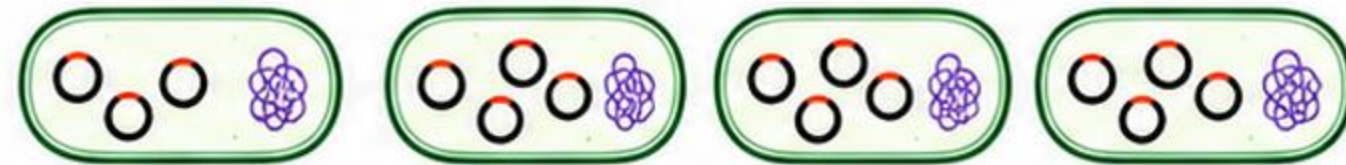
- ② Recombinant plasmid enters a host bacterium.



- ③ The host copies the plasmid while it divides.



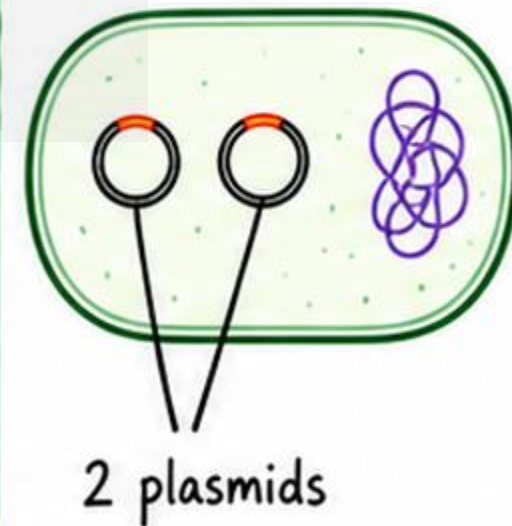
- ④ Many daughter cells contain many copies of the gene.



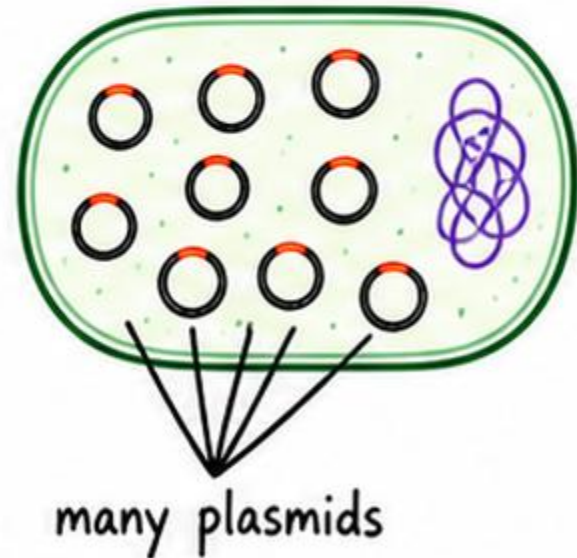
COPY NUMBER

- Copy number = number of vector molecules per host cell.
- Some plasmids stay at a few copies; others reach many copies.
- A high-copy vector can give many copies of the inserted gene.

LOW COPY NUMBER



HIGH COPY NUMBER



DNA linked to a vector is copied only when the vector can replicate in the host.



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