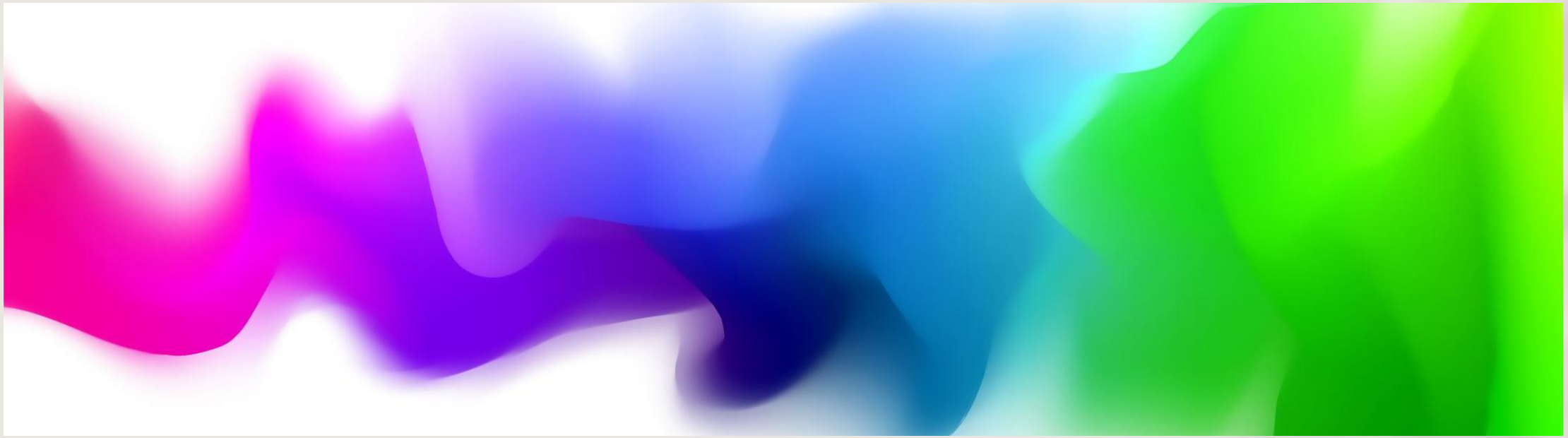

DNA Technology

Forensic Science

School Year 2023-2024

Dr. Wardisiani

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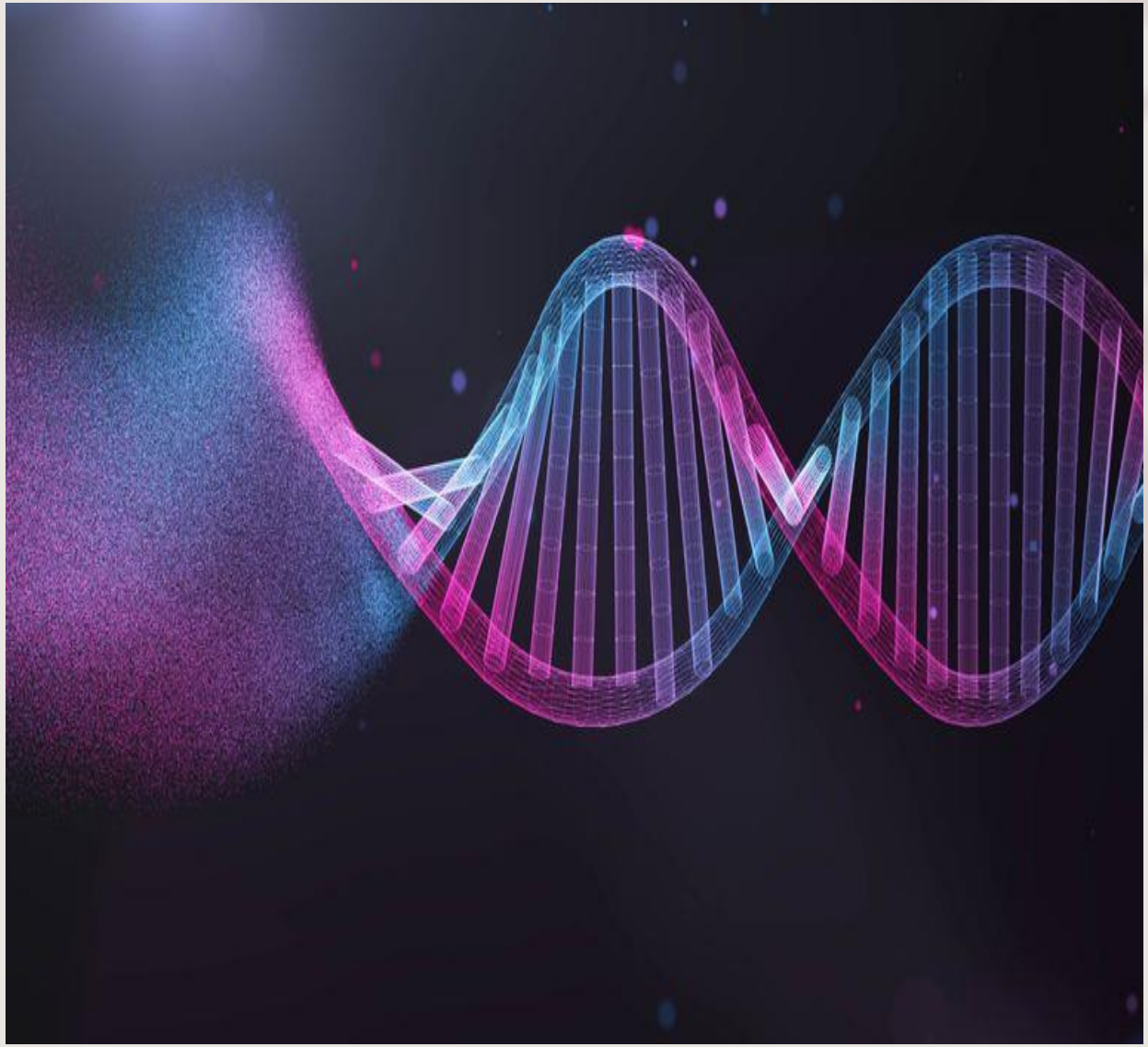
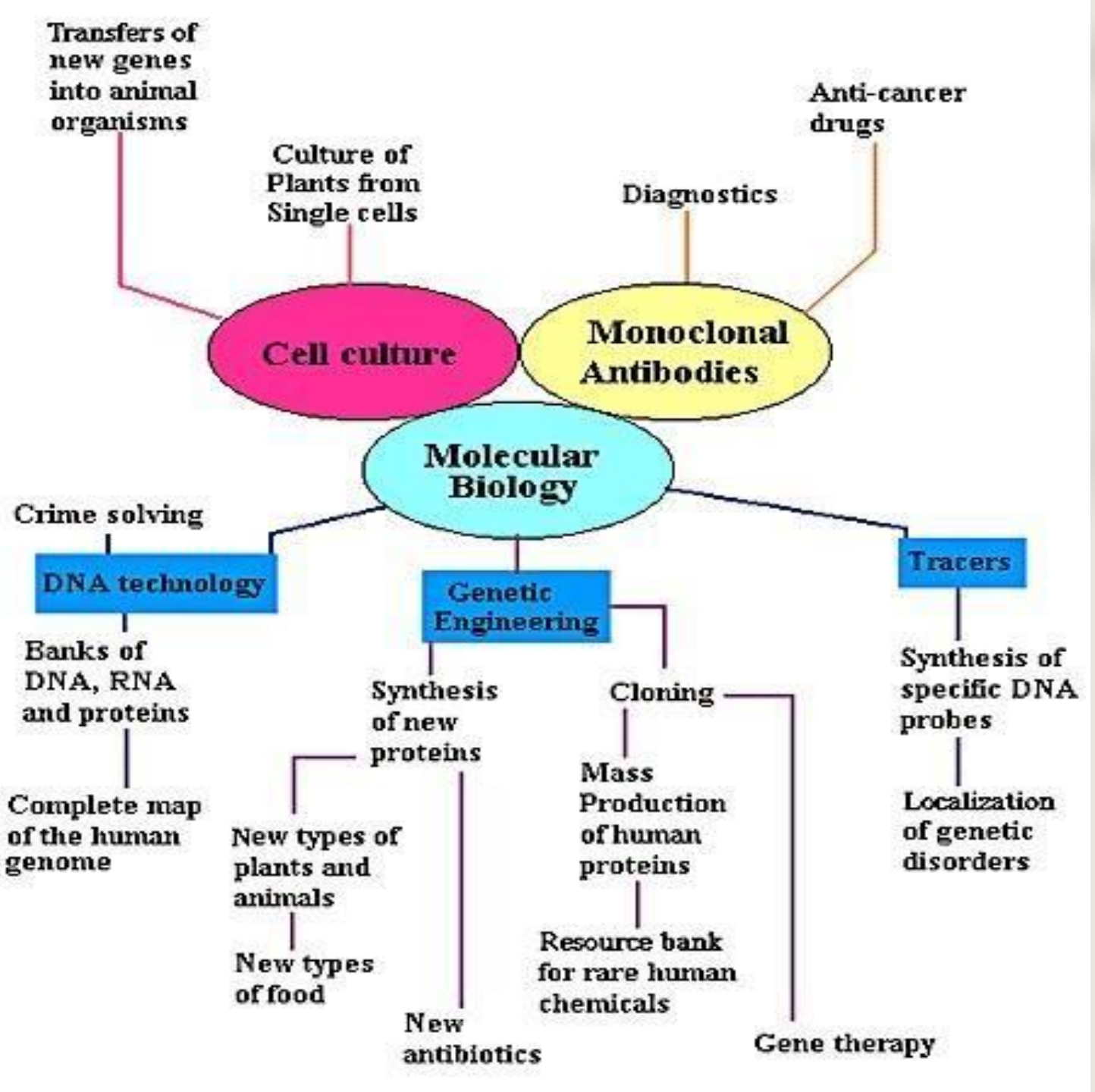
Recombination

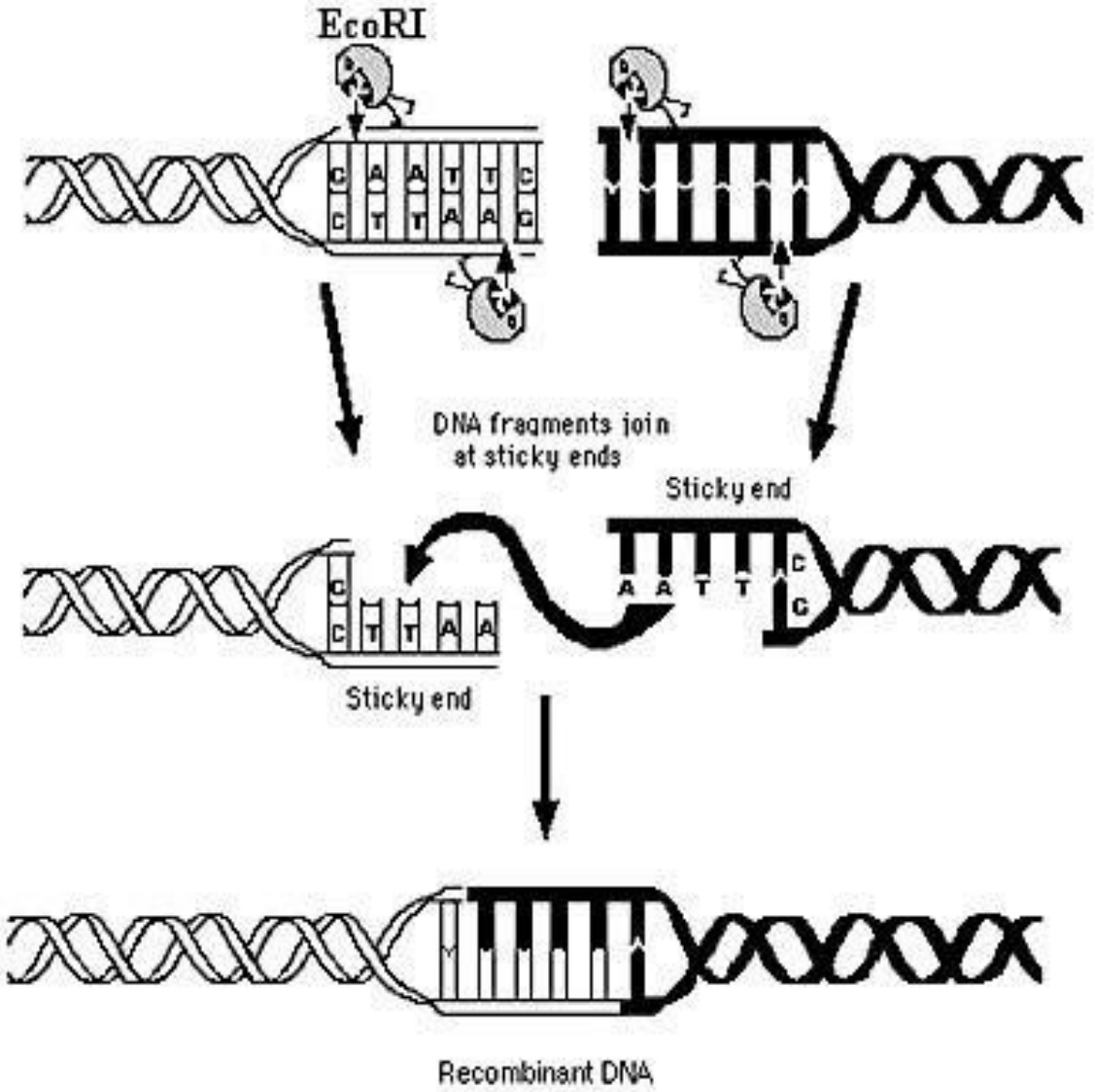
- How does this happen in nature?
- Genetic recombination
- Meiosis I
- Sexual reproduction
- One from mom, one from dad
- Bacterial Transformation
- Viral Infections
- This can be between similar species, or dissimilar species
- Recombination provides the raw material for evolution
- Changes the genetic makeup of the individuals
- Natural recombination's are random and undirected




Transfers of new genes into animal organisms
Culture of Plants from Single cells
Diagnostics
Anti-cancer drugs
Cell culture
Monoclonal Antibodies
Molecular Biology
Crime solving
DNA technology
Genetic Engineering
Tracers
Banks of DNA, RNA and proteins
Synthesis of new proteins
Cloning
Synthesis of specific DNA probes
Complete map of the human genome
New types of plants and animals
Mass Production of human proteins
Localization of genetic disorders
New types of food
Resource bank for rare human chemicals
New antibiotics
Gene therapy

Recombinant DNA Technology

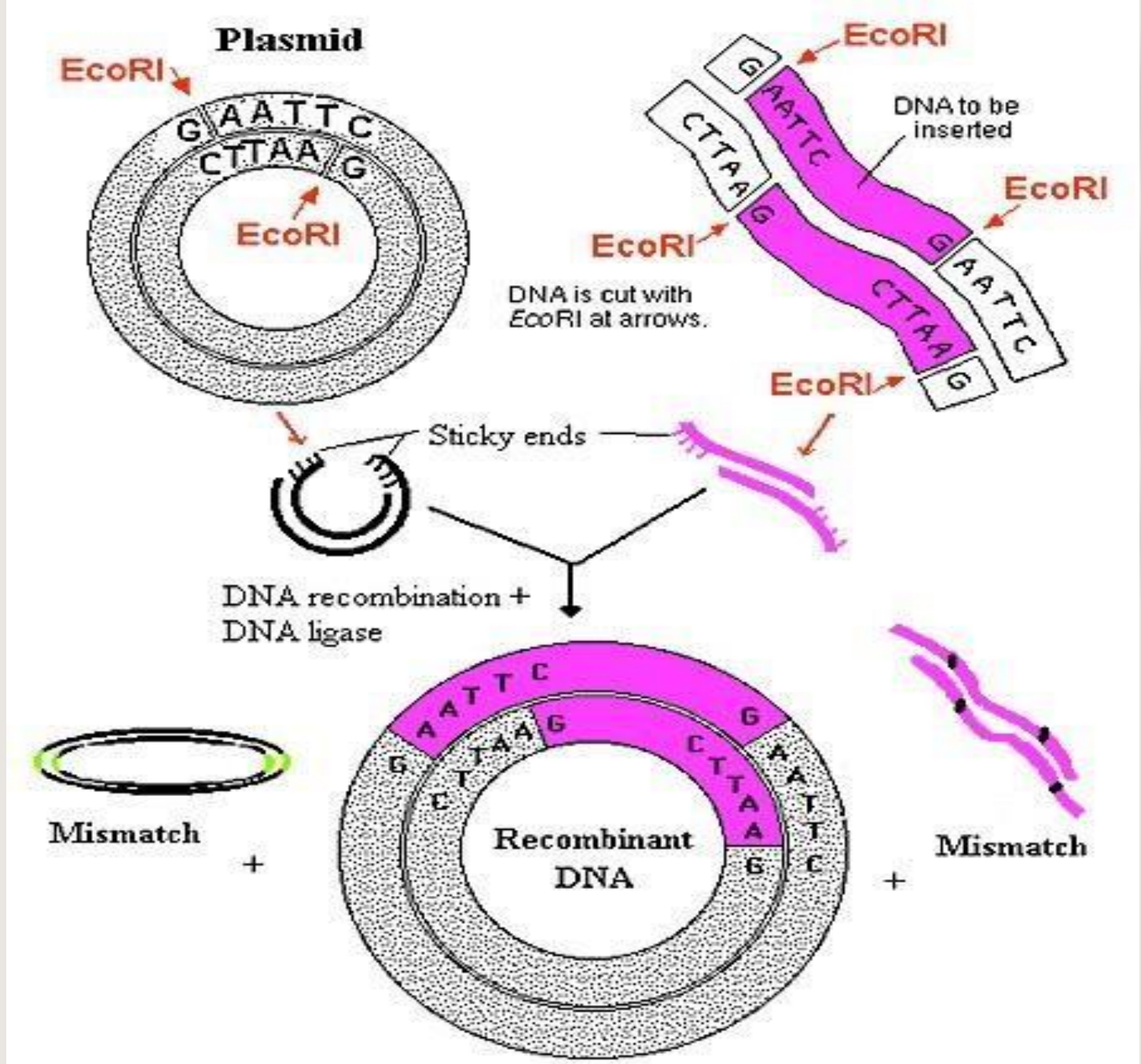
- DNA Library
- Assemblage of all the DNA of the organism
- Genes of interest are ID’d
- Produce a copy
- Insert the copy
- Restriction enzymes cut the DNA at specific nucleotide sequences
- In nature, our bodies do this cutting to foreign DNA that enters our body
- Or, we attach methyl groups that attack the invaders
- Different enzymes cut at different locations
- Eco RI cuts at GAATTC-CTTAAG segments
- When it cuts, it produces “sticky” ends



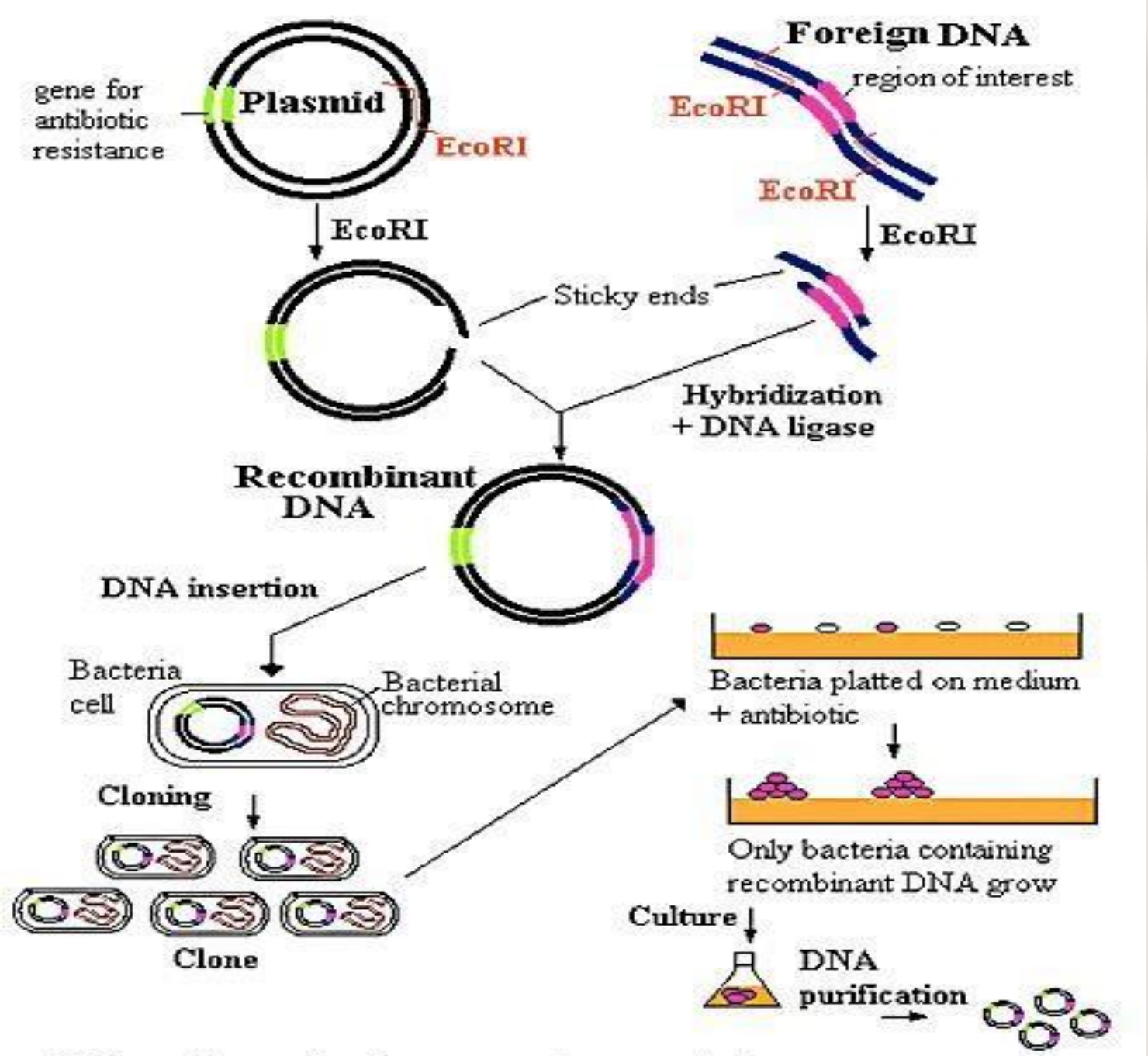
Restriction Enzyme
Action of EcoRI

What Happens Next

- Any new segment can now be added
- We need to attach the sticky ends to the new piece and then it will be glued right into place
- Now, it is incorporated into the host genome
- Gene probes look for specific plasmids bearing the desired gene
- DNA sequences can be amplified



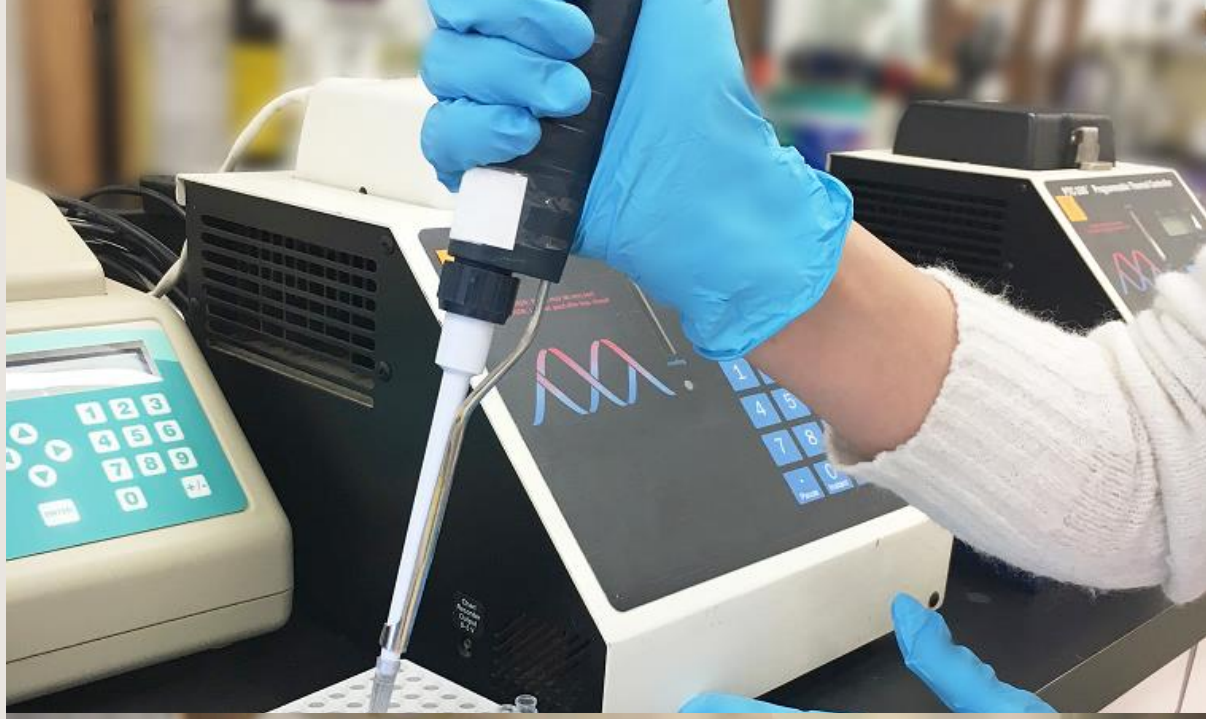
Inserting a DNA Sample into a Plasmid



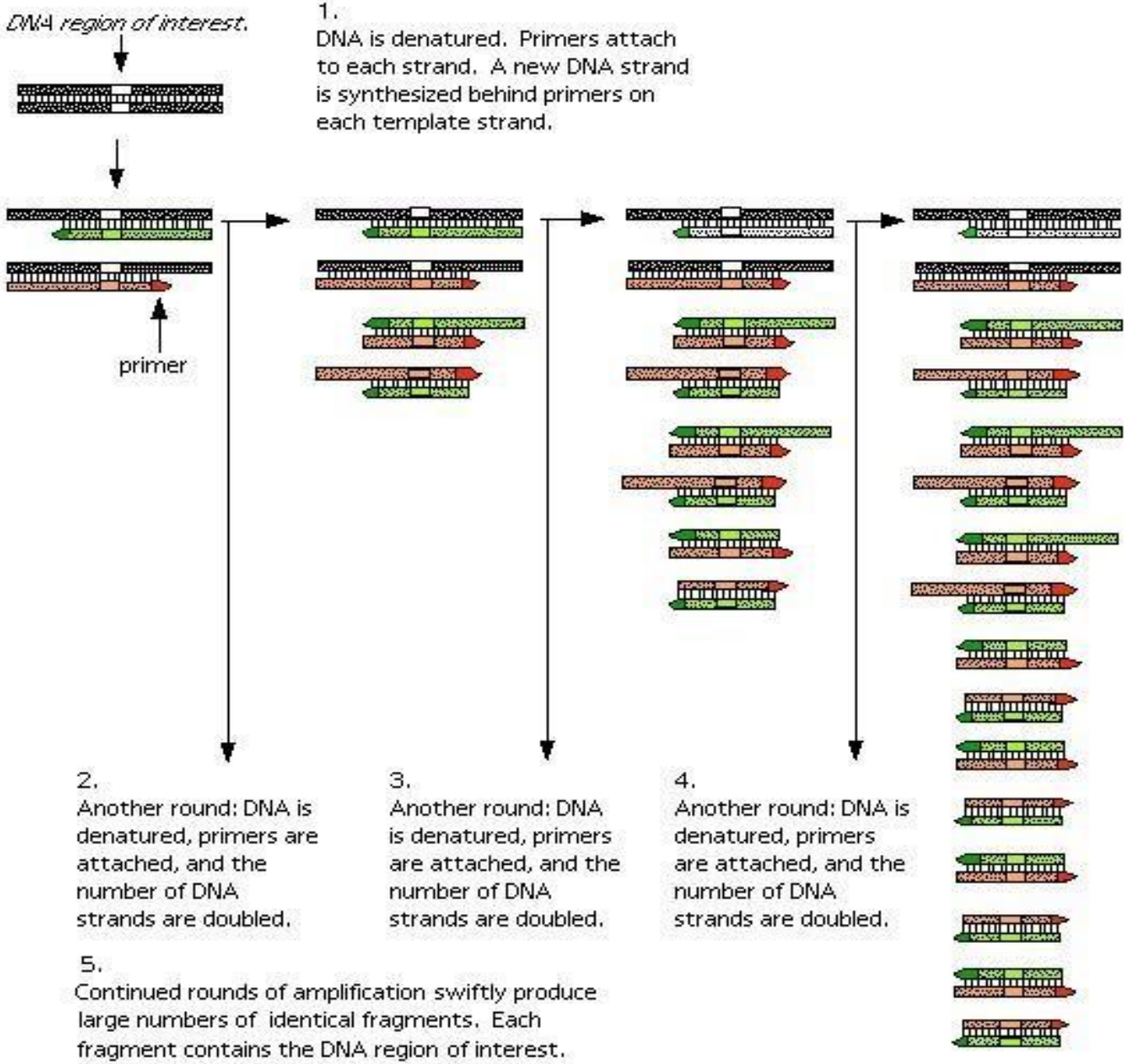
Cloning into a plasmid

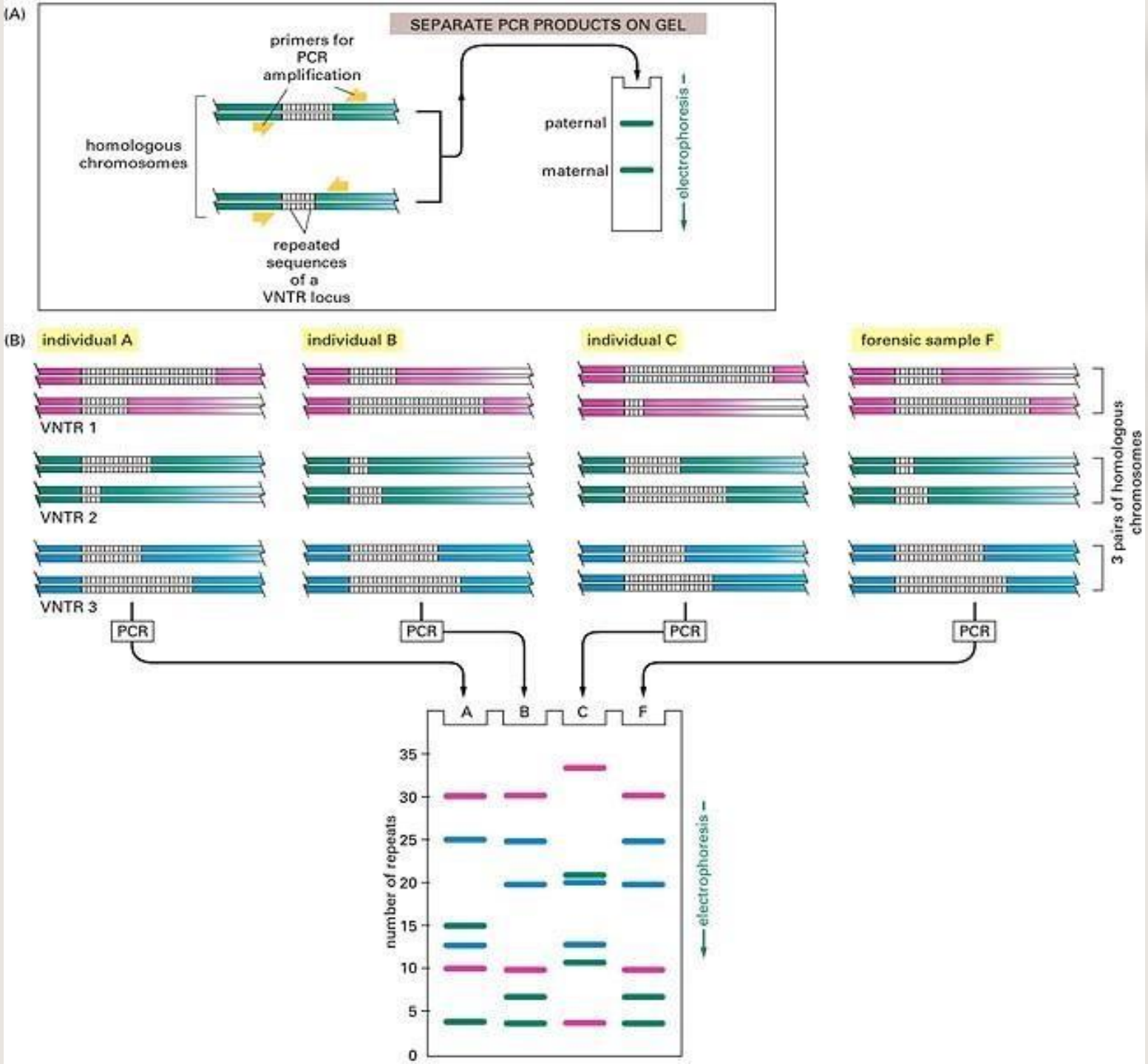
Polymerase Chain Reaction

- Makes millions of copies very quickly
- Restriction enzymes can be used to provide markers for the chromosome
- These are called RFLP’s
- Restriction Fragment Length Polymorphisms
- These can also be used to locate a gene
- Really, this is nothing more than how many times can we cut the DNA



POLYMERASE CHAIN REACTION




(A)
SEPARATE PCR PRODUCTS ON GEL
primers for PCR amplification
homologous chromosomes
repeated sequences of a VNTR locus
paternal
maternal
electrophoresis
(B)
individual A
individual B
individual C
forensic sample F
VNTR 1
VNTR 2
VNTR 3
3 pairs of homologous chromosomes
PCR
A
B
C
F
number of repeats
35
30
25
20
15
10
5
0
electrophoresis

Thank You
For Your Attention!

Questions and Comments