

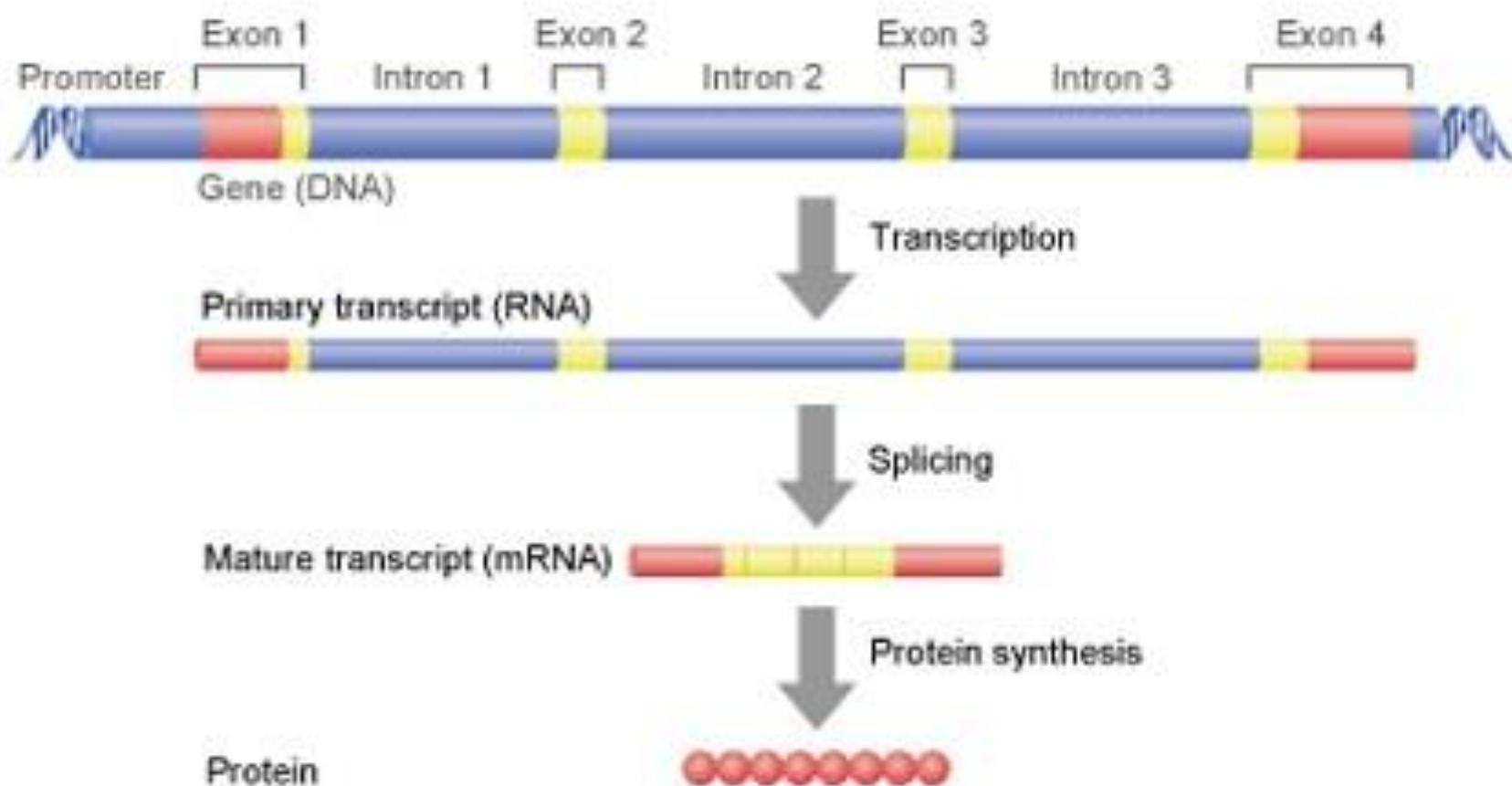
Microbial Genetics

- **Principles:**
- Gene function is the basis of cell functions
- Microorganisms provide simple systems for studying genetic phenomena
- Microorganisms are used for isolation and duplication of specific genes from other organisms by molecular cloning
- Microorganisms produce valuable substances such as antibiotics, vitamins, hormones etc., and can be used for large scale industrial processes
- Genes of higher organisms can be transferred to microorganisms by cloning and can be used for study and industrial processes
- Disease causing mechanisms can be studied and prevention measures can be arrived at.

Glossary

1. **Strain or clone:** A clone is a population of cells that are genetically ideal pure culture.
2. **Genome :** All the genes present in a cell.
3. **Phenotype:** Collection of characteristics that are observable.
4. **Genotype:** Specific set of genes it possess.
5. **Gene:** A gene is a nucleotide sequence that code for a polypeptide, tRNA or rRNA. Most bacterial genes have at least four major parts promoters, leaders, coding regions and trailers.
6. **Genetic recombination:** Two separate genomes are brought together in one unit.
7. **Mutation:** Inherited change in the base sequence of nucleic acid.

Structure of a Gene



Genetic recombination or Gene Transfer in Bacteria

Transformation – Transfer of bacterial genes involving free DNA

Transduction – Transfer of host genes from one cell to another mediated by a virus

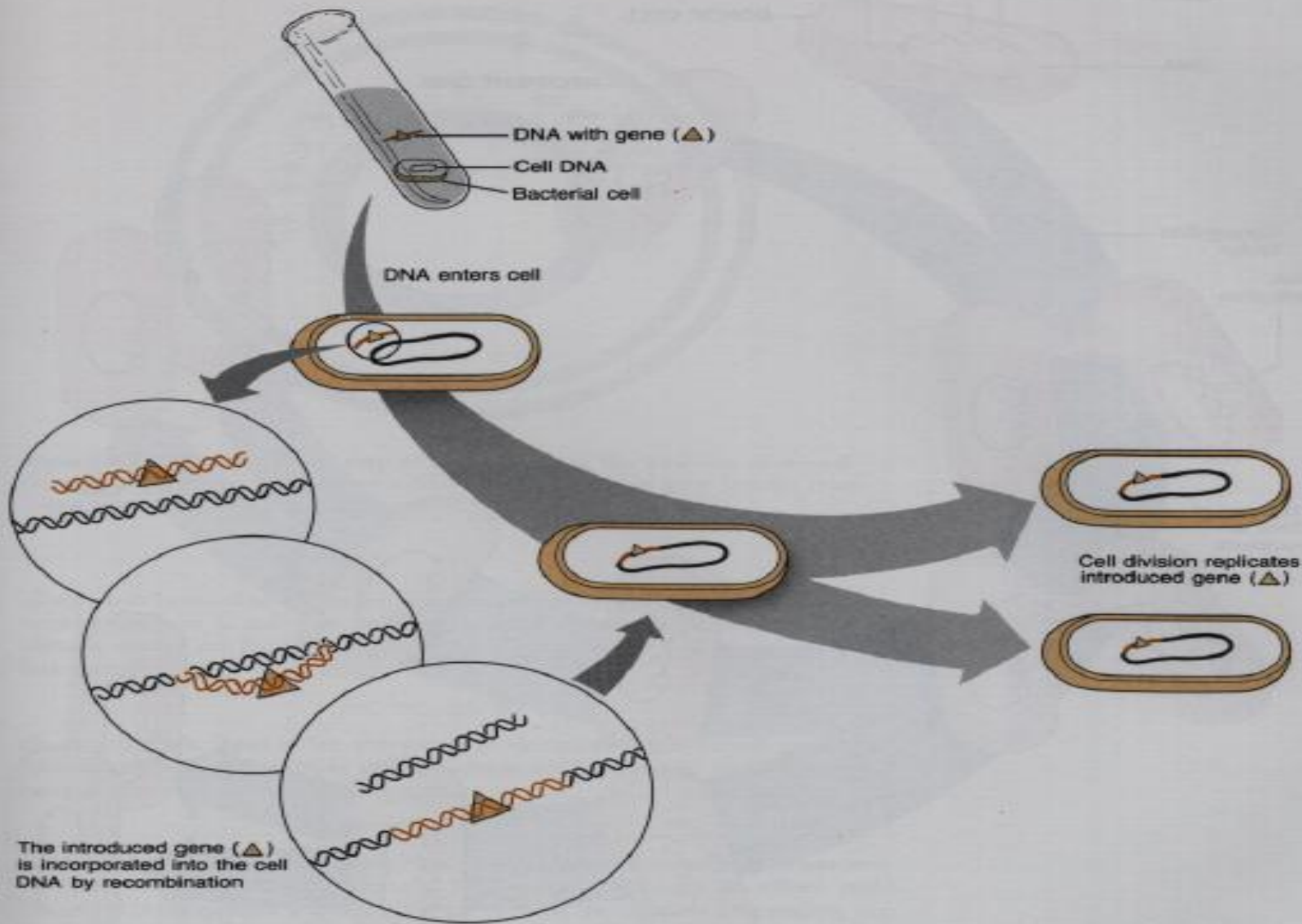
Conjugation – Transfer of genes from one cell to another involving cell to cell contact and a plasmid.

Transformation

A cell that is able to take up a molecule of DNA is called a competent cell.

In Gram negative bacteria only dsDNA is taken up into the cell, however only ssDNA segment is incorporated into the genome.

In Gram positive bacteria only ssDNA is taken up.



Bacterial transformation: DNA introduces new genetic information into cells.

Transduction

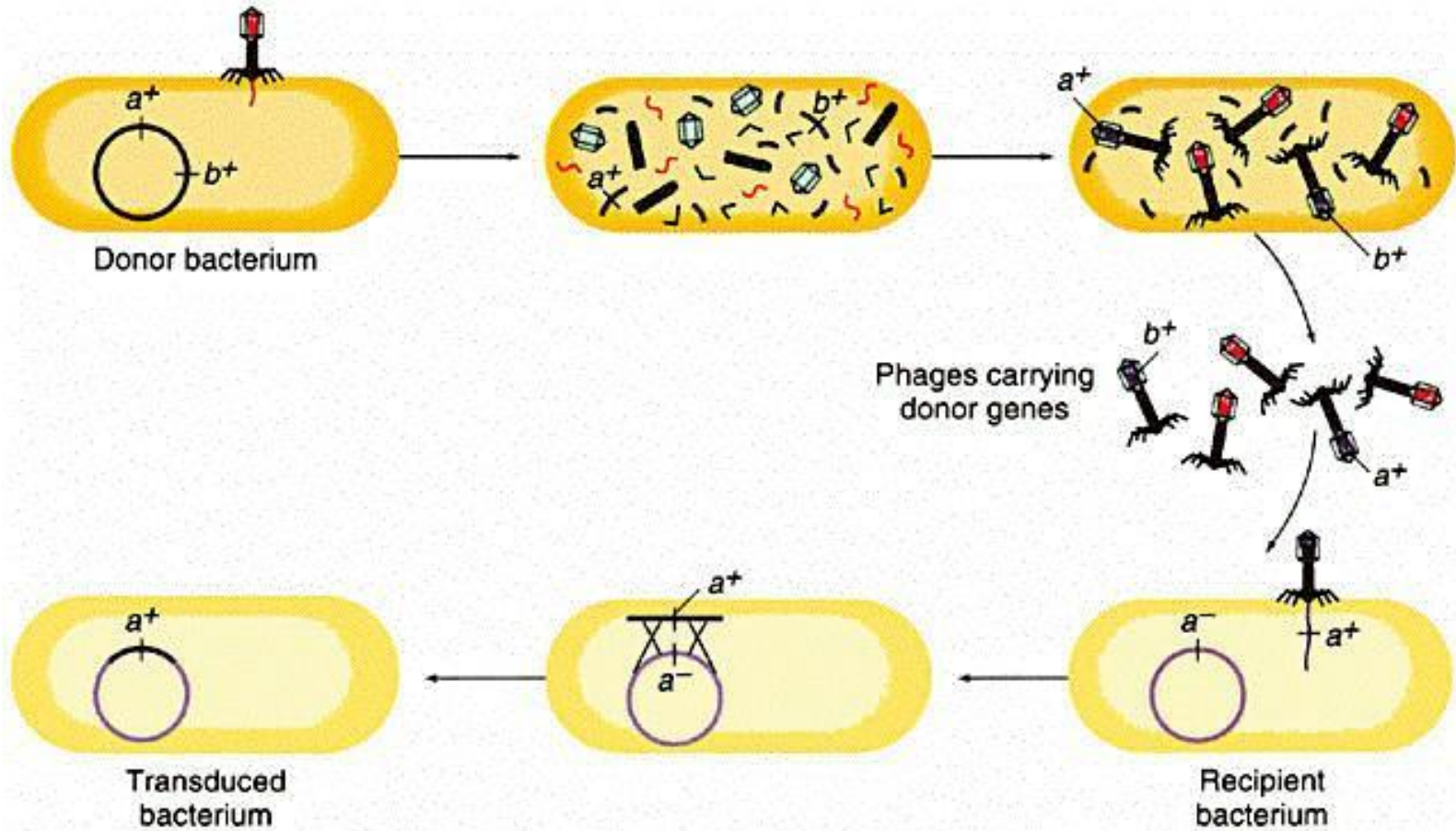
Genetic transfer mediated by phages

Not all phages can transduce

Not all bacteria are transducible

Host DNA derived from any portion of host genome becomes a part of the DNA of the mature virus - which gets integrated into another cell upon entry.

Bacterial Transduction



Bacterial conjugation

Conjugation or mating – involves the transfer of DNA from a donor to a recipient by cell to cell contact through the F (Fertility) pilus

F pilus joins with the mate, change in plasma membrane permeability so that DNA can move from one cell to another.

During mating, a single strand of donor DNA is replicated, and this copy is transferred to the recipient where the complimentary strand is synthesized.

Bacterial conjugation

