

TD03 Microbial Genetics**Exercise 1 — Basic Concepts**

1. What is bacterial conjugation?
2. What is a donor bacterium?
3. What is a recipient bacterium?
4. What is the role of the pilus?

Exercise 2 — Steps of Conjugation

Put the following events in the correct order:

1. Transfer of the 5' DNA strand
2. Initial contact between donor and recipient
3. Formation of a transfer channel
4. Stabilization of cell contact
5. Cleavage/linearization of plasmid DNA at *oriT*

Exercise 3 — Self-Transmissible Plasmids

1. What is a self-transmissible plasmid?
2. What happens to the recipient after receiving a self-transmissible plasmid?
3. Why can the recipient subsequently transfer the plasmid?

Exercise 4 — Non-Self-Transmissible Plasmids

1. Why can some plasmids not transfer themselves?
2. Can such a plasmid nevertheless be transferred?
3. What is the role of the helper plasmid?
4. Does the recipient necessarily become a donor after receiving the mobilized plasmid?

Exercise 5 — The Importance of *oriT*

A plasmid lacks several transfer genes but contains an *oriT* sequence.

1. Can this plasmid be mobilized by a helper plasmid?
2. What is the role of *oriT*?
3. What happens if a plasmid lacks *oriT*?

Exercise 6 — Experimental Interpretation

A donor bacterium contains plasmid P1, which is self-transmissible. A recipient bacterium does not contain P1.

After conjugation:

1. Which bacterium is the donor?
2. Which bacterium is the recipient?
3. What does the recipient acquire?
4. What is the status of the recipient after successful transfer?
5. What does this demonstrate?

Exercise 7 — Chromosomal Gene Mobilization

1. Can conjugative plasmids transfer chromosomal genes?
2. What is an Hfr cell?
3. What can happen during conjugation involving an Hfr cell?
4. What determines the amount of chromosomal DNA transferred?
5. Why is Hfr conjugation useful experimentally?

Exercise 8 — F' Plasmids and Merodiploidy

1. How is an F' plasmid formed?
2. What happens when an F' plasmid is transferred to a recipient?
3. What is a merodiploid cell?

Synthesis Problem

A bacterial donor contains an F plasmid. The plasmid integrates into the bacterial chromosome.

1. What type of cell is produced?
2. What can the Hfr cell transfer?
3. How can researchers determine gene order?
4. What is the relationship between transfer time and gene position?
5. What is the major difference between F⁺ and Hfr cells?