

TD01 Microbial Genetics**Exercise 1 - Basic Concepts**

1. What is a plasmid?
2. What is an R plasmid?
3. What is a virulence plasmid?
4. What are bacteriocinogenic plasmids?

True / False

- Plasmids are always essential for bacterial survival.
- R plasmids can carry antibiotic-resistance determinants.
- All plasmids are transferable by conjugation.
- Plasmids may carry virulence genes.
- Some plasmids can encode heavy-metal resistance.

Exercise 2 - Functional Classification of Plasmids**Gene/function Plasmid type**

bla /

adh /

tox /

Metal-R /

metabolic capacities /

bact /

Exercise 3 — Antibiotic Resistance and R Plasmids

1. How can an R plasmid confer antibiotic resistance?
2. Why can R plasmids produce multidrug resistance?
3. Why is this clinically important?

Exercise 4 — Data Interpretation

Strain A: sensitive to antibiotics and contains no resistance plasmid.

Strain B: resistant to several antibiotics and contains plasmid P2.

1. What is the most likely role of plasmid P2?
2. What explains the multidrug-resistant phenotype?
3. What would happen if P2 were transferred to a sensitive recipient bacterium by conjugation?
4. What does this illustrate?

Exercise 5 — Environmental Adaptation

1. How can plasmids contribute to bacterial adaptation to polluted environments?
2. What is the environmental significance of these plasmids?
3. Why are plasmids important for rapid adaptation?

Synthesis Problem — The Adaptive Plasmid

A bacterium carries a plasmid containing genes for:

- antibiotic resistance;
- heavy-metal resistance;
- degradation of aromatic compounds.

1. What adaptive advantages does this plasmid provide?
2. How can this plasmid increase bacterial survival?
3. Why can plasmid acquisition produce rapid adaptation?
4. What happens under strong environmental selection?
5. Complete the statement:
> “Plasmids can contribute significantly to bacterial adaptation because...”