

TD02 Microbial Genetics**Exercise 1 — Understanding the Mechanism**

1. What is bacterial transformation?
2. What type of genetic material is transferred?
3. What is required for a bacterium to undergo transformation?
4. What may happen to the incoming DNA after uptake?

Exercise 2 — Avery Experiment

1. What bacterial species was used in the experiment?
2. What happened when an avirulent strain was exposed to free DNA from a virulent strain?
3. What happened when the DNA preparation was treated with DNase?
4. What happened when the preparation was treated with protease or RNase?
5. What did Avery and colleagues conclude?

Exercise 3 — Identifying the Transforming Molecule

Complete the table:

Treatment of DNA preparation	Transformation (Yes or No), Interpretation
No treatment	
DNase	
Protease	
RNase	

Exercise 4 — Experimental Reasoning

A researcher obtains an avirulent bacterial strain and exposes it to DNA extracted from a virulent strain.

1. What phenotype would you expect after successful transformation?
2. If DNase is added before transformation, what would you expect?
3. If protease is added instead, what would you expect?
4. What does this experiment demonstrate?

Exercise 5 — Competence

1. Define bacterial competence.
2. Give three examples of naturally competent bacterial genera.
3. What is natural competence?
4. What is artificial competence?
5. What is the main difference between natural and artificial competence?

Exercise 6 — Fate of Transforming DNA

1. Why is linear DNA particularly vulnerable inside the bacterial cell?
2. How can transforming DNA escape degradation?
3. What is the consequence of successful chromosomal integration?

Exercise 7 — Case Study

A non-capsulated *Streptococcus pneumoniae* strain is exposed to DNA extracted from a capsulated strain.

After incubation, some bacterial cells become capsulated.

1. What process occurred?
2. What was the source of the new genetic information?
3. What is the phenotype acquired by the recipient?
4. What does the appearance of this phenotype indicate?
5. What experiment could confirm that DNA is responsible?

Synthesis Problem — Transformation as a Genetic Exchange Mechanism

A bacterial population is exposed to extracellular DNA released from other bacterial cells.

1. Name the genetic exchange mechanism.
2. What is the first requirement for DNA uptake?
3. What happens to DNA that remains extracellular?
4. What can happen after DNA enters the recipient cell?
5. Complete the following comparison:

Mechanism Source/form of DNA Main transfer agent

- Transformation /
- Conjugation /
- Transduction /