CHEMISTRY YEAR 12 - MODULE 5 - LESSON 2

Reversibility, Non-Equilibrium Systems & Entropy

Use this worksheet after reading the lesson to practise the key ideas and prove you can meet the success criteria.

Name ____________

Date ____________

Class ____________

1. Key Ideas

Fritz Haber's discovery that nitrogen and hydrogen gas could be converted to ammonia — reversibly — changed the course of human history. The reaction that feeds half the world's population works precisely because it doesn't go all the way to completion.

- The thermodynamic spectrum from irreversible to reversible reactions
- Why large negative $\Delta G°$ means the reaction goes to completion

2. Success Criteria

By the end, you should be able to:

- The thermodynamic spectrum from irreversible to reversible reactions
- The connection between the magnitude of $\Delta G°$ and the position of equilibrium
- Why at equilibrium, $\Delta G = 0$

3. Key Terms

Dynamic equilibrium
A state where forward and reverse reaction rates are equal.

Equilibrium constant (Keq)
The ratio of product to reactant concentrations at equilibrium.

Le Chatelier's Principle
A system at equilibrium shifts to minimise applied disturbances.

Reaction quotient (Q)
The ratio of product to reactant concentrations at any instant.

Closed system
A system where neither matter nor energy can escape to surroundings.

Reversible reaction
A reaction that can proceed in both forward and reverse directions.

4. Activity: Build the Lesson Map

Use the lesson to complete the table. Keep answers brief but specific.

Prompt	Your answer
Main concept	
Important example	
Common mistake to avoid	
How this links to the next lesson	

5. Short Answer Questions

1. Explain this lesson goal in your own words: "The thermodynamic spectrum from irreversible to reversible reactions". Use one specific example from the lesson.

BAND 3 2 MARKS

2. Apply this idea to a new example: "The connection between the magnitude of $\Delta G°$ and the position of equilibrium". Show your reasoning clearly.

BAND 4 3 MARKS

3. Analyse why this idea matters for understanding Reversibility, Non-Equilibrium Systems & Entropy: "Why at equilibrium, $\Delta G = 0$".

BAND 5 4 MARKS

6. Extend: Apply the Idea

BAND 5/6 5 MARKS

A student gives a memorised answer about Reversibility, Non-Equilibrium Systems & Entropy but does not use evidence or reasoning.

Improve the answer by writing a stronger response that uses accurate terminology, a relevant example and a clear explanation.

7. Multiple Choice

1. What is the best first step when answering a question about Reversibility, Non-Equilibrium Systems & Entropy?

☐ A. Identify the key concept being tested

☐ B. Write every fact from memory

☐ C. Ignore the command word

☐ D. Skip examples and evidence

2. Which answer would show stronger understanding of Reversibility, Non-Equilibrium Systems & Entropy?

☐ A. An answer with accurate terms and reasoning

☐ B. A copied definition only

☐ C. A single-word response

☐ D. An answer with no example

3. What should you do if a question asks you to explain?

☐ A. Link the idea to a reason or cause

☐ B. List unrelated facts

☐ C. Only draw a diagram

☐ D. Write the shortest possible answer

8. Success Criteria Proof

Finish with evidence that you can do each success criterion.

SUCCESS CRITERION 1

Prove that you can: The thermodynamic spectrum from irreversible to reversible reactions

BAND 3 | 2 MARKS

SUCCESS CRITERION 2

Prove that you can: The connection between the magnitude of ΔG° and the position of equilibrium

BAND 4 | 3 MARKS

SUCCESS CRITERION 3

Prove that you can: Why at equilibrium, ΔG = 0

BAND 5 | 4 MARKS

One thing I still need help with: