CHEMISTRY YEAR 11 - MODULE 4 - LESSON 8

Hess's Law

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

Steel production requires carbon to reduce iron ore — and chemists needed to know the exact ΔH for $C(s) + O_2(g) \rightarrow CO_2(g)$ via the intermediate $CO(g)$. The problem: you can't burn carbon to CO without also producing CO_2. The solution: Hess's Law. Add two measurable equations together, cancel the intermediate, and the answer falls out — no impossible experiment required.

- Hess's Law: ΔH is the same regardless of pathway — enthalpy is a state function
- Why Hess's Law follows from enthalpy being a state function (First Law of Thermodynamics)

2. Success Criteria

By the end, you should be able to:

- Hess's Law: ΔH is the same regardless of pathway — enthalpy is a state function
- Reverse equation → ΔH changes sign; scale equation by n → ΔH scales by n
- The NESA prototype: C → CO_2 via CO(g) as intermediate

3. Key Terms

Enthalpy change (ΔH)
The heat energy exchanged at constant pressure during a reaction.

Exothermic
A reaction releasing heat to surroundings (ΔH < 0).

Endothermic
A reaction absorbing heat from surroundings (ΔH > 0).

Calorimetry
The experimental measurement of heat changes during chemical processes.

Hess's Law
The total enthalpy change is independent of the pathway taken.

Entropy
A measure of the disorder or randomness of a system.

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: "Hess's Law: ΔH is the same regardless of pathway — enthalpy is a state function". Use one specific example from the lesson.

BAND 3 2 MARKS

2. Apply this idea to a new example: "Reverse equation → ΔH changes sign; scale equation by n → ΔH scales by n". Show your reasoning clearly.

BAND 4 3 MARKS

3. Analyse why this idea matters for understanding Hess's Law: "The NESA prototype: C → CO_2 via CO(g) as intermediate".

BAND 5 4 MARKS

6. Extend: Apply the Idea

BAND 5/6 5 MARKS

A student gives a memorised answer about Hess's Law 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 Hess's Law?

☐ 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 Hess's Law?

☐ 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: Hess's Law: ΔH is the same regardless of pathway — enthalpy is a state function

BAND 3 2 MARKS

SUCCESS CRITERION 2

Prove that you can: Reverse equation → ΔH changes sign; scale equation by n → ΔH scales by n

BAND 4 3 MARKS

SUCCESS CRITERION 3

Prove that you can: The NESA prototype: C → CO_2 via CO(g) as intermediate

BAND 5 4 MARKS

One thing I still need help with: