CHEMISTRY YEAR 11 - MODULE 4 - LESSON 7

Enthalpy of Formation

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

Hydrazine (N_2H_4) was used as rocket fuel in the Apollo lunar modules. Engineers needed to know exactly how much energy it released before the first test fire — and they calculated it entirely on paper using tabulated enthalpy of formation values. No experiment needed. Standard enthalpies of formation give you a more accurate ΔH for any reaction, from any data table, instantly.

- ΔH° f = enthalpy change when 1 mol of compound forms from elements in standard states at 25°C, 100 kPa
- Why ΔH° f of elements = 0 (by definition — no change forming an element from itself)

2. Success Criteria

By the end, you should be able to:

- ΔH° f = enthalpy change when 1 mol of compound forms from elements in standard states at 25°C, 100 kPa
- ΔH° f of any element in its standard state = 0 kJ mol^{-1}
- Formula: ΔH° rxn = ΣΔH° f (products) − ΣΔH° f (reactants)

3. Key Terms

"One mole of compound"
A pure substance formed from two or more elements chemically bonded in a fixed ratio.

"From its elements"
A pure substance that cannot be broken down into simpler substances by chemical means.

"Standard states"
H_2, O_2, C(graphite), N_2, not compounds) "Standard states" — each element in its most stable physical form at 25°C and 100 kPa (e.g.

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).

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: "ΔH° f = enthalpy change when 1 mol of compound forms from elements in standard states at 25°C, 100 kPa". Use one specific example from the lesson.

BAND 3 2 MARKS

2. Apply this idea to a new example: "ΔH° f of any element in its standard state = 0 kJ mol^{-1}". Show your reasoning clearly.

BAND 4 3 MARKS

3. Analyse why this idea matters for understanding Enthalpy of Formation: "Formula: ΔH° rxn = ΣΔH° f (products) − ΣΔH° f (reactants)".

BAND 5 4 MARKS

6. Extend: Apply the Idea

BAND 5/6 5 MARKS

A student gives a memorised answer about Enthalpy of Formation 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 Enthalpy of Formation?

- [ ] 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 Enthalpy of Formation?

- [ ] 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: ΔH° f = enthalpy change when 1 mol of compound forms from elements in standard states at 25°C, 100 kPa

BAND 3 2 MARKS

SUCCESS CRITERION 2

Prove that you can: ΔH° f of any element in its standard state = 0 kJ mol^{-1}

BAND 4 3 MARKS

SUCCESS CRITERION 3

Prove that you can: Formula: ΔH° rxn = ΣΔH° f (products) − ΣΔH° f (reactants)

BAND 5 4 MARKS

One thing I still need help with: