AP CHEMISTRY • EXERCISE SHEET

6.2 Energy Diagrams

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS endothermic 吸热 • exothermic 放热

Objective

Build the skills to answer exam questions on **energy diagrams** for reactions.

You must be able to:

- draw/read an energy diagram showing reactants, products, and E_a
- show ΔH as products minus reactants
- compare exothermic and endothermic diagrams

1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ The exothermic diagram

Reactants start **high**, climb over the activation-energy barrier, and end **lower** as products. Energy is released, so $\Delta H < 0$ (the arrow points down from reactants to products).

■ The endothermic diagram

Reactants start **low**, climb the barrier, and end **higher** as products. Energy is absorbed, so $\Delta H > 0$ (the arrow points up).

■ Reading E_a and ΔH

E_a = height of the peak above the **reactants**. ΔH = (product level) − (reactant level).

■ A worked comparison

Same E_a but different ΔH: an exothermic reaction's products sit below the reactants; an endothermic reaction's products sit above. The barrier position is the same idea in both.

2 Practice

Now apply the methods above.

2.1 On an energy diagram, how is ΔH found? [1]

2.2 For an exothermic reaction, are the products higher or lower than the reactants? [1]

2.3 Where is E_a measured to on the diagram? [1]

3 Exam-style questions

3.1 On an **endothermic** energy diagram, the products are [1]

- **A** lower than the reactants
- **B** higher than the reactants
- **C** at the same level
- **D** at the peak

3.2 An energy diagram shows reactants at 30 kJ, peak at 110 kJ, products at 70 kJ.

(a) Find E_a. [1]

(b) Find ΔH and classify the reaction. [2]

3.3 Two reactions have the same ΔH but different E_a. Explain which reacts faster and why. [2]

Solutions

2.1 Products' energy minus reactants' energy.

2.2 Lower.

2.3 From the reactants up to the peak.

3.1 B — higher than the reactants.

3.2 (a) $E_a = 110 - 30 = 80$ kJ. (b) $\Delta H = 70 - 30 = +40$ kJ, endothermic.

3.3 The one with the **lower** E_a reacts faster, because a larger fraction of collisions exceed the smaller barrier.