AP CHEMISTRY • EXERCISE SHEET

6.1 Endothermic and Exothermic Processes

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

Objective

Build the skills to answer exam questions on **endothermic and exothermic processes**.

You must be able to:

- classify a process as **exothermic** 放热 ($\Delta H < 0$) or **endothermic** 吸热 ($\Delta H > 0$)
- link the sign of ΔH to heat released or absorbed
- relate bond breaking/forming to energy

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.

Exo vs endo

- **Exothermic** —releases heat to the surroundings; $\Delta H < 0$; surroundings warm up.
- **Endothermic** —absorbs heat from the surroundings; $\Delta H > 0$; surroundings cool down.

Bonds and energy

Breaking bonds **absorbs** energy; **forming** bonds **releases** energy. If more energy is released (forming) than absorbed (breaking), the reaction is exothermic.

A worked judgement

Combustion feels hot → releases heat → **exothermic**, $\Delta H < 0$. A cold pack that gets cold when mixed → absorbs heat → **endothermic**, $\Delta H > 0$.

Sign convention

ΔH is written from the system's view: negative when the system **loses** energy (exothermic), positive when it **gains** energy (endothermic).

2 Practice

Now apply the methods above.

2.1 State the sign of ΔH for an exothermic reaction. [1]

2.2 A reaction makes the beaker feel cold. Classify it. [1]

2.3 Does breaking a bond absorb or release energy? [1]

3 Exam-style questions

3.1 An endothermic reaction has [1]

- **A** $\Delta H < 0$ and releases heat
- **B** $\Delta H > 0$ and absorbs heat
- **C** $\Delta H = 0$
- **D** no energy change

3.2 When ammonium nitrate dissolves in water, the solution gets colder.

(a) Classify the process and give the sign of ΔH. [2]

(b) State the direction of heat flow (system surroundings). [1]

3.3 Explain, in terms of bond breaking and forming, why combustion is exothermic. [2]

4 Go further

You are now ready for the real exam questions on this subtopic:

- work through the **6.1 Endothermic and Exothermic Processes** lesson on the **Learn** page;
- read the **Endothermic and Exothermic Processes** section of the AP Chemistry handout on the **Know** page.

Solutions

2.1 Negative ($\Delta H < 0$).

2.2 Endothermic.

2.3 Absorbs energy.

3.1 B —$\Delta H > 0$ and absorbs heat.

3.2 (a) Endothermic; $\Delta H > 0$. (b) Heat flows from the surroundings into the system.

3.3 Combustion forms strong bonds in CO_2 and H_2O, releasing more energy than is absorbed breaking the fuel and O_2 bonds, so the net ΔH is negative.