5 Energetics – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
energy	能量			
exothermic	放热			
endothermic	吸热			
thermal energy	热能			
combustion	燃烧			
neutralisation	中和			
decomposition	分解			
enthalpy change	焓变			
activation energy	活化能			

Recall

Every chemical reaction transfers **energy** 能量. The reaction is either **exothermic** 放热 or **endothermic** 吸热, depending on which way the heat moves.

- An exothermic reaction **gives out** heat (warms the surroundings).
- An endothermic reaction **takes in** heat (cools the surroundings).

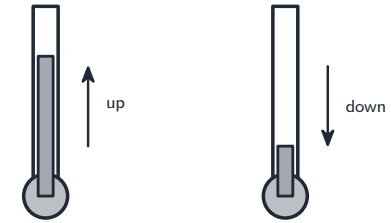
Nothing here is hard — it just adds a symbol and a diagram.

New ideas

Read these first, then do the Practice.

1 Exothermic and endothermic

- **exothermic** 放热反应 — gives out **thermal energy** 热能, so the surroundings warm **up**. Examples: **combustion** 燃烧, **neutralisation** 中和.
- **endothermic** 吸热反应 — takes in thermal energy, so the surroundings cool **down**. Example: thermal **decomposition** 分解.



2 Enthalpy change, ΔH

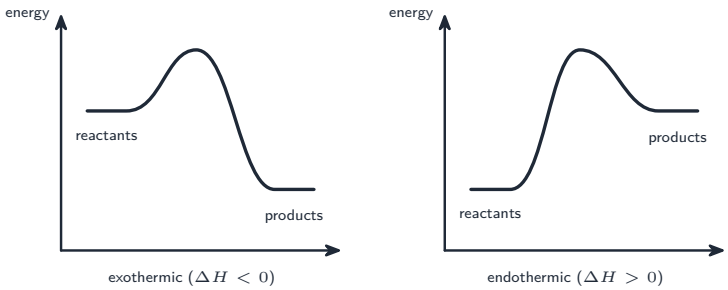
The thermal energy transferred is the **enthalpy change** 焓变, ΔH:

- ΔH is **negative** for exothermic (energy leaves the chemicals).
- ΔH is **positive** for endothermic (energy is taken in).

3 Reaction pathway diagrams

The **activation energy** 活化能 (E_a) is the least energy colliding particles need to react — a "hill" they must get over.

- **exothermic** — products **lower** than reactants ($\Delta H < 0$).
- **endothermic** — products **higher** than reactants ($\Delta H > 0$).



Watch out: match the sign to the direction — exothermic **gives out** heat so ΔH is **negative** (products lower); endothermic **takes in** heat so ΔH is **positive** (products higher). The activation energy is a *hill* every reaction must climb, exo or endo.

Practice

Try these in order.

5.1 What happens to the temperature of the surroundings in (a) an exothermic, (b) an endothermic reaction? [2]

5.2 Give the sign of ΔH for (a) an exothermic, (b) an endothermic reaction. [2]

5.3 Give one example of an exothermic reaction. [1]

5.4 What is meant by the *activation energy*? [1]

5.5 On a reaction pathway diagram, where are the products (compared with the reactants) for an exothermic reaction? [1]

5.6 Challenge. On a pathway diagram the products lie **above** the reactants. State (a) whether the reaction is exothermic or endothermic, (b) the sign of ΔH, and (c) what the surroundings do. [3]