AP CHEMISTRY • EXERCISE SHEET

5.11 How Catalysts Speed Things Up

Name: _____ Class: _____ Date: _____ **Total: 11 marks**

KEY WORDS catalyst 催化剂 • activation energy 活化能 • energy profile 能量图

Objective

Build the skills to answer exam questions on **catalysis** — how catalysts speed reactions.

You must be able to:

- explain that a **catalyst** 催化剂 provides a lower-E_a pathway
- state that a catalyst is **not consumed** and does not change ΔH
- distinguish **homogeneous** and **heterogeneous** catalysts

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.

How a catalyst works

A **catalyst** provides an **alternative pathway** with a **lower activation energy**, so a larger fraction of collisions succeed and the reaction speeds up.

Not used up; ΔH unchanged

A catalyst is **regenerated** at the end (used in an early step, released in a later one), so it is not consumed. It lowers E_a but **does not change** ΔH — the reactant and product energies are the same.

Effect on both directions

Because it lowers the same barrier, a catalyst speeds up the **forward and reverse** reactions equally — it helps reach equilibrium faster, without shifting it.

Homogeneous vs heterogeneous

- **Homogeneous** — same phase as the reactants (e.g. an aqueous catalyst in solution).
- **Heterogeneous** — a different phase (e.g. a solid catalyst with gaseous reactants adsorbing on its surface).

2 Practice

Now apply the methods above.

2.1 How does a catalyst speed up a reaction? [1]

2.2 Does a catalyst change ΔH? [1]

2.3 Distinguish a homogeneous from a heterogeneous catalyst. [2]

3 Exam-style questions

3.1 A catalyst increases the rate by [1]

A	B
C	D

A raising the temperature
B providing a pathway with lower activation energy
C increasing ΔH
D removing products

3.2 On an energy profile, a catalyst is added.

(a) State what changes and what stays the same. [2]

(b) Explain why the catalyst is not consumed. [2]

3.3 Explain why a catalyst speeds up the forward and reverse reactions equally and therefore does not shift the equilibrium position. [2]