

Exercise walk-through

5.11

Catalysis

AP Chemistry

You must be able to

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

1

The method

Method — 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.

Exercises 2.1-2.3

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]

Exercises 2.1-2.3

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

2.1

- By providing an alternative pathway with a lower activation energy
-

2.2 Does a catalyst change ΔH ? [1]

2.2

- No
-

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

2.3

- Homogeneous – same phase as the reactants; heterogeneous – a different phase (e.g. solid catalyst, gas reactants)

Exercise 3.1

3.1 A catalyst increases the rate by

[1]

☐

A raising the temperature

B providing a pathway with lower activation energy

C increasing ΔH

D removing products

Exercise 3.1

3.1 A catalyst increases the rate by

[1]

☐

A raising the temperature

B providing a pathway with lower activation energy

C increasing ΔH

D removing products

3.1 B

- a lower-activation-energy pathway

Exercise 3.2 (a)

3.2 On an energy profile, a catalyst is added.

(a) State what changes and what stays the same.

[2]

Exercise 3.2 (a)

3.2 On an energy profile, a catalyst is added.

(a) State what changes and what stays the same.

[2]

(a)

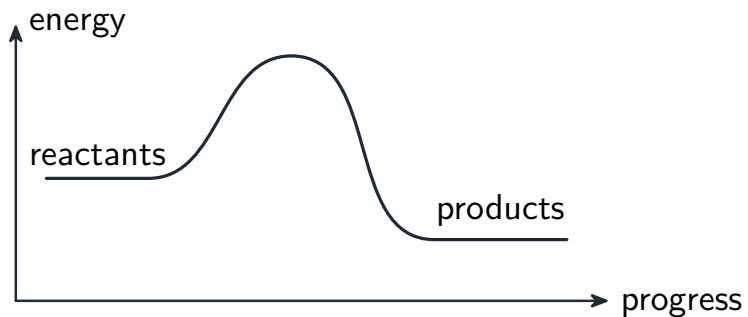
- The activation energy (peak) is lowered; ΔH (reactant and product energies) is unchanged

Exercise 3.2 (b)

3.2 On an energy profile, a catalyst is added.

(b) Explain why the catalyst is not consumed.

[2]

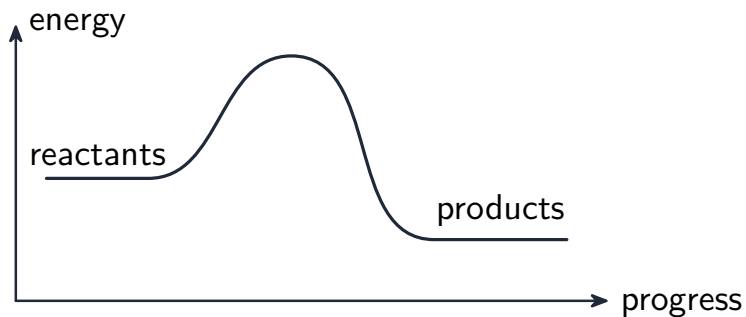


Exercise 3.2 (b)

3.2 On an energy profile, a catalyst is added.

(b) Explain why the catalyst is not consumed.

[2]



(b)

- It is used in an early step and regenerated in a later step, so it is not consumed overall

Exercise 3.3

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

Exercise 3.3

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

3.3

- The catalyst lowers the **same** barrier for both directions, so both the forward and reverse rates rise by the same factor; equilibrium (which depends on their ratio) is reached sooner but not shifted