

Exercise walk-through

5.1

Reaction Rates

AP Chemistry

You must be able to

- express **rate** as change in concentration per time
- list the factors that change rate (concentration, temperature, surface area, catalyst)
- explain each factor with collision ideas

1

The method

Method — Rate as a change per time

The **rate** is how fast a reactant is used up or a product forms:

$$\text{rate} = \frac{\Delta[\text{concentration}]}{\Delta t},$$

usually in $\text{mol L}^{-1}\text{s}^{-1}$.

Exercises 2.1-2.3

2.1 Write the definition of reaction rate.

[1]

2.2 State two factors that increase reaction rate.

[2]

2.3 Why does a powder react faster than a lump of the same mass?

[1]

Exercises 2.1-2.3

2.1 Write the definition of reaction rate. [1]

2.1

- The change in concentration of a reactant or product per unit time
-

2.2 State two factors that increase reaction rate. [2]

2.2

- Any two: higher concentration, higher temperature, larger surface area, a catalyst
-

2.3 Why does a powder react faster than a lump of the same mass? [1]

2.3

- A powder has a larger surface area, so more particles are exposed to collide

Exercise 3.1

3.1 Increasing the concentration of a reactant increases the rate because it [1]

☐

A lowers the activation energy

B increases the collision frequency

C changes the products

D cools the mixture

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3.1 B

- more particles per volume means more frequent collisions

Exercise 3.2 (a)

3.2 A reaction is run at 20°C and again at 40°C .

(a) State which is faster.

[1]

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[1]

(a)

- 40°C

Exercise 3.2 (b)

3.2 A reaction is run at 20°C and again at 40°C .

(b) Give two reasons, in terms of particle collisions, why raising temperature speeds a reaction. [2]

run 1
 20°C

run 2
 40°C

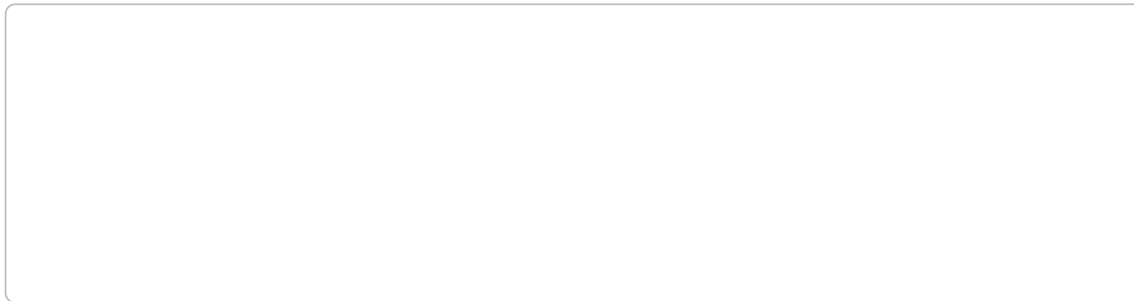
Exercise 3.2 (b)

3.2 A reaction is run at 20°C and again at 40°C.

(b) Give two reasons, in terms of particle collisions, why raising temperature speeds a reaction. [2]

run 1
20°C

run 2
40°C



(b)

- Particles move faster (more frequent collisions) and more of them have energy above the activation energy (more successful collisions)

Exercise 3.3

3.3 Explain, using collision ideas, why a catalyst speeds up a reaction without being used up. [2]

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3.3

- A catalyst provides an alternative pathway with a lower activation energy, so more collisions succeed; it is regenerated at the end, so it is not consumed