8 Rate of reaction – 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)		
catalyst	催化剂			
collisions	碰撞			
collide	碰撞			
effective collision	有效碰撞			
non-effective collision	无效碰撞			
concentration	浓度			
pressure	压强			

Recall

At IGCSE you learned that reactions go faster with higher **concentration**, higher **temperature**, and a **catalyst** 催化剂. Now we explain *why*, using **collisions** 碰撞.

- Particles must collide to react.
- But not every collision works.

Nothing here is harder than IGCSE —it just explains the reasons.

New ideas

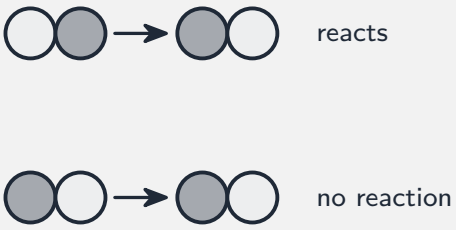
Read these first, then do the Practice.

■ 1 Collisions

To react, particles must **collide** 碰撞. Only some collisions cause a reaction:

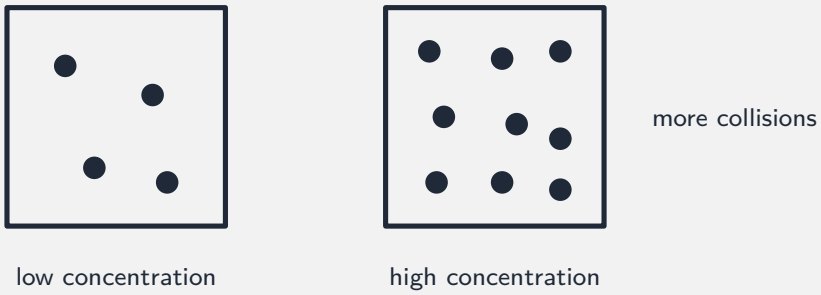
- an **effective collision** 有效碰撞 has **enough energy** *and* the **correct orientation** (direction).
- a **non-effective collision** 无效碰撞 has too little energy, or the wrong angle — nothing happens.

So the rate depends on the **frequency of effective collisions** (how many useful collisions happen each second).



2 Concentration and pressure

Increasing the **concentration** 浓度 of a solution (or the **pressure** 压强 of a gas) packs the particles closer. They collide **more often**, so there are more effective collisions each second —the rate rises.



Watch out: a faster rate needs more *effective* collisions per second. Simply colliding is not enough —the collision must also have enough energy *and* the correct orientation.

Practice

Try these in order.

8.1 What is meant by the *rate of reaction*? [1]

8.2 State the two things a collision needs to be *effective*. [2]

8.3 Explain why increasing the concentration of a reactant increases the rate. [2]

8.4 A reaction makes 48 cm^3 of gas in 24 s. Calculate the mean rate in $cm^3\,s^{-1}$. [2]

8.5 Increasing the pressure of a gas reaction speeds it up. Explain why, in terms of collisions. [2]

8.6 Challenge. Powdered marble reacts with acid much faster than the same mass of large marble chips. Explain why, in terms of collisions. [2]