5 Reaction rate and collision theory – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	**Write it 3 times** (English)		
Kinetics			
reaction rate			
Collision theory			
activation energy			

Recall

You already know how to make a reaction go faster:

- Use a higher concentration, or a higher temperature.
- Break a solid into smaller pieces (more surface area).
- Add a catalyst.

This sheet explains **why** these work, using the idea of colliding particles. Each idea has a worked example.

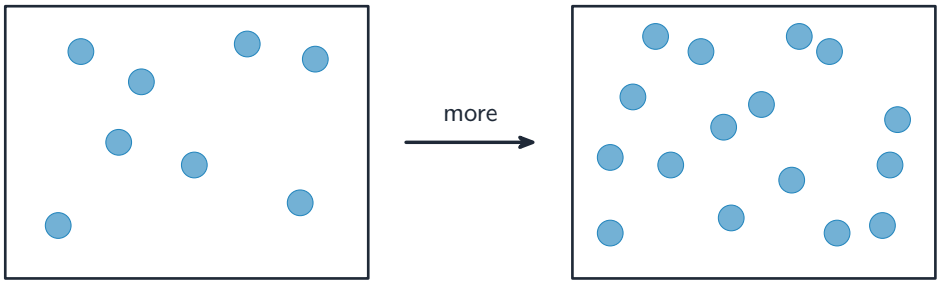
New ideas

1 Reaction rate

Kinetics is the study of **reaction rate** – how fast reactants turn into products. The rate usually **slows down** as the reaction goes, because the reactants get used up.

2 What speeds a reaction up

The rate rises with:



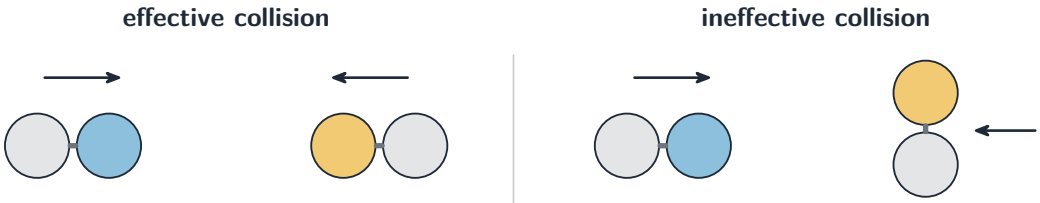
lower concentration
fewer collisions

higher concentration
more collisions

- higher **concentration** (more particles, more collisions),
- higher **temperature** (faster, more energetic particles),
- larger **surface area** (more contact),
- a **catalyst**.

3 Collision theory

Collision theory explains it: for a reaction, particles must collide with **enough energy** and in the **right orientation**.



reactive ends line up
⇒ **reaction**

wrong orientation
⇒ **no reaction**

4 Activation energy

The minimum energy a collision needs to react is the **activation energy** E_a. Only collisions above this energy succeed.

Worked example. Raising the temperature works mainly because more particles now have energy above E_a – so a far larger fraction of collisions succeed, and the rate rises sharply.

Watch out: heating speeds a reaction up mostly because **more particles exceed the activation energy**, not just because they collide a bit more often. The energy of the collisions matters more than the number.

Practice

Try these in order. The methods are all above.

2.1 List four things that make a reaction go faster. [2]

2.2 State the two conditions a collision must meet to lead to a reaction. [2]

2.3 Explain, using collision theory, why increasing the concentration speeds up a reaction. [2]

2.4 State what the activation energy of a reaction is. [1]

2.5 Explain why powdered chalk reacts with acid faster than a single lump of the same mass. [2]