

MOLECULAR COLLISION

A molecular collision happens when two or more molecules come into contact with each other - that is when they physically bump or interact in space.

These collisions are the foundation of chemical reactions - because for a reaction to occur, reactant molecules must collide.

Types of molecular collisions

1) Elastic collision

* The molecules bounce off each other without any change in their internal energy.

* Total kinetic energy is conserved.

Example - Gas molecules colliding in an

Important Calls	✓	Things to Do	✓	Meetings	✓
ideal gas	☐		☐		☐
	☐		☐		☐
	☐		☐		☐

18

February

2025

WL 08 • 049-316

Tuesday

	M	T	W	T
FEB '25	3	4	5	6
	10	11	12	13
	17	18	19	20
	24	25	26	27

2) Inelastic collisions →

* Part of the kinetic energy is converted into potential energy or internal energy.

* These can lead to chemical reactions if enough energy is transferred.

conditions for a chemical reaction (Effective collision theory) →

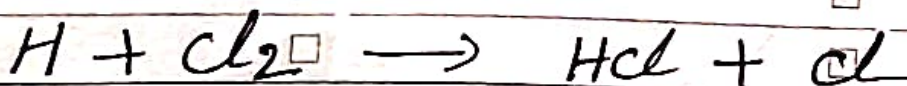
Not all collisions lead to reactions - only effective collisions do.

For a collision to be effective, it must satisfy two conditions.

1) Proper orientation →

Molecules must collide in a specific way so that the reactive parts are aligned

Example ☐ In the reaction ☐



Important Calls

✓ Things to Do

✓ Meetings

2) Sufficient Energy $\rightarrow$

Molecules must collide with at least the activation energy - the minimum energy required to break bonds in the reactants and form new bonds in the products.

Energy and collision Frequency $\rightarrow$

collision Frequency (z) $\rightarrow$

The number of collisions per second per unit volume.

It increases with temperature and concentration.

* Fraction of effective collisions!

only a small fraction of total collisions have energy $\geq E_a$

This idea is captured in the Arrhenius equation

Things to Do	Meetings
☐	☐
☐	☐
☐	☐

$$K = Ae^{-E_a/RT}$$

20

February
2025

Thursday

Wk 08 • 051-314

	M	T	W	T
FEB '25	3	4	5	6
	10	11	12	13
	17	18	19	20
	24	25	26	27

 $k =$ Rate constant $A =$ Frequency factor $E_a =$ Activation energy $R =$ Gas constant $T =$ Temperature

— > —