Rates of Reaction (Level 2) exam tips

Your answers on Rate of Reaction require explicit detail to be written about collision theory.

• Name the specific particles involved in the reaction eg *hydrochloric acid* as opposed to just *acid.*

#### Starter sentence.

#### For a chemical reaction to occur, particles must collide with one another with enough energy and at the required angle.

• **CONCENTRATION**

At a higher concentration there are more reactant particles in the same volume.
The frequency of collisions increases per unit time.

Therefore, the rate of reaction increases.

• **TEMPERATURE**
At a low temperature, fewer particles have enough kinetic energy to overcome the activation energy barrier,
but at a higher temperature the particles gain kinetic energy and are moving faster,
So there is an increase in the frequency of collisions between particles per unit time

**and**

particles also collide more effectively *(effectiveness of collisions has a greater effect than frequency of collisions).*

Because the particles have more kinetic energy to overcome the activation energy
Therefore, the rate of reaction increases.

• If you mention **activation energy** then define it as the minimum kinetic energy for collisions to be successful.

• **SURFACE AREA**
For example, if a lump of marble chips (CaCO3) is crushed to a smaller size such as powdered form.

The CaCO3 has a greater surface area,

there are more particles of the solid substance (CaCO3) exposed for attack by the acid (HCl)
So there is an increase in the frequency of collisions between the particles per unit time

Therefore, the rate of reaction increases.

• **CATALYST**

A catalyst is not used up in a reaction but speeds up the rate of a reaction.
A catalyst allows more successful/effective collisions to occur per unit time by lowering the activation energy.

This is because the catalyst has provided an alternative pathway.

So, the rate of reaction increases.

Also…”don’t be daft”, what NOT to do

Increase/decreasing heat (NO! use the word TEMPERATURE).
Adding water (NO! again far too vague, use the term CONCENTRATION (*of a named substance*).
For a temperature increase, particles DO NOT reach the Activation Energy EARLIER, what actually happens is

 that "MORE particles have kinetic energy GREATER than the Activation Energy".
Particles never have more activation energy but KINETIC ENERGY.
Refer to particles colliding with more ENERGY, never force.
Note that for Excellence "EFFECTIVENESS of the collisions has a greater effect than frequency of collisions".
For all factors, it is important to refer to the increase/decrease in FREQUENCY of collisions PER UNIT TIME.
Refer to the rate of reaction INCREASING/DECREASING, never quicker/slower.
Collision rate increases/decreases PER UNIT TIME.

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