

Chemistry 2.6 AS 91166 Demonstrate understanding of chemical reactivity

Writing Excellence answers to Reaction Rate Factors – Catalyst questions

Reaction Rate Factors – Catalyst QUESTION

Question: A particular reaction is complete when the solution turns cloudy and the paper cross under the flask can no longer be seen. The following experiments were carried out, and the times taken for the cross to disappear recorded. Elaborate on why the reaction in **Experiment 3** occurs faster than the reaction in **Experiment 1**.

experiment		Temperature /°C	Time for cross to disappear
1	No Cu ²⁺ present	25	42
2	No Cu ²⁺ present	50	23
3	Cu ²⁺ present	25	5

ANSWER

1. state the collision theory	Chemical reactions between particles of substances only occur when the following conditions have been met: Particles must collide with enough energy (called activation energy EA) and with the correct orientation. If these conditions are met, the collision will be considered successful .
2. Describe the reactants in your reaction and state which factors are the same	In the reaction of experiment 1 and experiment 3 , both are carried out under the same temperature. (we assume the concentration is also the same)
3. Describe the reactants in your reaction and state which factor is different (the factor affecting reaction rate)	The only change is the addition of a catalyst in Experiment 3 compared to experiment 1. An added catalyst means a faster rate of reaction.
4. link the factor to the collision theory	Particles must collide with enough energy to overcome the activation energy of the reaction. The activation energy is the energy that is required to start a reaction. When a catalyst is used, the activation energy is lowered . This is because the catalyst provides an alternative pathway for the reaction to occur in which the activation energy is lowered.
5. link the reaction to more of the collisions being successful occurring per unit of time	Now that the activation energy has been lowered, more reactant particles will collide with sufficient energy to overcome this lowered activation energy therefore more effective collisions are occurring more frequently .
6. link to more products (name products) being formed per unit of time AND link to a faster <u>reaction rate</u>	Experiment 3 will produce more products initially resulting in the solution turning cloudy and the cross disappearing quicker (5s compared to 42s), resulting in a faster reaction rate
7. summarize the reaction with the slower reaction rate	Experiment 1 has no catalyst so will take longer to react (cross to disappear) as less of the collisions are effective, so will have a slower rate of reaction than experiment 3.
8. Explain that both reactions will produce the same amount of product eventually as they started with the same amount of reactants	Both reactions will eventually produce the same amount of products if the same amounts of each reactant are used.

NOTE: The white column is how your answer would appear on your test paper so make sure you **write out complete sentences**. The grey area is just to help you structure your answer and would not appear in the question.