Chemistry 2.6 AS 91166 Demonstrate understanding of chemical reactivity

Writing Excellence answers to **Reaction Rate Factors – Temperature** questions

Reaction Rate Factors – Temperature 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 2** occurred faster than the reaction in **Experiment 1**.

experiment		Temperature /ºC	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 2**, both have no catalyst added.(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 an **increase in temperature in Experiment** 2 compared to experiment 2. An increase in temperature means a faster rate of reaction.
4. **link** the factor to the collision theory (**activation energy**)	The activation energy is the energy that is required to start a reaction. When the temperature is higher, the particles have **more kinetic energy**.
5. link the reaction to **more of the collisions being successful** occurring per unit of time	because the particles are moving with more kinetic energy, it will be more likely that when collisions occur they are **more likely to be effective** as a greater proportion of collisions **overcome the activation energy of the reaction.**
6. next link the factor to the collision theory (**faster moving particles**)	When the temperature is higher, the particles have **more kinetic energy**; the particles are **moving faster**
7. link the reaction to **more successful collisions** occurring per unit of time	Because the particles are moving faster, there will be **also more frequent collisions**. Experiment 2 has **more effective collisions per unit of time.** (than experiment 1.
8. link to more products (name products) being formed per unit of time AND link to a faster reaction rate	Experiment 2 will produce more products initially resulting in the solution turning cloudy and the cross disappearing quicker (23s compared to 42s), resulting in a **faster reaction rate**
9. summarize the reaction with the **slower reaction rate**	Experiment 1 is at a lower temperature so will take longer to react (cross to disappear) as the particles are moving slower than in experiment 1, so will have a slower rate of reaction.
10. 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.