

Chapter 5 Kinetics - GCSE Assumed Knowledge

Learning Objectives	Keypoints
Explain what is meant by rate of reaction	The rate of reaction is a measure of how quickly reactants are made into products in a chemical reaction. $\text{Rate} = \frac{\text{amount of reactants used}}{\text{time taken}}$ or $\text{rate} = \frac{\text{amount of product formed}}{\text{time taken}}$
Suggest practical methods for determining rates	If one of the products is a gas then the amount of product can be measured by measuring the volume of gas produced – by using either a gas syringe, upward delivery over water or a mass balance. If no gases are produced, then the rate of reaction can be calculated by measuring the time taken for a solid to be used up.
Interpret rate of reaction graphs	If the volume of gas is plotted on the y axis and the time is plotted on the x axis then the line will be a curve with the steepest gradient at the start. To calculate the mean rate of reaction from a graph pick two points on the graph. The gradient is the change in volume divided by the change in time. To calculate the rate of reaction at a specific time, known as the instantaneous rate of reaction, draw a tangent to the curve and measure the gradient of the tangent (the change in volume divided by the change in time)
Describe and explain the effect of changes on the rate of reaction	In order for reactions to occur the reactant particles need to collide with each other. If the particles which collide do not have enough energy, known as the activation energy, then they will not react and will bounce back from the collision unchanged. If the particles which collide have the activation energy or greater then they will react. If there are more frequent collisions then the rate of reaction will increase. If the particles which collide have more energy, or if the activation energy is lowered, then there will be more successful collisions.
Describe and explain the effect of changes in concentration of solutions on the rate of reaction	A higher concentration of solution means that there will be more particles of solute in the same volume. This will lead to more frequent collisions so the rate of reaction will increase.
Describe and explain the effect of changes in pressure of reacting gases on the rate of reaction	A higher pressure means that there will be more particles of gas in the same volume. This will lead to more frequent collisions so the rate of reaction will increase.
Describe and explain the effect of changes in the size of pieces of a reacting solid on the rate of reaction	Smaller pieces of solid mean that the solid has a higher surface area. This means that more of the reactant particles are exposed so there are more frequent collisions. This increases the rate of reaction.
Describe the characteristics of catalysts and their effect on rates of reaction	A catalyst is a chemical which speeds up the rate of a reaction without being used up or altered itself. Catalysts are specific to the reaction, so a chemical that catalyses one reaction may not catalyse another reaction.
Recall that enzymes act as catalysts in biological systems	Enzymes are biological catalysts that speed up reactions in biological systems.
Explain catalytic action in terms of activation energy	A catalyst lowers the activation energy, which leads to more successful collisions. This increases the rate of reaction.