Chemistry for the IB Diploma Programme





Guiding Question revisited

How can the rate of a reaction be controlled?

In this chapter we have explored collision theory and investigative techniques to show:	
	The rate of reaction is expressed as the change in concentration of a particular reactant or product per unit time. It has units of mol dm ⁻³ s ⁻¹ .
	Rate of reaction can be measured indirectly using different experimental techniques. The choice of technique will depend on the changes that occur during a specific reaction such as the production of a gas, the formation of a precipitate, or changes in the colour or electrical conductivity of a solution.
	The rate at a specific point in a reaction can be calculated from the gradient of a tangent on a graph of concentration, volume, absorbance or mass against time.
	For a reaction to occur, species must collide with sufficient kinetic energy and proper orientation. These collisions are known as 'successful' collisions.
	The minimum energy required for a successful collision is called the activation energy, $E_{\rm a}$.
	The use of a catalyst and increases in pressure, concentration, surface area and temperature lead to an increase in the frequency of successful collisions per unit time and so increase the rate of a reaction.
	Catalysts increase the rate of reaction by providing an alternative reaction pathway with a lower E_a . This effect can be represented in a reaction energy profile.
	Maxwell–Boltzmann distribution curves can be used to explain the effect of changing temperature and the use of a catalyst on the probability of successful collisions occurring.