Definitions and Concepts for OCR (A) Chemistry GCSE

Topic 5 - Monitoring and Controlling Chemical Reactions

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*Definitions in **bold** are for higher tier only*

Definitions marked by '' are for separate sciences only*

Definitions have been taken, or modified from the OCR (A) Specification for GCSE Chemistry, J248, Version 3.3 May 2020

Activation energy: The minimum amount of energy that particles must collide with to react.

***Actual yield:** The mass of product obtained from a reaction. It is normally less than the theoretical yield due to incomplete reactions, side reactions and loss of product in transfer.

***Atom economy:** The measure of the amount of starting materials that end up as useful products.

$$\text{Percentage atom economy} = \frac{\textit{Molecular mass of desired product}}{\textit{Sum of molecular masses of all reactants}} \times 100$$

***By-product:** **A secondary product made in the reaction of something else.**

Catalyst: Increases the rate of reaction by providing a different reaction pathway with a lower activation energy. They are not used up during the reaction.

Closed system: A system in which nothing can get in and nothing can get out. A reversible reaction will eventually reach equilibrium when carried out in a closed system.

Dynamic equilibrium: A reversible reaction will reach dynamic equilibrium when the rate of the forward reaction is equal to the rate of the backward reaction. At dynamic equilibrium, the concentration of reactants and products remains constant.

Effect of concentration on equilibrium: **If the concentration of a reactant is increased, more products will be formed until equilibrium is reached again. If the concentration of a product is decreased, more reactants will react until equilibrium is reached again.**

Effect of concentration on reaction rate: Increasing the concentration of reactants in solution means the reacting particles will be closer together. This means they will collide more often so there will be a higher rate of successful collisions and a faster rate of reaction.

Effect of pressure on equilibrium: **An increase in pressure causes the equilibrium position to shift towards the side with the smaller number of moles of gas. A decrease in pressure causes the equilibrium position to shift towards the side with the larger number of moles of gas.**

Effect of pressure on reaction rate: Increasing the pressure of gaseous reactants means the reacting particles will be closer together. This means they will collide more often so there will be a higher rate of successful collisions and a faster rate of reaction.

Effect of surface area on reaction rate: Increasing the surface area of the reactants means there are more exposed reacting particles as there is a greater surface area to volume ratio. This means there are more frequent successful collisions so the rate of reaction increases.

Effect of temperature on equilibrium: **An increase in temperature will shift the equilibrium position in the direction of the endothermic reaction. A decrease in temperature will shift the equilibrium position in the direction of the exothermic reaction.**

Effect of temperature on reaction rate: Increasing the temperature means the particles will have more kinetic energy and so will move faster. If the molecules are moving faster they will collide more often and, since they've gained kinetic energy, a larger proportion of the particles will have at least the activation energy. For both these reasons the rate of reaction increases.

Enzymes: Biological catalysts which speed up biochemical reactions so that organisms can survive.

Le Chatelier's principle: **If a reaction at equilibrium is subjected to a change in concentration, temperature or pressure, the position of equilibrium will move to counteract the change.**

Molar volume: **The volume occupied by one mole of gaseous molecules.**

Molar volume at RTP: **The volume occupied by one mole of molecules of any gas at room temperature and pressure (RTP). The molar volume at RTP is 24 dm^3.**

***Percentage yield:** The percentage ratio of the actual yield of product from a reaction compared with the theoretical yield.

$$\text{Percentage yield} = \frac{\textit{Actual yield}}{\textit{Theoretical Yield}} \times 100$$

Rate of reaction: The measure of the amount of product formed or reactant used over time. The units of rate of reaction may be given as g/s, cm^3/s or mol/s.

Reaction profile: Used to show the relative energies of reactants and products, the activation energy and the overall energy change of a reaction.

Reversible reaction: A reaction in which the products can react together to reform the reactants. Reversible reactions are denoted by the symbol ⇌.

***Standard solution:** A solution containing a known concentration of a substance.

***Theoretical yield:** The maximum possible mass of product that can be obtained from a reaction.

***Titration:** A technique used where a solution of known concentration is used to determine the concentration of an unknown solution.