Definitions and Concepts for OCR (B) Chemistry GCSE

Topic 6 - Making Useful Chemicals

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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 (B) Specification for GCSE Chemistry, J258, Version 3.2 April 2020

Acid: Produces hydrogen ions (H^+) in aqueous solutions with a pH range between 0 and 7. Acids react with metals to produce a salt and hydrogen, and acids react with carbonates to produce a salt, water and carbon dioxide.

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

Alkali: Produces hydroxide ions (OH^-) in aqueous solutions with a pH range between 7 and 14.

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

$$\text{Percentage atom economy} = \frac{\textit{Mass of atoms in desired product}}{\textit{Total mass of atoms in reactants}} \times 100$$

***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.

Crystallisation: A separation technique to obtain soluble solids from solutions. The process involves heating the solution until crystals start to form, leaving the solution to cool and then filtering the formed crystals from the solution.

Dynamic equilibrium: Reached by a reversible reaction 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. 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. They work at their optimum within a narrow range of temperature and pH.

Evaporation: A separation technique to separate soluble solids from solutions. The solution is slowly heated in an evaporating dish so that the solvent evaporates to leave the dry crystals.

***Fertiliser:** A chemical added to soil to increase the fertility, allowing crops to grow more effectively. They generally contain compounds of nitrogen, potassium and phosphorus.

Filtration: A separation technique used to separate an insoluble solid from a solution.

***Haber process:** An industrial process which produces ammonia from the reaction between nitrogen and hydrogen. The reaction conditions are 450°C and 200 atm and it requires an iron catalyst.

pH scale: A measure of the acidity or alkalinity of a solution. The scale ranges from 0-14 and can be measured using universal indicator or a pH probe.

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.**

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

Strong acid: An acid which is completely ionised in an aqueous solution so that nearly all the H^+ ions are released. Examples of strong acids include hydrochloric, nitric and sulfuric acids.

Universal indicator: A mixture of dyes that changes colour gradually over a range of pH and is used in testing for acids and alkalis.

Weak acid: An acid which is only partially ionised in an aqueous solution. This means only a small number of the H^+ ions are released. Examples of weak acids include ethanoic, citric and carbonic acids.