

Definitions and Concepts for Edexcel Chemistry IGCSE

Topic 3 - Physical Chemistry

Definitions marked by "" are for separate sciences only*

Definitions have been taken, or modified from the [Edexcel Specification for IGCSE Chemistry, 4CH1, Issue 2, April 2018](#)

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

Calorimetry: The process used to measure the amount of heat energy released or absorbed during a chemical reaction.

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.

Collision theory: Chemical reactions only occur when colliding particles collide with the correct orientation and with sufficient energy (activation energy).

Displacement: A chemical reaction in which a more reactive element displaces a less reactive element from its compound.

***Dynamic equilibrium:** Reached by reversible reactions 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 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:** Increasing the pressure causes the equilibrium position to shift towards the side with the smaller number of moles of gas. Decreasing the pressure causes the equilibrium 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.

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***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.

Endothermic reaction: A reaction in which energy is taken in from the surroundings so the temperature of the surroundings decreases. *[Bond breaking is an endothermic process.]

Enthalpy change: The amount of heat energy given out or absorbed during a reaction.

Exothermic reaction: A reaction in which energy is transferred to the surroundings so the temperature of the surroundings increases. *[Bond making is an exothermic process.]

Heat energy change: The energy change of a reaction which can be calculated from a calorimetry experiment as follows:

$$Q=mc\Delta T$$

where Q =Energy (J), m =mass (kg), c =specific heat capacity (J/kg°C), ΔT =temperature change

Molar enthalpy change: The amount of heat energy given out or absorbed by one mole of a substance during a reaction. It can be calculated from heat energy change, Q , by dividing Q by the amount of moles of the substance which took part in the reaction. The value is made negative if the reaction was exothermic.

Neutralisation: The reaction in which an acid and a base react together to form a salt and water.

***Overall energy change of the reaction:** The difference between the sum of the energy needed to break bonds in the reactants and the sum of the energy released when bonds in the products are formed.

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, cm³/s or mol/s.

Reaction profile: Graphs 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 \rightleftharpoons .

