

AP Chemistry rewards a definition that names the particles and the direction. “Entropy increases” scores nothing on its own; “the number of accessible microstates increases because the gas expands” earns the point. Learn each sentence, then attach it to the particles in the question. 化学题必须写出微粒层面的原因与变化方向, 只写结论不得分。

Atomic structure and periodicity

Electronegativity 电负性 — the ability of an atom in a bond to attract the shared pair of electrons toward itself

Ionization energy 电离能 — the energy needed to remove one mole of electrons from one mole of gaseous atoms

Coulomb’s law (as applied here) 库仑定律 — the attraction between charges rises with the size of the charges and falls with the square of the distance; it explains periodic trends and lattice energy

Effective nuclear charge 有效核电荷 — the net positive charge an outer electron experiences, reduced from the full nuclear charge by shielding from inner electrons

Photoelectron spectroscopy 光电子能谱 — a technique whose peak positions give the binding energies of electrons in each subshell, and whose peak heights give how many electrons are in it

Bonding and intermolecular forces

Lattice energy 晶格能 — the energy released when gaseous ions come together to form one mole of an ionic solid; it grows with ionic charge and falls with ionic radius

London dispersion forces 伦敦色散力 — attractions from instantaneous, induced dipoles, present between all molecules and stronger for larger, more polarisable ones

Hydrogen bonding 氢键 — an unusually strong dipole attraction between a hydrogen bonded to N, O or F and a lone pair on N, O or F of another molecule

Polar covalent bond 极性共价键 — a shared pair unequally distributed because the two atoms differ in electronegativity, giving partial charges

Stoichiometry and gases

Mole 摩尔 — the amount of substance containing 6.022×10^{23} particles

Molarity 摩尔浓度 — moles of solute per litre of solution

Limiting reactant 限量反应物 — the reactant that is fully consumed first and therefore determines the maximum product formed

Percent yield 产率 — actual yield divided by theoretical yield, expressed as a percentage

Ideal gas law 理想气体定律 — $PV = nRT$, valid when particles have negligible volume and no intermolecular attractions

Partial pressure 分压 — the pressure one gas in a mixture would exert alone in the same volume; the total pressure is the sum of the partial pressures

Kinetics

Rate law 速率定律 — an equation giving reaction rate as a function of reactant concentrations, with orders determined experimentally, never from the equation

Activation energy 活化能 — the minimum energy a collision must carry for reactants to reach the transition state

Catalyst 催化剂 — a substance that provides an alternative pathway of lower activation energy and is regenerated unchanged

Rate-determining step 决速步 — the slowest elementary step in a mechanism, whose reactants set the form of the overall rate law

Thermodynamics and equilibrium

Enthalpy change 焓变 — the heat absorbed or released at constant pressure; negative for exothermic, positive for endothermic

Hess's law 盖斯定律 — the enthalpy change of a reaction is the same whatever the route, so known steps can be summed to give an unknown one

Entropy 熵 — a measure of how many accessible microstates a system has; it increases when a system becomes more dispersed or disordered

Gibbs free energy 吉布斯自由能 — $\Delta G = \Delta H - T\Delta S$; a reaction is thermodynamically favourable when ΔG is negative

Equilibrium 平衡 — the state in which forward and reverse reactions proceed at equal rates, so concentrations stop changing

Equilibrium constant 平衡常数 — the ratio of product to reactant activities at equilibrium, each raised to its stoichiometric coefficient; it changes only with temperature

Le Chatelier's principle 勒沙特列原理 — a system at equilibrium subjected to a change shifts in the direction that partially opposes that change

Acids, bases and electrochemistry

Brønsted-Lowry acid 布朗斯特酸 — a proton donor

Brønsted-Lowry base 布朗斯特碱 — a proton acceptor

Buffer 缓冲溶液 — a solution of a weak acid and its conjugate base that resists pH change when small amounts of acid or base are added

Equivalence point 等当点 — the point in a titration at which the added titrant exactly neutralises the analyte in stoichiometric proportion

Oxidation 氧化 — loss of electrons, shown by an increase in oxidation number

Reduction 还原 — gain of electrons, shown by a decrease in oxidation number

Galvanic cell 原电池 — an electrochemical cell in which a thermodynamically favourable redox reaction drives electrons through an external circuit

Electrolysis 电解 — driving a non-favourable redox reaction by supplying electrical energy from an external source