IGCSE Chemistry

Formula Sheet · 公式表

The IGCSE paper prints a periodic table and nothing else. Every calculation route below has to come from memory, and the ones students lose marks on are not the hard ones – they are the mole triangle and the unit conversion. 考卷只提供元素周期表, 以下公式全部需要记忆。

Given on the paper

A periodic table with relative atomic masses, proton numbers, symbols and names. Use it for every M_r – do not memorise atomic masses.

Nothing else. No constants, no molar volume, no equations. The molar volume of 24 dm^3 per mole at room temperature must be recalled.

The mole

Relative formula mass 相对分子质量 — Add the relative atomic masses of every atom in the formula. For $Ca(OH)_2$ the subscript multiplies both atoms in the bracket, which is where most errors start.

Moles from mass 由质量求物质的量 — moles = mass $\div M_r$

Moles from solution 由溶液求物质的量 — moles = concentration × volume in dm^3. Divide a cm^3 volume by 1000 first: 25.0 cm^3 is 0.0250 dm^3.

Moles of gas 气体的物质的量 — moles = volume in $dm^3 \div 24$ at room temperature and pressure

Concentration in g/dm3 质量浓度 — concentration in g dm^{-3} = concentration in mol dm^{-3} $\times M_r$

Percentage yield 产率 — actual mass ÷ theoretical mass ×100. The theoretical mass comes from the balanced equation, using the limiting reactant.

Percentage by mass of an element 元素质量分数 — ($A_r\times$ number of atoms) $\div M_r \times 100$

Calculations you are expected to set out

Empirical formula 实验式 — Divide each mass or percentage by that element's A_r, then divide all the answers by the smallest. Multiply up if you get a .5.

Reacting masses 反应质量计算 — Moles of what you know, then the ratio from the balanced equation, then back to mass. Three steps, always in that order.

Titration 滴定 — Moles of the solution you know completely, then the equation ratio, then divide by the other volume to get its concentration.

Rate of reaction 反应速率 — rate = change in quantity ÷ time. On a graph, the gradient of the tangent gives the rate at that moment, and the curve flattening means a reactant is running out.

Facts examined as if they were formulae

Charges of common ions 常见离子电荷 — Group I is +1, Group II +2, Group VII −1; then the ones with no pattern: NO_3^-, OH^-, CO_3^{2-}, SO_4^{2-}, NH_4^+. Formulae of ionic compounds are unwritable without these.

State symbols 状态符号 — (s), (l), (g), (aq). They are worth a mark in their own right in equation questions, and (aq) is not the same as (l).

Test results 检验现象 — Limewater turns milky for carbon dioxide; a glowing splint relights in oxygen; a lit splint gives a squeaky pop with hydrogen; damp red litmus turns blue with ammonia.

How to keep the marks

Balance the equation before doing any calculation. A calculation built on an unbalanced equation cannot score the ratio mark, however good the arithmetic is.

Write the units at every stage. Half the wrong answers in mole questions are a factor of 1000 from a volume left in cm^3.

Round only at the end, and give three significant figures unless the question says otherwise.