

On this exam a justification is a chain of particles: what species is present, what it does, and why that produces the observation. A restatement of the observation never scores. Everything below is a rule the readers apply. 本科的“解释”要写出微观链条: 有什么粒子、发生什么、为什么导致该现象。

Justifying, calculating, communicating

- ✗ Justifying an answer by restating what the question observed.
- ✓ **Name the particles and the interaction: ‘the solution conducts, so mobile ions must be present, so the compound is ionic’.**

The guidelines print exactly this chain as the justification that earns the point.

要写出微观解释链

SG 3 years
- ✗ Giving an enthalpy change with no sign.
- ✓ **The sign IS the answer: negative for exothermic, positive for endothermic.**

Mark schemes state the sign must be included; a magnitude alone does not earn the point.

焓变必须带符号

MS
- ✗ Answering a calculation with the number only.
- ✓ **Show the set-up – the balanced equation, the moles, the substitution – then the value with its units.**

Points are awarded for the set-up separately from the arithmetic, so working survives a slip.

要写出计算过程

SG 3 years
- ✗ Rounding a molar quantity partway through.
- ✓ **Carry the full value and round once, matching the data’s significant figures.**

The precision of the data given sets the precision of the answer, and premature rounding moves it out of range.

中途不要取整

CED Skill 5
- ✗ Drawing a Lewis structure with the lone pairs left off.
- ✓ **Show ALL bonding pairs and ALL non-bonding pairs explicitly.**

Mark schemes state this requirement in those words; implied electrons earn nothing.

孤对电子也要画出

MS
- Where a question asks for a particulate diagram, draw the right NUMBER of particles as well as the right kinds – the ratio is part of the answer.

粒子图的数量比例也要对

CED Skill 1

1 · Atomic Structure and Properties 原子结构与性质

- ✗ Explaining an ionisation-energy trend by ‘more protons’.
- ✓ **Finish the chain: greater effective nuclear charge, so the outer electron is held more strongly.**

The readers award the point for the attraction, not for the count of protons.

要写出有效核电荷与吸引力

CED 1.6
- ✗ Reading a photoelectron spectrum peak height as energy.
- ✓ **Height gives the NUMBER of electrons in that subshell; position gives the binding energy.**

The two axes carry different information, and swapping them makes every deduction wrong.

峰高是电子数, 峰位是能量

CED 1.4

2 · Compound Structure and Properties 化合物的结构与性质

- ✗ Assigning an oxidation number by guessing.
- ✓ **Work from the rules: Na is +1 and O is –2, so in NaOCl the chlorine must be +1 for neutrality.**

Mark schemes print this exact reasoning for the point.

按规则推氧化数

MS
- ✗ Explaining a boiling-point difference by ‘stronger bonds’.
- ✓ **Name the intermolecular force – hydrogen bonding, dipole-dipole, London dispersion – and say why it is stronger here.**

Covalent bonds are not what breaks on boiling; the wrong force makes the explanation wrong.

沸点看分子间作用力

CED 2.5

3 · Properties of Substances and Mixtures 物质与混合物的性质

- ✗ Explaining a gas-law change without saying which quantities were held constant.
- ✓ **Name them: at constant temperature and amount, halving the volume doubles the pressure.**

The reasoning point depends on the conditions, not on the arithmetic.

要说明哪些量保持不变

CED 3.4
- ✗ Describing a solution’s concentration as ‘strong’.
- ✓ **Concentrated and dilute describe amount; strong and weak describe dissociation.**

The two words are not interchangeable, and the substitution makes an acid-base answer wrong.

浓稀 ≠ 强弱

CED 3.9

4 · Chemical Reactions 化学反应

- ✗ Writing a net ionic equation with the spectator ions still in it.
- ✓ **Cancel every species that appears unchanged on both sides, and balance charge.**
- The spectators are what the question is asking you to remove.
- 净离子方程要去掉旁观离子 CED 4.2
- ✗ Using the reagent in excess for a limiting-reactant calculation.
- ✓ **Compare mole ratios first, then work from the limiting one.**
- Both moles are computable, so the wrong choice gives a plausible answer with no warning.
- 先确定限量反应物 CED 4.5

5 · Kinetics 化学动力学

- ✗ Deducing a rate law from the balanced equation's coefficients.
- ✓ **Read it from the data: compare experiments where one concentration changes.**
- The rate law is experimental; only for an elementary step do the coefficients give the orders.
- 速率方程由实验数据得出 CED 5.3
- ✗ Saying a catalyst 'speeds up the reaction'.
- ✓ **It provides an alternative pathway with a lower activation energy, and is not consumed.**
- The mechanism is the explanation point; the effect is already in the question.
- 催化剂降低活化能 CED 5.10
- ✗ Naming the rate-determining step as the fastest one.
- ✓ **It is the SLOWEST step, and the rate law follows from it.**
- The mechanism question hinges on this, and reversing it inverts the whole answer.
- 决速步是最慢的一步 CED 5.8

6 · Thermochemistry 热化学

- ✗ Concluding a reaction is exothermic because the flask feels cool.
- ✓ **A flask that COOLS means the reaction absorbed energy: it is endothermic.**
- Mark schemes print this reasoning directly, and the sign follows from it.
- 变冷说明吸热 MS
- ✗ Using only the mass of the solute in $q = mc\Delta T$.
- ✓ **Use the total mass of the SOLUTION, and state the assumptions you made about c .**
- The calorimetry point depends on the mass being the thing that changed temperature.
- 用溶液总质量 CED 6.5

7 · Equilibrium 化学平衡

- ✗ Saying an equilibrium 'stops' when it is reached.
- ✓ **Both reactions continue at equal rates, so the concentrations stay constant.**
- The dynamic nature is the content being tested, and 'stops' contradicts it.
- 平衡是动态的 CED 7.2
- ✗ Applying Le Chatelier without saying which side has more moles of gas.
- ✓ **Compare the two sides first, then state the shift.**
- The direction depends on that comparison, and the reasoning is the scored part.
- 先比较两边气体的物质的量 CED 7.9
- ✗ Concluding that no solid remains when a solubility equilibrium is established.
- ✓ **If the system is at equilibrium, some solid must still be present.**
- The guidelines print this reasoning: an equilibrium condition requires the solid phase.
- 平衡时固体必须还在 SG2022 Q1

8 · Acids and Bases 酸与碱

- ✗ Assuming equal pH means equal concentration.
- ✓ **A weak acid needs a HIGHER concentration to reach the same pH as a strong one.**
- The guidelines set out this comparison for hydrochloric and propanoic acid.
- 弱酸达到同 pH 需更高浓度 SG2023 Q2
- ✗ Running a reaction that needs the deprotonated form in pure water.
- ✓ **Use a buffered solution at a pH that keeps the species in the form the reaction needs.**
- The guidelines require the buffer to be named for the point.
- 要用缓冲溶液控制形态 SG2022 Q3
- ✗ Choosing an indicator by colour preference.
- ✓ **Choose one whose range spans the pH at the equivalence point.**
- The equivalence pH depends on the salt formed, which is what the question is testing.
- 指示剂范围要覆盖等当点 CED 8.8

9 · Thermodynamics and Electrochemistry 热力学与电化学

- ✗ Saying a reaction is 'favourable' because it is exothermic.
- ✓ **For $\Delta G < 0$ at ALL temperatures the reaction must be exothermic AND have a positive entropy change.**
- Mark schemes state both conditions explicitly; one alone is not sufficient.
- 任何温度下自发需两个条件 MS

✗ Predicting the sign of ΔS without counting the gas moles.

✓ **No gaseous reactants and gaseous products means ΔS is positive.**

Mark schemes print this reasoning as the justification that earns the point.

看气体物质的量变化

MS

✗ Deciding which species is oxidised by guessing.

✓ **Use the cell's behaviour or the standard potentials: a working cell means E° is positive, which fixes the direction.**

The guidelines print both routes as accepted justifications.

用电极电势判断氧化还原

SG 2 years

✗ Choosing a titrant without checking the thermodynamics.

✓ **Pick the one for which E° is positive, or ΔG° negative.**

The guidelines award the point for choosing the correct titrant AND understanding why.

滴定剂选择要看自发性

SG2021 Q4

■ Where you calculate an entropy or enthalpy from tabulated values, write the subtraction out – products minus reactants – before the arithmetic. The set-up is a separate point.

先写 “ 产物减反应物 ”

SG2023 Q1