A-Level Chemistry

Common Mistakes · 常见错误

These are the errors that lose marks a candidate had already earned by understanding the chemistry. Almost all are about precision: a missing condition, a missing state, a unit not converted. 下列错误都不是不懂化学, 而是写得不够精确。

Moles, units and arithmetic

Forgetting to convert cm^3 to dm^3 before using $c = n/V$. Divide by 1000. This single conversion accounts for more lost calculation marks than any other step in the subject.

Using the mass of the SOLUTE instead of the mass of the SOLUTION in $q = mc\Delta T$. The water is what warms up.

Reporting an enthalpy change without a sign. Exothermic is negative; a missing sign loses the mark even when the number is right.

Giving an enthalpy change in J when the question asked for kJ mol^{-1}, or forgetting to divide by the moles of the limiting reagent.

Rounding intermediate values. Keep full precision until the last line.

Quoting an answer to more significant figures than the data allows – usually three.

Not identifying the limiting reagent before calculating a yield. The reagent in excess never determines the amount of product.

Conditions and states

Omitting state symbols where the question asks for them, and omitting the charge on an ion in an ionic equation.

Defining an enthalpy change without 'one mole' and without 'standard conditions'. Both are marks.

Writing a definition of first ionisation energy without 'gaseous'. It must be gaseous atoms forming gaseous 1+ ions.

Giving reaction conditions vaguely. 'Heat' is not a condition – say reflux, or distil, or the temperature; say the solvent; say the catalyst.

Forgetting that concentrated and dilute acid can give different products, and that hot and cold change the outcome for halogens with alkali.

Bonding and structure

Saying a hydrogen bond forms between hydrogen and any electronegative atom. It requires N, O or F on BOTH sides – a lone pair on one, and H bonded to N, O or F on the other.

Confusing intermolecular forces with covalent bonds. Boiling a simple molecular substance breaks the forces BETWEEN molecules, not the bonds within them.

Explaining a trend in boiling point by 'bigger molecule' alone. Say more electrons, so stronger induced-dipole forces, so more energy needed.

Predicting shape without counting LONE pairs. Lone pairs repel more than bonding pairs, which is why ammonia is pyramidal rather than trigonal planar.

Calling a dative covalent bond a different KIND of bond once formed. It is identical to any other covalent bond; only its origin differs.

Energetics, kinetics and equilibrium

Saying a catalyst lowers the activation energy of the reaction. It provides an ALTERNATIVE pathway with a lower activation energy – the original pathway is unchanged.

Saying a catalyst shifts the position of equilibrium. It speeds both directions equally and changes only the time taken to reach equilibrium.

Deducing the order of a reaction from the stoichiometric equation. Order is determined experimentally, and only species up to and including the rate-determining step appear in the rate equation.

Applying Le Chatelier to a temperature change without checking the sign of ΔH. Raising temperature favours the ENDOTHERMIC direction.

Saying increasing pressure always shifts equilibrium right. It shifts towards the side with FEWER moles of gas – which may be either side.

Including solids or pure liquids in a K_c expression. Only species whose concentration can change appear.

Acids, redox and electrochemistry

Confusing strength with concentration. A strong acid is fully dissociated; a concentrated acid has a lot of solute. A dilute strong acid and a concentrated weak acid are both possible.

Using the strong-acid pH formula for a weak acid. A weak acid needs K_a and the approximation $[\mathrm{H}^+] = \sqrt{K_a c}$.

Assigning oxidation numbers by charge on the whole species rather than element by element, and forgetting that oxygen is -1 in a peroxide.

Getting the electrode signs the wrong way round. In an electrochemical cell the more negative $E^\ominus$ half-cell is the negative electrode and is oxidised.

Assuming a feasible reaction is a fast one. $E^\ominus$ predicts feasibility, not rate.

Organic chemistry

Drawing a structure with a carbon making five bonds – always count.

Writing a mechanism without curly arrows, or with arrows starting on an atom rather than on a bond or a lone pair. The arrow shows a PAIR of electrons moving, and it starts where they are.

Confusing nucleophile with electrophile. A nucleophile donates an electron pair; an electrophile accepts one.

Giving the wrong product for oxidation of a primary alcohol: distilling gives the aldehyde, refluxing gives the carboxylic acid. The question tells you which apparatus.

Naming a compound without the lowest possible locants, or leaving out the stereochemistry when the question asked for it.

Saying a molecule is chiral without checking that the carbon carries four DIFFERENT groups.

Forgetting that a benzene ring does not decolourise bromine water without a catalyst, which is what distinguishes it from an alkene.