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A-Level Chemistry

How to Answer Every Question - Exam Technique Guide

Edexcel Chemistry (9CH0) | A-Level | 9 question types

THE NILE METHOD - every question, every time

1. Read the COMMAND WORD first - it tells you the skill (state / explain / evaluate).
2. Check the MARKS - roughly one developed point (or mark-scheme line) per mark.
3. Match the ASSESSMENT OBJECTIVES the marks reward (AO1 knowledge / AO2 application / AO3 evaluation).
4. PLAN before long answers - jot points, then write in clear PEEL / chain-of-reasoning paragraphs.
5. Use precise terminology, evidence and (where relevant) named studies or data.
6. For evaluation, write developed chains and a justified judgement - not a list.

Multiple Choice (Section A) · “Select one answer - A, B, C or D”

TESTS	AO1 recall and quick AO2 reasoning; one mark, no working credited
METHOD	**1.** Read the stem twice and underline what is actually asked - note any word like NOT, never, always or increases. **2.** Predict the answer before looking at the options so a plausible-looking distractor cannot bait you. **3.** Eliminate options that fail on a single clear reason rather than hunting for the right one. **4.** For numerical items, do the calculation in full on paper - the wrong distractors are built from common slips. **5.** Commit one clear mark on the grid and move on; never leave a blank because there is no negative marking.
STRUCTURE	No written structure - the single grid mark is the whole answer, so spend the time on certainty, not prose.
MODEL	*Which species is reduced in: $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$? Cu^{2+} gains two electrons (oxidation number falls from +2 to 0), so Cu^{2+} is reduced - choose that option.*
PITFALLS	› Missing the word NOT or EXCEPT in the stem and picking a true statement that is the wrong answer. › Picking the first option that looks right instead of checking all four - distractors are designed to look correct. › Guessing a calculation answer instead of working it out, so a manufactured wrong value traps you.

Short Recall - 'State' / 'Give' / 'Name' (1-2 marks) · “State, give, name, identify or write the formula”

TESTS	AO1 factual recall; the mark scheme accepts only a precise, correct term
METHOD	**1.** Answer the exact word used - 'state' wants a fact, 'name' wants a name, 'give the formula' wants a formula. **2.** Keep it to one clean point per mark; do not pad with explanation that is not asked for. **3.** Use correct chemical notation - charges as superscripts, numbers of atoms as subscripts. **4.** If two marks, give two distinct points, not the same idea reworded.
STRUCTURE	One short sentence or one formula per mark - no introduction, no justification unless the command word asks for it.
MODEL	*State the formula of the ion formed when chlorine acts as an oxidising agent: Cl^-. State one observation when chlorine water is added to potassium bromide solution: the solution turns orange.*
PITFALLS	› Writing a vague phrase such as 'it goes a different colour' instead of naming the colour. › Giving the name when the formula is asked for, or the reverse - read the command word. › Wrong notation, for example writing $Cl2^-$ or CL instead of Cl^-.

Multi-step Calculation - Moles, Titration, Atom Economy · "Calculate, determine or work out (show your working)"

TESTS	AO2 applying the mole concept; method marks for each step plus a final answer to correct significant figures
METHOD	**1.** Write the balanced equation and underline what the question asks you to find. **2.** Convert the given data to moles first - use $n = m/M_r$, or $n = c \times V$ (with V in dm^3) for solutions. **3.** Use the equation ratio to scale moles from the known species to the unknown. **4.** Convert moles back to the quantity wanted - mass, concentration, volume or percentage - carrying units at every line. **5.** Round only the final answer to the lowest number of significant figures in the data, and state the unit.
STRUCTURE	One labelled line of working per mark, in order - moles in, ratio, moles out, final conversion, answer with unit and significant figures.
MODEL	*25.0 cm^3 of NaOH is neutralised by 23.40 cm^3 of 0.100 mol dm^{-3} HCl. n(HCl) = 0.100 × 0.02340 = 2.34 × 10^{-3} mol. Ratio 1:1, so n(NaOH) = 2.34 × 10^{-3} mol. c(NaOH) = 2.34 × 10^{-3} ÷ 0.0250 = 0.0936 mol dm^{-3} (3 s.f.).*
PITFALLS	› Forgetting to convert cm^3 to dm^3 (dividing by 1000), giving an answer 1000 times out. › Rounding part-way through so the final figure drifts - keep full precision until the last line. › Quoting too many or too few significant figures, or dropping the unit on the final answer.

Energetics, Equilibrium and pH Calculations · "Calculate ΔH, K_c, K_p or pH"

TESTS	AO2 selecting and applying the correct formula with state-dependent rules and consistent units
METHOD	**1.** Identify which quantity is wanted and quote the correct equation - Hess cycle, $q = mc\Delta T$, K_c expression, or $pH = -\log[H^+]$. **2.** For ΔH from experiment, find $q = mc\Delta T$ in joules, divide by moles of the limiting reactant, and convert to kJ mol^{-1}. **3.** For equilibrium of a reaction such as $N_2 + 3H_2 \rightleftharpoons 2NH_3$, build the expression from the balanced equation - products over reactants, each raised to its mole number. **4.** For pH, decide strong or weak acid first; strong uses $[H^+]$ directly, weak uses $K_a = [H^+]^2 \div [HA]$. **5.** State the sign of ΔH, the units of K (which depend on the expression), and pH to two decimal places.
STRUCTURE	Quote the formula, substitute with units shown, evaluate, then state the answer with the correct sign or units and the right precision.
MODEL	*Find the pH of 0.0500 mol dm^{-3} HCl. HCl is a strong monoprotic acid, so $[H^+]$ = 0.0500 mol dm^{-3}. pH = $-\log(0.0500)$ = 1.30 (2 d.p.).*
PITFALLS	› Forgetting that exothermic ΔH is negative, so writing a positive value for a temperature rise. › Leaving K_c with no units or the wrong units - derive units from the expression each time. › Using the strong-acid method on a weak acid (or ignoring the K_a step), giving the wrong pH.

Explain / Justify (AO2 reasoning) · “Explain why, justify or account for”

TESTS	AO2 chemical understanding; the mark scheme rewards a clear cause linked to its effect, not a restated observation
METHOD	**1.** Name the underlying chemical principle first - bonding, electronegativity, intermolecular forces, Le Chatelier, or activation energy. **2.** Link cause to effect with a connective such as 'because' or 'therefore' so each idea earns its mark. **3.** Use correct technical vocabulary and reference data or trends in the question where given. **4.** Make one separate marking point for each mark available, checking the mark tariff before you stop.
STRUCTURE	Statement of the principle, then a 'because… therefore…' chain that ends at the property or observation being explained.
MODEL	*Explain why the boiling point of HF is higher than HCl. HF molecules form hydrogen bonds because F is highly electronegative and small, whereas HCl has only weaker dipole-dipole forces; more energy is therefore needed to separate HF molecules, so its boiling point is higher.*
PITFALLS	› Describing what happens instead of explaining why - 'it boils at a higher temperature' restates the question. › Vague cause-and-effect such as 'the bonds are stronger' without naming the type of force. › Stopping after one point when the question is worth two or three marks.

Organic Mechanism / Reaction Pathway · “Describe the mechanism, draw the mechanism or outline the synthesis”

TESTS	AO1 and AO2 organic mechanism marks; curly arrows, intermediates, reagents and conditions are each separately marked
METHOD	**1.** Name the mechanism type - free-radical substitution, electrophilic addition, nucleophilic substitution or addition, electrophilic substitution. **2.** Draw curly arrows from a bond or lone pair to where the electron pair goes; a full arrow shows a pair, a half-arrow (fish-hook) a single electron. **3.** Show every intermediate with the correct charge or radical dot, and balance the charge on each species. **4.** State the essential reagents and conditions - for example concentrated H_2SO_4, UV light, reflux, or aqueous warm NaOH. **5.** For a multi-step synthesis, give the reagent and product at each arrow so each conversion is unambiguous.
STRUCTURE	Reactant with curly arrow → intermediate → product, each step labelled with reagent and condition; one clearly drawn feature per mark.
MODEL	*Nucleophilic substitution of bromoethane by hydroxide: the lone pair on OH^- attacks the $\delta+$ carbon (arrow from O to C), while the C−Br bonding pair moves onto Br (arrow from bond to Br), giving ethanol and Br^-. Reagent: warm aqueous NaOH.*
PITFALLS	› Curly arrows starting from an atom rather than from a bond or a lone pair of electrons. › Omitting conditions - for instance forgetting UV light for free-radical substitution or 'concentrated' for nitration. › Leaving an intermediate without its charge or radical dot, so the species is not balanced.

Suggest - Apply to Unfamiliar Context (AO3) · “Suggest, predict or deduce from the information given”

TESTS	AO3 transferring known chemistry to new data; the mark scheme credits reasoning consistent with the stimulus, not memorised facts
METHOD	**1.** Read the unfamiliar information carefully and pull out the chemistry you already know that is analogous. **2.** State a reasoned prediction - 'suggest' means a sensible answer supported by chemical logic is accepted. **3.** Tie your answer explicitly to the data, graph or structure provided in the question. **4.** Check your suggestion is consistent with any trend or rule the question has established.
STRUCTURE	A short claim plus its justification drawn from the given context - predict, then say which feature of the data supports it.
MODEL	*A new haloalkane reacts faster than the chloro compound. Suggest why: the carbon-iodine bond is weaker than the carbon-chlorine bond, so it breaks more readily, therefore the iodo compound is hydrolysed faster.*
PITFALLS	› Ignoring the data given and writing a generic textbook answer that does not fit the new context. › Giving a prediction with no chemical reason, so it earns no AO3 reasoning mark. › Contradicting a trend the question has already stated in the stem.

Required-Practical / Core-Practical Method · “Describe how, plan the procedure or evaluate the method”

TESTS	AO1 and AO3 practical skills; marks for apparatus, technique, control of variables, safety and reliability
METHOD	**1.** Name the specific apparatus with the right precision - burette and pipette for titration, gas syringe for volume of gas, thermometer reading to 0.1 °C. **2.** Give the measurements to take and which variables to control or keep constant for a fair test. **3.** State how to improve reliability - repeat and average concordant titres within 0.10 cm^3, or repeat readings and discard anomalies. **4.** Add a relevant safety point tied to a hazard actually present, for example wear eye protection with corrosive acid. **5.** When evaluating, identify the main source of error and say specifically how it would change the result.
STRUCTURE	Apparatus, then ordered steps with the quantities measured, then reliability and safety - written so another student could repeat it exactly.
MODEL	*To find an enthalpy of neutralisation: measure 25.0 cm^3 of acid with a pipette into an insulated cup, record the start temperature, add the alkali, stir and record the maximum temperature; repeat and average. Improve accuracy by using a lid to reduce heat loss to the surroundings.*
PITFALLS	› Naming a measuring cylinder where a pipette or burette is required for accurate volumes. › A generic safety line such as 'be careful' instead of a hazard-specific precaution. › Vague evaluation like 'there were errors' without saying which error and its direction of effect.

Extended Response - 6-mark QWC / Levels-marked · “Evaluate, compare, discuss or explain fully (6 marks)”

TESTS	AO1, AO2 and sometimes AO3 together; a levels-based mark scheme rewarding a sustained, logically linked, well-organised argument
METHOD	**1.** Plan in the margin - jot four to six distinct chemical points before writing so the answer is organised, not rambling. **2.** Open with the principle, then develop each point in a logical sequence, linking ideas so the argument flows. **3.** Cover both sides if the command is 'evaluate', 'compare' or 'discuss', then reach a justified conclusion. **4.** Use accurate terminology and equations or data throughout - Level 3 needs scientifically correct detail, not just relevant ideas. **5.** Finish with a clear concluding sentence that answers the actual question asked.
STRUCTURE	Brief plan, a logically ordered paragraph of linked points (each developed, not listed), then a one-line conclusion - coherent prose is required for top-band credit.
MODEL	*Comparing two fuels: state each combustion enthalpy, link the larger release to stronger or more numerous bonds formed, weigh this against the carbon dioxide produced per mole, then conclude which is better for the stated purpose and justify the choice from the data.*
PITFALLS	› Writing a disconnected bullet list - levels-marked answers need linked, flowing reasoning to reach the top band. › Giving only one side of an 'evaluate' or 'discuss' question, capping the marks in a lower band. › Strong chemistry but no conclusion, so the response never answers the question and loses the final marks.