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GCSE Chemistry

Common Mistakes - and How to Avoid Them

AQA Chemistry (8462) | GCSE | 17 mistakes fixed

The mistakes that lose the most marks in **GCSE Chemistry (AQA)** - the ones examiners report year after year. For each: what students do wrong, the correct method step by step, and the one habit that stops you making it again. Read the fix, not just the error.

MISTAKE 1 Confusing mass number and atomic number

WHAT STUDENTS DO	Students read the larger number as protons, so they give the wrong number of protons, neutrons or electrons for an atom or ion.
DO THIS INSTEAD	**1.** Identify the atomic (proton) number Z - the SMALLER number, equal to protons. **2.** Identify the mass number A - the LARGER number, equal to protons + neutrons. **3.** Neutrons = A - Z (mass number minus atomic number). **4.** In a neutral atom, electrons = protons = Z. **5.** For an ion, adjust electrons by the charge: +2 means 2 fewer electrons, -1 means 1 more.
HOW TO AVOID IT	› Always write 'Z = protons (smaller), A = protons+neutrons (bigger), neutrons = A - Z' before answering.

MISTAKE 2 Forgetting state symbols in equations

WHAT STUDENTS DO	Students write balanced equations with no (s), (l), (g) or (aq), dropping the state-symbol mark.
DO THIS INSTEAD	**1.** Balance the equation for atoms first. **2.** Add (s) for solids/precipitates, (l) for pure liquids like water. **3.** Add (g) for gases such as CO2, H2 and O2. **4.** Add (aq) for anything dissolved in water (acids, alkalis, soluble salts in solution). **5.** Check every formula in the equation has a state symbol.
HOW TO AVOID IT	› Treat the equation as unfinished until every species carries a state symbol.

MISTAKE 3 Balancing by changing formulae instead of using big numbers

WHAT STUDENTS DO	To balance oxygen students change H2O to H2O2 or O2 to O3, inventing wrong substances.
DO THIS INSTEAD	**1.** Write correct formulae first and never alter the small subscripts. **2.** Balance only by putting large numbers in front of whole formulae. **3.** Balance metals/non-oxygen atoms first, then hydrogen, then oxygen last. **4.** Use fractions if needed, then double every number to clear them. **5.** Recount each element on both sides to confirm it balances.
HOW TO AVOID IT	› Subscripts are fixed by chemistry; only the big multipliers may change.

MISTAKE 4 Moles: rounding the Ar/Mr or answer too early

WHAT STUDENTS DO	Students round relative masses or intermediate mole values, so the final mass or volume is out by a few percent.
DO THIS INSTEAD	**1.** Work out Mr by adding the correct Ar of every atom in the formula. **2.** Use moles = mass / Mr, keeping full calculator precision. **3.** Carry the unrounded mole value into the next step. **4.** Only round the FINAL answer, to the significant figures given in the question. **5.** State the unit (g, mol, or dm3) with the answer.
HOW TO AVOID IT	› Round once, at the end - never the Mr or a midway value.

MISTAKE 5 Using 24 dm3 wrongly for gas volume

WHAT STUDENTS DO	Students multiply mass instead of moles by 24, or forget gas volume only works at room temperature and pressure.
DO THIS INSTEAD	**1.** Convert the given mass to moles using moles = mass / Mr. **2.** Confirm conditions are rtp (room temperature and pressure). **3.** Volume in dm3 = moles x 24. **4.** For cm3, multiply the dm3 answer by 1000. **5.** Quote the unit clearly (dm3 or cm3).
HOW TO AVOID IT	› It is moles x 24, not mass x 24 - find moles first.

MISTAKE 6 Mixing up exothermic and endothermic

WHAT STUDENTS DO	Students label a temperature RISE as endothermic, or draw an energy profile with products above reactants for an exothermic reaction.
DO THIS INSTEAD	**1.** Temperature of surroundings goes UP = exothermic = energy released. **2.** Temperature goes DOWN = endothermic = energy taken in. **3.** On a profile, exothermic has products BELOW reactants (energy released). **4.** Endothermic has products ABOVE reactants. **5.** Always mark the activation energy as the hump from reactants to the peak.
HOW TO AVOID IT	› Heat felt = exothermic (products lower); cold felt = endothermic (products higher).

MISTAKE 7 Bond energy sign error

WHAT STUDENTS DO	Students subtract the wrong way round and lose the sign, giving a positive value for an exothermic reaction.
DO THIS INSTEAD	**1.** Energy = bonds broken (in reactants) - bonds made (in products). **2.** Breaking bonds is endothermic (positive); making bonds is exothermic (negative). **3.** Add up all bond energies broken, then all bonds made. **4.** Subtract: energy in - energy out. **5.** A NEGATIVE result is exothermic; a POSITIVE result is endothermic.
HOW TO AVOID IT	› Use 'broken minus made'; a negative answer means exothermic.

MISTAKE 8 Reading rate graphs without reading the axes

WHAT STUDENTS DO	Students say the faster reaction is the one that finishes higher, ignoring that steeper means faster and the final height shows total product.
DO THIS INSTEAD	**1.** Read both axis labels and units before describing anything. **2.** A STEEPER gradient at the start = faster initial rate. **3.** The graph levelling off (plateau) means the reaction has finished. **4.** Two reactions ending at the same height made the same amount of product. **5.** Rate = change in quantity / time; draw a tangent for rate at an instant.
HOW TO AVOID IT	› Steepness = speed, final height = amount; never confuse the two.

MISTAKE 9 Reversible reactions and Le Chatelier the wrong way

WHAT STUDENTS DO	Students say increasing pressure shifts equilibrium to the side with MORE gas molecules, or that a catalyst changes the position.
DO THIS INSTEAD	**1.** Write the balanced reversible equation and count gas moles each side. **2.** Increase pressure -> shifts to the side with FEWER gas molecules. **3.** Increase temperature -> shifts in the ENDOthermic direction. **4.** Increase a reactant concentration -> shifts towards products. **5.** Remember a catalyst speeds both directions equally and does NOT move the position.
HOW TO AVOID IT	› Use 'oppose the change'; catalysts change speed, never equilibrium position.

MISTAKE 10 Naming organic compounds and homologous series

WHAT STUDENTS DO	Students label any hydrocarbon an alkane, or confuse alkene with alkane and forget the C=C double bond.
DO THIS INSTEAD	**1.** Count the carbons: meth-1, eth-2, prop-3, but-4. **2.** All single C-C bonds and formula CnH2n+2 = alkane (ending -ane). **3.** A C=C double bond and formula CnH2n = alkene (ending -ene). **4.** Alkenes decolourise bromine water; alkanes do not. **5.** Name from the stem plus the correct ending.
HOW TO AVOID IT	› Double bond present = alkene (CnH2n, decolourises bromine water).

MISTAKE 11 Chromatography Rf calculation upside down

WHAT STUDENTS DO	Students divide solvent distance by spot distance, giving an Rf greater than 1.
DO THIS INSTEAD	**1.** Measure distance moved by the SPOT from the start line (pencil line). **2.** Measure distance moved by the SOLVENT front from the same line. **3.** Rf = distance moved by spot / distance moved by solvent. **4.** Rf is always between 0 and 1 (no units). **5.** If your value exceeds 1, you have divided the wrong way - swap them.
HOW TO AVOID IT	› Spot on top, solvent on bottom; Rf can never exceed 1.

MISTAKE 12 Forgetting to draw the baseline in pencil

WHAT STUDENTS DO	Students draw the chromatography start line in pen, so the ink dissolves and ruins the result, losing a method mark.
DO THIS INSTEAD	**1.** Draw the start line in PENCIL near the bottom of the paper. **2.** Spot the samples on the line and let them dry. **3.** Place the paper in solvent so the solvent level is BELOW the line. **4.** Let the solvent rise, then mark the solvent front before it dries. **5.** Explain pencil is used because it is insoluble in the solvent.
HOW TO AVOID IT	› Pencil baseline, solvent below the spots - state both in the method.

MISTAKE 13 Test for gases mixed up

WHAT STUDENTS DO	Students say a glowing splint relights for hydrogen, or limewater turns cloudy for oxygen.
DO THIS INSTEAD	**1.** Hydrogen -> lit splint gives a SQUEAKY POP. **2.** Oxygen -> a GLOWING splint RELIGHTS. **3.** Carbon dioxide -> limewater turns from clear to MILKY/cloudy. **4.** Chlorine -> bleaches damp blue litmus paper white. **5.** Match the gas to its specific test in the answer.
HOW TO AVOID IT	› Pop = hydrogen, relights glowing splint = oxygen, cloudy limewater = CO2.

MISTAKE 14 Crude oil fractions and cracking confusion

WHAT STUDENTS DO	Students say small molecules have high boiling points, or that cracking makes longer chains.
DO THIS INSTEAD	**1.** Longer hydrocarbon chains have STRONGER intermolecular forces and HIGHER boiling points. **2.** They condense LOW in the fractionating column (the hot bottom). **3.** Short chains (petrol/gases) come off near the COOL top. **4.** Cracking breaks LONG chains into SHORTER, more useful alkanes plus alkenes. **5.** Cracking uses heat and a catalyst (or steam) and always makes at least one alkene.
HOW TO AVOID IT	› Long chain = high boiling point = bottom of column; cracking shortens chains.

MISTAKE 15 Greenhouse gases vs ozone vs acid rain

WHAT STUDENTS DO	Students blame CO2 for acid rain or say carbon dioxide damages the ozone layer, mixing up the issues.
DO THIS INSTEAD	**1.** Carbon dioxide and methane are GREENHOUSE gases causing global warming. **2.** Sulfur dioxide (from sulfur impurities in fuel) causes ACID RAIN. **3.** Incomplete combustion produces carbon monoxide (toxic) and soot/particulates. **4.** Acid rain corrodes buildings and damages plants and aquatic life. **5.** Match each pollutant to its specific environmental effect.
HOW TO AVOID IT	› CO2/CH4 = global warming; SO2 = acid rain; CO = toxic gas - keep them separate.

MISTAKE 16 Required practical: not repeating or controlling variables

WHAT STUDENTS DO	Students change two things at once or do one run, so AQA's practical questions on validity and repeatability lose marks.
DO THIS INSTEAD	**1.** Identify the independent variable (the one you change). **2.** Identify the dependent variable (the one you measure). **3.** List control variables and keep them constant for a fair test. **4.** Repeat readings and calculate a mean, ignoring anomalies. **5.** State how repeats improve reliability/repeatability of the result.
HOW TO AVOID IT	› Change one variable, control the rest, repeat and mean - state this explicitly.

MISTAKE 17 Reactivity series and displacement direction

WHAT STUDENTS DO	Students predict a less reactive metal displacing a more reactive one, or get the ionic half-equations backwards.
DO THIS INSTEAD	**1.** Recall the order: K, Na, Ca, Mg, Al, (C), Zn, Fe, (H), Cu, Ag, Au. **2.** A more reactive metal displaces a less reactive metal from its compound. **3.** Write the displacement: more reactive metal + salt of less reactive metal. **4.** Oxidation is loss of electrons; reduction is gain (OIL RIG). **5.** Check the more reactive metal is oxidised (loses electrons) in the half-equation.
HOW TO AVOID IT	› Only a more reactive metal displaces a less reactive one - check the series first.