

EXAMINER TIPS FOR IGCSE CHEMISTRY (0620)

How to use these tips

These tips highlight some common mistakes made by students. They are collected under various subheadings to help you when you revise a particular topic. Many of the tips relate to June 2004 papers.

PAPER 1

- Some questions may ask you to choose a combination of things in order to select the correct answer – understand exactly what is required before you start to answer
- Within a single question, use a pencil to cross out the choices that are clearly incorrect, then choose between the others

GENERAL TIPS FOR PAPERS 2, 3, 5 AND 6

- Read the question correctly. For example, if the question says 'give two observations apart from temperature change', don't include temperature change in your answer
- Check for contradictions within your answer. For example, a common error is to write 'a white *insoluble* precipitate *dissolves*' (6.5(a)(i)) Show any workings
- In any calculation, the final answer should be to the correct number of significant figures – generally the same as the data. You may be penalized if you write an excess number of significant figures e.g. 1.257487 instead of 1.26
- Know your syllabus statements and definitions exactly – use the Revision Checklist on the website. Don't add your own ideas to the statements. For example, the syllabus statement on batteries says 'they are *portable*', meaning they can be easily carried around: an answer such as 'they are small' may not be accepted, as something can be small yet heavy (3.1(a))
- If asked to 'describe what you would observe', write down what you see, hear or feel (e.g. 'the test tube gets hot'). A common mistake is to write something like 'a gas is given off' or 'copper is deposited'; these are not observations, these are conclusions
- If asked to 'describe what you would see', don't note observations about sounds or temperature
- Learn your definitions! Questions such as "what is a compound?" or "Define the mole." are often poorly answered. Define does not mean 'give an example of.'
- When drawing diagrams:
 - (i) make sure they fill the space given on the paper and are LABELLED
 - (ii) when drawing apparatus for gas measurement, make sure that the gas cannot escape. For example, don't draw a gas syringe with the plunger much smaller than the syringe barrel – this is a common error
- When asked to give examples, give the number requested by the examiner. For example, if asked to give two examples, do not give three – if one is incorrect, you may lose a mark. If a question asks for a single use for a substance don't write a list – the examiner will think you are 'playing safe' and you won't get the mark (2.5(d))
- If you have to tick boxes to answer a question, make sure that you tick the correct number – don't assume that a single answer is always required (2.5(f))

- In chemistry, when plotting a graph of reaction rate, you must draw a curve of best fit through your points. Lines drawn with a ruler from point to point will not get a mark (5.1(b)(i))
- Look out for 'hidden words' in questions such as 'which of the following is a gas containing diatomic molecules?' Many students focus on one or two words, and might forget 'gas'. Underline key words and read the question slowly (2.1(e)(i))
- Avoid vague statements. For example, if the question asks about the use of graphite, the answer 'graphite is used for electrodes in electrolysis' is appropriately specific. 'Graphite is used in electrolysis,' is too vague (2.1(d)(ii))

PAPERS 1, 2 AND 3: TIPS ON SPECIFIC TOPICS

Acids and bases

- Don't confuse the pH scale with the degree of acidity. The more acidic the substance, the lower the pH – learn this by remembering that 'a' (for acid) is the lowest numbered letter of the alphabet (1.30)
- A common error is to think that less sodium hydroxide is needed to neutralise a weak acid than to neutralise a strong acid of the same concentration. The *same amount* is needed because the hydroxide is reacting with all the acidic hydrogens in the molecule, not just those that have ionised (3.6(b)(ii))
- The phrase '*explain why* this acid is acting as a base' demands a chemical reason (usually based on particle theory). The examiner is looking for an answer involving proton transfer. Vague answers (such as 'it is neutralising the base') are not accepted as they do not give an explanation (3.2(b)(iv))
- Simple inorganic salts such as sodium chloride are generally neutral when dissolved in water – they are not acidic (1.3)
- Nitric acid is a strong, not a weak, acid (6.7(c))

Air and water

- To remember that carbon monoxide is poisonous (it binds to haemoglobin), think of the 'nox' in carbon monoxide as being short for noxious (poisonous). The effects of pollutant gases on nature are often confused, as not all pollutant gases are acidic. Know the different effects of carbon monoxide, sulphur dioxide and carbon dioxide (1.31)
- A common error is to think that fume cupboards keep air away from a reaction. Fume cupboards have a continuous airflow to allow poisonous vapours to escape through the fan (6.3(d))

Atomic structure and bonding

- It is a common mistake to count the bonds and not the electrons when asked about the number of electrons shared between the atoms in a molecule. For example, the number of shared electrons in methane is eight *not* four (1.8)
- Take care when writing electronic structures including hydrogen. Always show the hydrogen atom either as a circle or (if ionic) by its symbol. It is best practice to write the symbol of the atom in the centre so it is clear to the examiner which atom is which (2.1(f)(i))
- When writing dot-and-cross diagrams for ionic structures, put the charge outside of the brackets, at the top, not in the centre of the atom

- When asked about the number of covalent bonds in a compound, focus on the outer energy level / shell electrons that are shared, not the total number of electrons. Remember that some molecules have non-bonding pairs of electrons e.g. nitrogen (3.1(b)(i))
- When drawing dot-and-cross diagrams for molecules such as nitrogen which have only three bonding pairs of electrons, don't forget to draw in the lone pairs of electrons. Remember that there must be eight electrons surrounding each atom (3.3(b))
- Practice drawing diagrams of giant molecule structures, including silicon dioxide, diamond and graphite, as these are nearly always drawn badly. You must show the continuation bonds (3.1(c)(i))

Electrochemistry

- A common mistake is to think that sulphate ions break up during the electrolysis of aqueous solutions into sulphur dioxide. In fact, oxygen is given off at the positive electrode (from the electrolysis of the water) (3.5(b)(ii))
- If the exam paper shows an electrical circuit to test conduction, observations can also include what can be seen to be happening in the circuit e.g. 'the bulb lights up' (6.3(a))

Energy changes

- If asked whether a reaction is endothermic or exothermic, remember the following: endothermic – heat is put in (e.g. you have to heat with a Bunsen to get a reaction); exothermic – heat is given out (e.g. burning fuels and neutralisation reactions are always exothermic) (1.18)

Equations, formulae and moles

- If asked for a word equation, do not write a symbol equation. A word equation tests knowledge of chemical names. Although a correct symbol equation is often accepted this is not guaranteed and if you make an error, you won't get the mark
- A common error is to think that a nitrate ion has a 2- charge. The formula for the nitrate ion is NO_3^- . This makes the formula for nitric acid HNO_3 [(1.9), (3.4(a)(i))]
- The charge on a silver ion is 1+. A common mistake is to think that silver has a 2+ charge
- When working out formulae, don't be confused by oxidation numbers. A common mistake is to think that the formula for lead(IV) oxide is PbO_4 or that lead(II) nitrate is $\text{Pb}_2(\text{NO}_3)$. In a formula you have to balance the positive and negative charges. Lead(IV) = 4+, lead(II) = 2+, oxide = 2- and nitrate = 1-. So lead(IV) oxide is PbO_2 , and lead(II) nitrate is $\text{Pb}(\text{NO}_3)_2$ (1.9)
- If asked to name a salt formed in a particular reaction, don't put down any other product or you will lose a mark (2.1(f)(ii))
- When explaining redox reactions, make sure you understand exactly what is being asked, especially if the question says 'use the equation...'. Don't just give a definition of redox in terms of electron loss or gain. If a question says 'use the equation to explain why the iron oxide is reduced', you must refer to the species in the equation in your answer, e.g. 'the iron oxide loses its oxygen'. 'Iron oxide gains electrons' is incorrect (2.6(b)), (3.1(b)(iii))
- When calculating moles, if you are given an equation such as:

$$\text{Mg} + 2\text{CH}_3\text{CO}_2\text{H} \rightarrow (\text{CH}_3\text{CO}_2)_2\text{Mg} + \text{H}_2$$

ignore the 2 in the equation when calculating the molar mass of ethanoic acid. The molar mass of ethanoic acid is 60, not 120. However, remember when calculating reacting masses that the 2 needs to be taken into account

Experimental methods

- If you are distilling an aqueous solution of a salt, the salt itself does not evaporate as it has too high a boiling point. Only the water evaporates (1.30)

Organic chemistry

- Examiners are often very particular. One way to please them is to use the word 'only' in the definition of a hydrocarbon i.e. the answer 'a compound containing only carbon and hydrogen'. (2.4(d)(i))
- Only one compound is formed in the reaction of ethene with steam. Remember, this is a simple addition reaction (one compound formed from two or more substances) – a common error is to say that hydrogen is also formed (1.40)(2.2(b)(v))
- When trying to identify 'cracking' reactions from a set of reactions given, look out for one molecule of reactant forming two or more molecules of product. Remember that cracking does not involve oxygen
- 'Clear' does not mean 'colourless'; when bromine is added to an alkene the colour change is red-brown to colourless, not red-brown to clear (3.7(c)(ii))

Periodic table and metals

- Don't confuse the properties of elements with those of their compounds (especially when they appear in the same question). For example, if asked about the properties of the element oxygen, don't give the properties of an oxide (1.5)
- The properties of transition elements often cause problems. Remember that transition elements themselves are NOT coloured, it is their *compounds* that are coloured
- When trying to distinguish between a transition metal and a non-transition metal, information on boiling points is more important than information on density. Some non-transition elements (such as lead) are very dense (1.25)
- If asked about the *specific properties* of transition metals, don't list general properties of metals, such as 'shiny', 'malleable', etc.
- In questions about sacrificial protection, remember that the more reactive metal of the pair will corrode. To answer this sort of question, know the order of common metals in the reactivity series (1.32)
- 'Corrosive' and 'corrosion' are often confused. 'Corrosive' means that a chemical 'eats away' another substance – acids and alkalis are corrosive. 'Corrosion' is the *process* of 'eating away'. A statement such as 'iron is corrosive' is therefore incorrect (2.6(d)(v))
- The *source* of an element is where it is found (i.e. a particular place or in a particular substance) – a source of sulphur is the southern USA, or petrol. It does not mean the process of extraction. Don't write vague statements such as 'underground' (3.2(a)(i))
- Sulphur dioxide is not used 'to make wood pulp', it is used to bleach wood pulp (3.2(a)(ii))

Qualitative analysis

- Look out for phrases such as '*chemical test*' or '*physical test*' – don't just focus on the word 'test'. For example, a chemical test for water could be 'turns anhydrous copper sulphate blue' (the word 'anhydrous' is essential). A physical test for water could be 'a boiling point of 100oC', using the correct units (2.2(c)(i))
- When testing hydrogen chloride gas with litmus paper, many students think that the litmus paper is bleached first and then goes red. Remember that chlorine does this, not hydrogen chloride (2.1(f)(ii))
- The tests for ammonium and nitrate ions are commonly confused. Both require heating with sodium hydroxide, but to test for nitrate you need to add aluminium, as you need to remove the oxygen (reduce the nitrate) to make the ammonia. You don't need to do this for the ammonium ion as it has no oxygen (3.6(b)(i))
- Tests for aluminium ions and zinc ions are also often confused. Remember PANDA (precipitate of aluminium (hydroxide) does not dissolve in ammونيا). Both zinc and aluminium ions form a white precipitate with sodium hydroxide, which re-dissolves in excess, but in ammonia only the zinc precipitate re-dissolves (1.19)
- Questions involving the height of precipitates when sodium hydroxide is added to a solution of metal ions often cause problems. Remember, as you add more hydroxide to a solution of suitable metal ions (e.g. iron(II) ions) there will be more precipitate until all the metal ions are used up. However, with excess sodium hydroxide, some hydroxides re-dissolve e.g. aluminium hydroxide. In these cases the height of the precipitate will then decrease as you add more hydroxide (3.4(b)(iii))

Rates of reaction and equilibrium

- Many students have difficulty explaining what is meant by rate of reaction. Remember two points: it is the change in volume or mass etc over a fixed period of time. Time is often omitted (2.3(a))
- Remember that the total volume of gas released by the same *amount* of metal is always the same. A common error is to think that powdered metal, when reacted with acid, gives off more gas than larger lumps of the same amount of metal (1.17)
- The total volume of gas released by a catalysed reaction is exactly the same as for an uncatalysed reaction. The same amount of reactants is the important factor (3.3(c)(iii))
- In rate questions, when asked to analyse graphs of volume of gas against time for the reaction of an acid with a metal or carbonate, a common error is to state the volume is increasing and not mention the rate. Remember that the rate is getting less and less with time because rate is the *difference in volume* divided by time (3.3(c)(i))
- A common mistake is to say that in an equilibrium reaction, a catalyst increases the rate of the forward reaction more than the back reaction. One of the characteristics of equilibrium is that the backward and forward reactions go at the same speed. This applies to catalysed as well as uncatalysed reactions (3.2(a)(v))

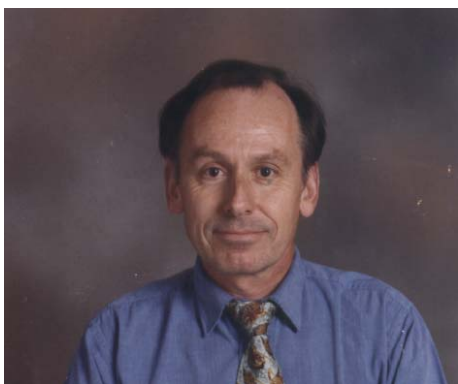
Solubility

- A common error is to think that calcium hydroxide is insoluble in water. Remember that limewater is a solution of calcium hydroxide, so it must at least be slightly soluble (1.20)
- If you are asked to explain what the symbol (aq) means, write down more than 'aqueous'. An answer such as 'dissolved in water' is needed (3.3(a))

TIPS ON PRACTICAL PAPERS

- Makes sure that you know the accuracy to which you can read burettes, measuring cylinders, etc.
- If asked to describe the appearance of a substance, remember that there are generally two points to be made, the state and the colour (5.2(a))
- When making practical observations, use the words 'precipitate' rather than 'cloudy' if you cannot see through the test tube on adding one aqueous solution to another. Don't forget the colour (5.2(c))
- 'Test the pH' means 'give the pH number', not just say whether something is acidic or alkaline (5.2(c))

About the Examiner



Dr. Roger Norris has been an examiner for CIE for about 10 years and is the Principal Examiner for IGCSE Paper 2 as well as Principal Examiner and Team Leader for other Cambridge Chemistry papers. As well as examining Roger has held research positions in the UK and abroad. He has 28 year's teaching experience of Chemistry and other Sciences in UK secondary schools. Roger has also been involved in the development of curriculum material for the Nuffield Foundation and in the production of various published Science and Chemistry courses.