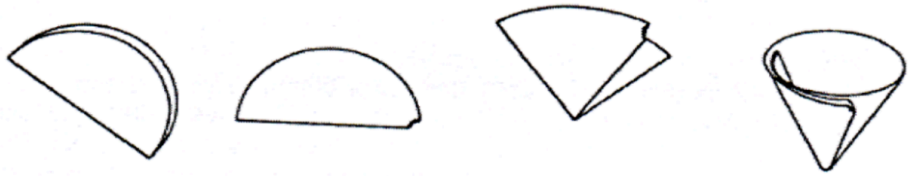
General QA Skills

Observation Type	Things to Note
General Guidelines	1) Keep your bench and apparatus clean to prevent contamination. 2) Make sure droppers, reactant bottles, litmus paper, universal indicator paper, etc. do not touch the side of the test tubes to prevent contamination. 3) When not in use, keep any droppers inside the reagent they are used to add. 4) Regardless of whether you are adding a solid, adding a reagent, heating, etc., always do it slowly first to prevent missing subtle observations. a) For reagents, add dropwise before adding in excess. b) For solids, add one small spatula before adding in excess. c) For heating, heat gently (on and off the flame) before heating strongly. 5) Record any observations immediately because the degrees of change may be required. 6) Write in the margins the ions that you expect to be in the test tube based on your observations. 7) Note down the condition for the observation (e.g. heating, adding what reagent) in the answer booklet. 8) If you know an observation must happen by theory or if the question tells you that it will happen, record the observation even if you don't see it.
Initial Colour	Whenever a new reagent or solid is introduced, note down the colour in the answer booklet. ● Refer to the solid or reagent as "(colour) solid" or "(colour) solution" throughout the series of tests. It is insufficient to just identify its colour once. Additionally, for solids, if it is a distinctive feature, identify if the solid is shiny, a powder or a crystal.
Precipitation	Use a small amount of the unknown reagent to prevent dissolution of ppt. ● Whenever you see the solution becoming opaque, cloudy or have specks, you should note down precipitation. ● For the complex ion test, you must add only a few drops of acid. Even then, you will only see small specks. ● For the CO_2 test, you must add a very small volume of $Ca(OH)_2$. The ppt. is not very obvious. Frequently, a colour change will be observed. Do not discard the test tube if you don't see any change yet. Instead, set it aside.

Solubility	Whenever a solid is added to a liquid or solution, note down the solubility of the solid in the answer booklet. ● You have to identify the liquid or solution added, and the colour of the resultant solution. ○ "Soluble in excess NaOH (aq) giving a colourless solution" ✅ ○ "Soluble in excess" ❌ Whenever testing for solubility, make sure to tap the test tube against the palm of your hand for a sufficiently long time to dissolve solids which may not be very soluble. ● If there is a lot of precipitate in the test tube, or the solute is not very soluble, decant the solution into the sink so that there is less ppt. in the test tube, and continue shaking. When you expect to test for solubility in excess reagent, add less of the reagent that produces a ppt. so that it is the limiting reagent and you will be able to see the solid dissolve.
Gases	Before you carry out any test, always consider what gas might be produced and prepare the relevant gas tests. Normally, gases are produced when these tests are carried out: adding acids, metal strips, powders or heating. ● You will never be testing for SO_2 or NO_2 because these are toxic. If you did not get the expected observation, you did the test wrong. If you expect a gas to be observed, you should add more of the reagent or solid that gives you the gas so that you can see observations more clearly. Some gases may not be produced in a high concentration. Hence, the observations may be very faint. Here are two common examples: ● CO_2: Use limited $Ca(OH)_2$ because if not the ppt. is too faint to see. ● Cl_2: heat the mixture of $KMnO_4$ and Cl^-.
Decomposition	Whenever you are heating a solid directly: ● Add a small amount so you don't have to wait forever if the solid decomposes completely. E.g. $(NH_4)_2CO_3$ ● Hold the tube in an almost horizontal position to speed up heating. ● Note down in the answer booklet if water droplets appear at the mouth of the test tube. This typically happens for crystalline solids. When you are heating a liquid or solution directly: ● Heat gently first before heating strongly to prevent the test tube from cracking. ● Take the test tube off the flame when you start to see bubbles to prevent spurting. ● The test-tube should not be held in a fixed position all the time. Remove it from the flame every now and then and shake gently.

Colour Changes	Whenever you start to see that there is a colour change, note it down immediately. ● Even if it is small or gradual, note down every step that you can. Do not only note down the initial and final colour. It is always safer to record more than less. Always leave a sample of an unknown substance aside to allow for change in colour to be seen if it happens after a while. The colour change can be seen more clearly if you look from the top of the test tube when placed against a white tile.
Filtration	Tear off a small piece of the filter paper to allow for better filtration.  If the residue is required, wash it with deionised water. When the water has drained, wash the precipitate again with deionised water <u>while it is in the filter funnel</u>. Do not collect the washings of the residue together with the filtrate. Record the colour of the filtrate and the residue.
pH	Whenever possible, note down both the colour of the indicator <u>and</u> the exact pH in the answer booklet.
Organic QA	It is <u>extremely</u> important to add small amounts to prevent excess addition. ● When colour change is expected, add only a few drops of the coloured reagent. ● When precipitation is expected, add a few drops of the unknown liquid to prevent dissolution. And add the reagent in excess. When hydrolysis is being used, the reaction mixture has to be placed in a hot water bath for at least 5 minutes If there is an immiscible aqueous and organic layer <u>that needs to be mixed</u>, then tap against the palm of your hand to mix.

Frequently Tested Inorganic QA Tests

Inorganic QA Test	Interpretation and Inference	Observation
Add NaOH (aq). Heat.	Cation test. Prepare moist red litmus paper. Consider preparing another sample of the test to check for colour change over time. This is important if the initial sample is used for another test.	_____ ppt., _____ in excess NaOH (aq) Rapidly turning brown on contact with air Turning brown on contact with air To give a _____ solution Colourless and pungent gas which turns moist red litmus paper blue produced on heating. Gas is NH_3 $2Ag^+ + 2OH^- \rightarrow Ag_2O + H_2O$ **(Dark)** brown ppt Ag_2O is formed if Ag^+ is present, insoluble in excess NaOH (aq).
Add NaOH (aq), add Al foil/Zn, heat	Davarda's Alloy test. i.e. NO_2^- and NO_3^- test. Prepare moist red litmus paper.	$8Al + 5OH^- + 18H_2O + 3NO_3^- \rightarrow 8Al(OH)_4^- + 3NH_3$ $2Al + OH^- + 5H_2O + NO_2^- \rightarrow 2Al(OH)_4^- + NH_3$ $4Zn + 7OH^- + 6H_2O + NO_3^- \rightarrow 4Zn(OH)_4^{2-} + NH_3$ $3Zn + 5OH^- + 5H_2O + NO_2^- \rightarrow 3Zn(OH)_4^{2-} + NH_3$ Grey Al foil/Zn dissolves. On heating, **vigorous effervescence** of colourless, pungent gas which turns damp red litmus paper blue. Gas is NH_3.
Add NH_3 (aq).	Cation test, with exception of NH_3.	_____ ppt., _____ in excess NH_3 (aq) Rapidly turning brown on contact with air Turning brown on contact with air To give a _____ solution

		$NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$ $2Ag^+ + 2OH^- \longrightarrow Ag_2O + H_2O$ $Ag^+ + 2NH_3 \rightleftharpoons [Ag(NH_3)_2]^+$ **(Light)** brown ppt Ag_2O is formed if Ag^+ is present, Soluble in excess NH_3 (aq).
	Silver halide dissolution test. Shaking for a longer duration is expected.	White ppt. is soluble in excess NH_3 (aq) to form a colourless solution. ppt. is AgCl. Cream ppt. is partially soluble in excess NH_3 (aq) ppt is AgBr. Yellow ppt. is insoluble in excess NH_3 (aq). ppt is AgI.
Add concentrated NH_3.	Silver halide dissolution test. Shaking for a longer duration is expected.	White ppt. is soluble in excess concentrated NH_3 to form a colourless solution. ppt. is AgCl. Cream ppt. is soluble in excess concentrated NH_3 to form a colourless solution. ppt is AgBr. Yellow ppt. is insoluble in excess concentrated NH_3. ppt is AgI.
Add $Ba(NO_3)_2$ (aq) or $BaCl_2$ (aq). Add HCl (aq)/HNO_3 (aq)	SO_4^{2-}, SO_3^{2-}, CO_3^{2-} test. SO_3^{2-}, CO_3^{2-} test. Prepare a small volume of $Ca(OH)_2$ (aq).	White ppt. White ppt. soluble in acid to form a colourless solution. Effervescence of colourless, odourless gas which forms white ppt. with $Ca(OH)_2$ (aq). Gas is CO_2. Effervescence of colourless, pungent gas which decolourises purple $KMnO_4$ (aq). Gas is SO_2.

Add H_2SO_4 (aq)	Ba^{2+} test. Check other tests.	White ppt., insoluble in excess H_2SO_4.
	Metals test. Prepare a lighted splint.	Grey solid dissolves. Effervescence of colourless, odourless gas which extinguishes a lighted splint with a 'pop' sound. Gas is H_2.
	SO_3^{2-}, CO_3^{2-}, NO_2^- test. Check other tests. Prepare a small volume of $Ca(OH)_2$ (aq).	Effervescence of colourless, odourless gas which forms white ppt. with $Ca(OH)_2$ (aq). Gas is CO_2. Effervescence of colourless, pungent gas which decolourises purple $KMnO_4$ (aq). Gas is SO_2. Effervescence of brown, pungent gas. Gas is NO_2.
	Complex ion test. I.e. test for Al^{3+}, Zn^{2+}, Cr^{3+}, Cu^{2+}. Check other tests.	_____ ppt. Soluble in excess H_2SO_4 (aq), giving a _____ solution.
Add HCl (aq),	Metals test. Prepare a lighted splint.	Grey solid dissolves. Effervescence of colourless, odourless gas which extinguishes a lighted splint with a 'pop' sound. Gas is H_2.
	SO_3^{2-}, CO_3^{2-}, NO_2^- test. Check other tests. Prepare a small volume of $Ca(OH)_2$ (aq).	Effervescence of colourless, odourless gas which forms white ppt. with $Ca(OH)_2$ (aq). Gas is CO_2. $2H^+ + SO_3^{2-} \rightarrow SO_2 + H_2O$ Effervescence of colourless, pungent gas which decolourises purple $KMnO_4$ (aq). Gas is SO_2. $2H^+ + NO_2^- \rightarrow NO + H_2O$

Heat.		$NO + ½\ O_2 \rightarrow NO_2$ Effervescence of brown, pungent gas. Gas is NO_2.
	Complex ion test. I.e. test for Al^{3+}, Zn^{2+}, Cr^{3+}, Cu^{2+}. Check other tests.	$[Cu(H_2O)_6]^{2+} + 4Cl^- \rightleftharpoons CuCl_4^{2-} + 6H_2O$ Dark blue solution turns yellow-green. _____ ppt. Soluble in excess HCl (aq), giving a _____ solution.
	Ag^+, Pb^{2+} test. Check other tests.	White ppt. Soluble in excess NH_3 (aq), giving a colourless solution.
	Oxidising agent test. Check other tests, especially for H_2O_2. If H_2O_2 is present, top observation still holds but no additional observation. Prepare moist blue litmus paper.	On heating, effervescence of greenish-yellow, pungent gas which turns moist blue litmus paper red, then bleaches it. Gas is Cl_2. Purple solution ($KMnO_4$) decolourises Yellow solution (Fe^{3+}) turns pale green (Fe^{2+}) Orange solution ($Cr_2O_7^{2-}$) turns green (Cr^{3+})
Add HNO_3 (aq).	Metals test. Prepare a lighted splint.	Grey solid dissolves. Effervescence of colourless, odourless gas which extinguishes a lighted splint with a ‘pop’ sound. Gas is H_2
	SO_3^{2-}, CO_3^{2-}, NO_2^- test. Check other tests. Prepare a small volume of $Ca(OH)_2$ (aq).	Effervescence of colourless, odourless gas which forms white ppt. with $Ca(OH)_2$ (aq). Gas is CO_2. Effervescence of colourless, pungent gas which decolourises purple $KMnO_4$ (aq). Gas is SO_2.

		Effervescence of brown, pungent gas. Gas is NO_2.
	Complex ion test. I.e. test for Al^{3+}, Zn^{2+}, Cr^{3+}, Cu^{2+}. Check other tests.	_____ ppt. Soluble in excess H_2SO_4 (aq), giving a _____ solution.
Add Al foil/Zn	Davarda's Alloy test. I.e. NO_2^- and NO_3^- test. Check other tests. Prepare moist red litmus paper.	Al foil/Zn dissolves in NaOH (aq). On heating, **vigorous effervescence** of colourless, pungent gas which turns damp red litmus paper blue. Gas is NH_3.
	Acids test. I.e. HCl, HNO_3, H_2SO_4, Cr^{3+}, Fe^{3+}, Al^{3+}. Prepare a lighted splint. Check other tests.	Effervescence of colourless, odourless gas which extinguishes a lighted splint with a 'pop' sound. Gas is H_2.
Add $AgNO_3$ (aq)	Reducing agent test (Fe^{2+}, H_2O_2). Prepare a glowing splint.	Grey ppt. formed. Ag Pale green solution (Fe^{2+}) turns yellow (Fe^{3+}) Effervescence of colourless, odourless gas, which relights a glowing splint. Gas is O_2. (from H_2O_2)
Add $AgNO_3$ (aq) Add NH_3 (aq)/ Add concentrated NH_3 (aq)	Halides test.	White/Cream/Yellow ppt. White ppt. is soluble in excess NH_3 (aq) and concentrated NH_3 to form a colourless solution. ppt. is AgCl. Cream ppt. is partially soluble in excess NH_3 (aq) and soluble in concentrated NH_3 to form a colourless solution. ppt is AgBr. Yellow ppt. is insoluble in excess NH_3 (aq). and

		concentrated NH_3. ppt is AgI.
Add KI (aq)	Oxidising agent test. Check other tests.	Purple solution ($KMnO_4$) turns brown (I_2) Yellow solution (Fe^{3+}) turns brown (colour of I_2 is darker than pale green Fe^{2+}) Orange solution ($Cr_2O_7^{2-}$) turns brown (colour of I_2 is darker than green Cr^{3+}) Black solid (solid I_2) formed in a brown solution on adding excess KI (if applicable)
	Ag^+/ Pb^{2+} test.	Yellow ppt. Yellow ppt. is insoluble in excess NH_3 (aq) and concentrated NH_3. ppt. is AgI/PbI_2
Add Na_2CO_3 (aq) or $NaHCO_3$ (aq) Add NaOH (aq)/NH_3 (aq) Add HCl (aq) / H_2SO_4 (aq) / HNO_3 (aq)	Acids test. I.e. HCl, HNO_3, H_2SO_4, Cr^{3+}, Fe^{3+}, Al^{3+}. Check other tests. Prepare a small volume of $Ca(OH)_2$ (aq).	$2[M(H_2O)_6]^{3+} + 3CO_3^{2-} \rightarrow 2M(OH)_3(H_2O)_3 + 3CO_2 + 3H_2O$ Effervescence of colourless, odourless gas which forms white ppt. with $Ca(OH)_2$. Gas is CO_2. _____ ppt. _____ ppt. _____ in excess NaOH (aq)/NH_3 (aq) to give a _____ solution _____ ppt. _____ in excess acid to give a _____ solution
Add excess H_2SO_4 (aq).	Reducing agent test (Fe^{2+}, H_2O_2, Cl^-,	Purple $KMnO_4$ decolourised.

Add $KMnO_4$ (aq).	I^-). Prepare a glowing splint. Prepare moist blue litmus paper.	Pale green solution (Fe^{2+}) turns yellow (Fe^{3+}) Effervescence of colourless, odourless gas, which relights a glowing splint. Gas is O_2. (from H_2O_2) On heating, greenish-yellow pungent gas which turns moist blue litmus paper red, then bleaches it evolved. Gas is Cl_2. Colourless solution ($KMnO_4$) turns brown (I_2)
Add Cl_2 (aq) Add Hexane or CCl_4	Halide test. Check other tests.	Cl^-: Solution remained pale yellow When hexane/CCl_4 is added, 2 separate layers form Br^-: Solution turns orange on addition of Cl_2 (aq) When hexane is added, top hexane layer is orange-red and aqueous layer is orange When CCl_4 is added, bottom CCl_4 layer is orange-red and aqueous layer is orange I^-: Solution turns brown on addition of Cl_2 (aq) When hexane is added, top hexane layer is purple and aqueous layer is brown When CCl_4 is added, bottom CCl_4 layer is purple and aqueous layer is brown

Add H_2O_2 (aq)	Reducing agent test (Fe^{2+}, Cl^-, I^-).	Pale green solution (Fe^{2+}) turns yellow (Fe^{3+}) Colourless solution (I^-) turns brown (I_2) On heating, greenish-yellow pungent gas which turns moist blue litmus paper red, then bleaches it evolved. Gas is Cl_2.
	Oxidising agent test. Prepare a glowing splint.	Effervescence of colourless, odourless gas which relights a lighted splint. Gas is O_2. Purple solution ($KMnO_4$) decolourises. Yellow solution (Fe^{3+}) turns pale green (Fe^{2+}) Orange solution ($Cr_2O_7^{2-}$) turns green (Cr^{3+})
Add Fe^{2+} (aq)	Oxidising agent test. Check other tests.	Pale green (Fe^{2+}) solution turns yellow (Fe^{3+}) Purple solution ($KMnO_4$) turns yellow (Fe^{3+}) Orange solution ($Cr_2O_7^{2-}$) turns green (colour of Cr^{3+} is darker than yellow Fe^{3+})
Add $Na_2S_2O_3$ (aq)	Oxidising agent test. Check other tests.	Purple solution ($KMnO_4$) turns colourless Yellow solution (Fe^{3+}) turns pale green (Fe^{2+}) Orange solution ($Cr_2O_7^{2-}$) turns green (Cr^{3+}) Brown solution (I_2) turns colourless (I^-)
Add Fe^{3+} (aq)	Reducing agent test (H_2O_2, Fe^{2+}, I^-). Prepare a glowing splint.	Effervescence of colourless, odourless gas which relights a lighted splint. Gas is O_2.

		Pale green solution (Fe^{2+}) turns yellow (Fe^{3+}) Colourless solution (I^-) turns brown (I_2)
	CO_3^{2-}, HCO_3^- test	Effervescence of colourless, odourless gas which forms white ppt. with $Ca(OH)_2$ (aq). Gas is CO_2.
Heat strongly over flame	Decomposition test	$M(NO_3)_2$ (s) ⟶ MO (s) + ½ O_2 (g) + 2NO_2 (g) ● Brown pungent gas evolved. Gas is NO_2. ● Colourless, odourless gas which relights a glowing splint evolved. Gas is O_2. ● _____ solid turns _____ (where applicable) MCO_3 (s) ⟶ MO (s) + CO_2 (g) ● Colourless odourless gas which forms white ppt. with $Ca(OH)_2$ evolved. Gas is CO_2. ● _____ solid turns _____ (where applicable) $M(OH)_2$ (s) ⟶ MO (s) + H_2O <u>(g)</u> ● Water droplets form on mouth of the test tube. ● _____ solid turns _____ (where applicable) $(NH_4)_2CO_3$ (s) ⟶ 2NH_3 (g) + H_2O (g) + CO_2 (g) ● Colourless, pungent gas which turns damp red litmus paper blue evolved. Gas is NH_3 ● Colourless odourless gas which forms white ppt. with $Ca(OH)_2$ evolved. Gas is CO_2. ● White solid completely decomposes.
	Water of Crystallisation test	IDK.xH_2O (s) ⟶ IDK (s) + xH_2O <u>(g)</u> Water droplets form on the mouth of the test tube. _____ crystals turn _____ (where applicable)

Add Cu^{2+}, then add KI (aq) Add $Na_2S_2O_3$ (aq)	Cu^{2+} characteristic test	$Cu^{2+} + 2I^- \rightarrow CuI + ½ I_2$ Blue solution turns brown White ppt. in brown solution (I_2) ● The ppt may not be visible as it is blocked by I_2 Brown solution decolourises, leaving white ppt. $Cu^+ + 2S_2O_3^{2-} \rightarrow [Cu(S_2O_3)_2]^{3-}$ White ppt. Dissolves in excess $Na_2S_2O_3$
Add ClO^- (aq) aka bleach	Chlorine gas test	greenish-yellow pungent gas which turns moist blue litmus paper red, then bleaches it evolved. Gas is Cl_2.

Frequently Tested Organic QA Tests

Organic QA Test	Interpretation and Inference	Observation
Add Br_2 (aq)/ in CCl_4 **dropwise**	Test for alkenes, phenols, phenylamines. **Add 2-3 drops only**. If Br_2 is added in excess, it will not decolourise.	Orange/orange-red Br_2 (aq) decolourises/ remains orange/orange-red White ppt. formed (if applicable)/no ppt.
Add H_2SO_4 (aq) Add $KMnO_4$ (aq) **dropwise** Warm.	Test for alkenes, alkyl benzenes, 1° or 2° alcohols, aldehydes, esters (unless the alkoxy part is a phenoxy group). Prepare a small volume of $Ca(OH)_2$ (aq).	Purple $KMnO_4$ decolourises/remains purple Effervescence of colourless, odourless gas which forms white ppt. with $Ca(OH)_2$ (aq). Gas is CO_2./no effervescence
Add NaOH (aq) Add $KMnO_4$ (aq) **dropwise** Warm.	Test for alkenes, alkyl benzenes, 1° or 2° alcohols, aldehydes, esters (unless the alkoxy part is a phenoxy group).	Purple $KMnO_4$ decolourises/remains purple Brown ppt. MnO_2 formed/no ppt.
Add NaOH (aq) Add $KMnO_4$ (aq) **dropwise**	Test for alkenes	Purple $KMnO_4$ decolourises/remains purple Brown ppt. MnO_2 formed/no ppt.
Add NaOH (aq)/ethanolic, warm Let cool, add excess HNO_3 (aq) Add $AgNO_3$ (aq)	Test for halogenoalkanes, test for acyl halides. Warm in hot water bath for 5 mins.	White/Cream/Yellow ppt. (can be determined by the rate of formation of ppt.) (Partially) soluble/insoluble in excess NH_3 (aq)/conc. NH_3

Add $NaCO_3$/ $NaHCO_3$ (aq)	Carboxylic acid test Prepare a small volume of $Ca(OH)_2$ (aq).	Effervescence of colourless, odourless gas which forms white ppt. with $Ca(OH)_2$ (aq). Gas is CO_2./no effervescence
Add neutral $FeCl_3$ (aq)	Phenol test	Yellow/Colourless solution turns violet (depending on whether you add phenol to $FeCl_3$ or vice versa)./remains yellow/colourless
Add $AgNO_3$ (aq) Add NaOH (aq) Add NH_3 (aq) until the precipitate dissolves. Warm.	Aldehyde test * The addition of NaOH may not be included in some QA questions, but if you are required to propose the test, you need to include it. The silver mirror may appear as precipitate if you did not carry out the test properly. Record 'silver mirror formed' anyway	 Brown ppt. Brown ppt. dissolves in excess NH_3 (aq) $[Ag(NH_3)_2]^{2+} + RCHO + 3OH^- \rightarrow RCOO^- + 2H_2O + 2Ag + 4NH_3$ Silver mirror formed/no silver mirror
Add $CuSO_4$ (aq) Add sodium tartrate dissolved in NaOH (aq) Warm	Aldehyde test excluding benzaldehyde The heating will generally take a very long time as this reaction is slow.	 Pale blue ppt. Soluble in excess to give a dark blue solution Brick-red ppt. In blue solution/no brick red ppt. Blue solution decolourises/remains blue (if applicable)
Add 2,4-DNPH aka Brady's reagent **dropwise**	Carbonyl compound test. **Add 2-3 drops only**. If 2,4-DNPH is added in excess, it will not form a ppt.	Orange ppt. in orange solution./ no ppt.

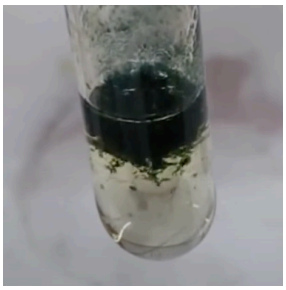
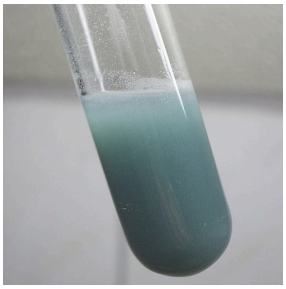
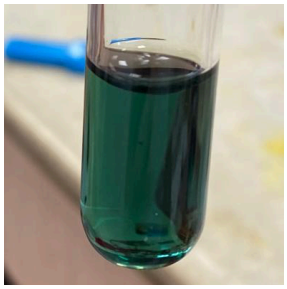
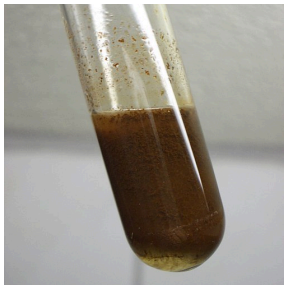
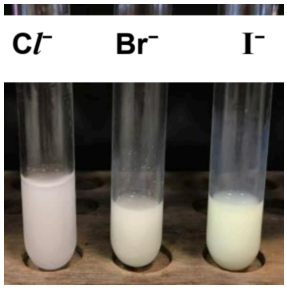
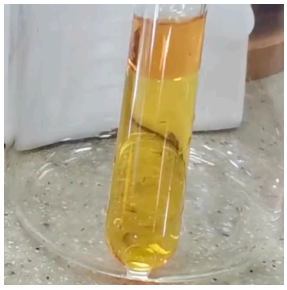
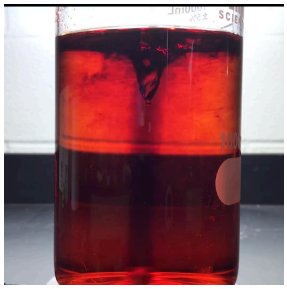
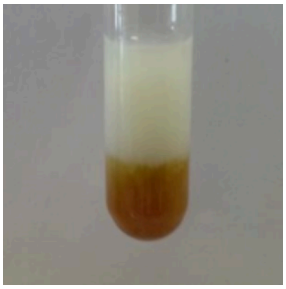
Test with moist red litmus paper	Amine test This is unlikely to come out	Moist red litmus paper turns blue.
Add NaOH (aq) Add I_2 (aq) Warm	Methyl carbinol test, methyl carbonyl test. Warm in hot water bath for 5 mins.	Yellow ppt in brown/colourless solution (depending on what you see)/no yellow ppt. Brown solution decolourises. (depending on what you see)/remains brown
Add NaOH (aq) Warm	Amine salts test, amide test. Prepare moist red litmus paper You might have to warm for a significant period of time while holding litmus paper above the test tube. Do not let the litmus paper touch the mouth of the test tube.	Colourless, pungent gas which turns moist red litmus paper blue evolved./no gas evolved. Moist red litmus paper remains red.
Add H_2SO_4 (aq) Add $K_2Cr_2O_7$ (aq) warm	Aldehyde test, alcohol test You will not have to carry out this test	Orange $K_2Cr_2O_7$ turns to green Cr^{3+}/remains orange.
Add Na (s)	Alcohols test, carboxylic acids test, phenols test You will not have to carry out this test	Na dissolves to form a colourless solution Vigorous effervescence of colourless, odourless gas which extinguishes a lighted splint with a ‘pop’ sound.
Add any aqueous solution	Acyl chloride test	White fumes of HCl/no white fumes

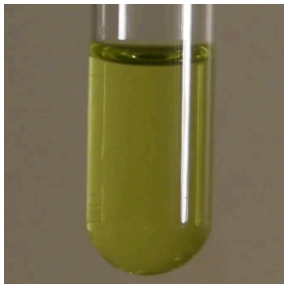
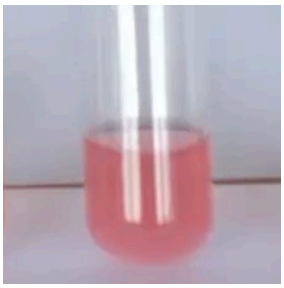
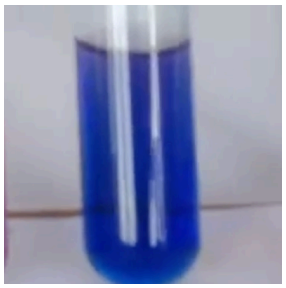
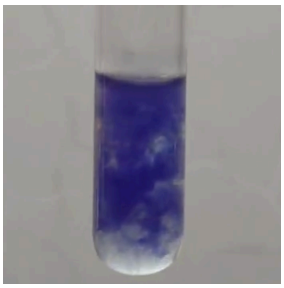
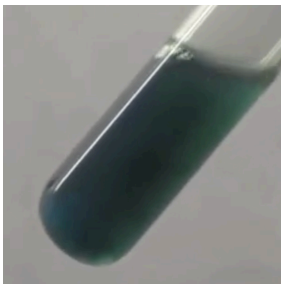
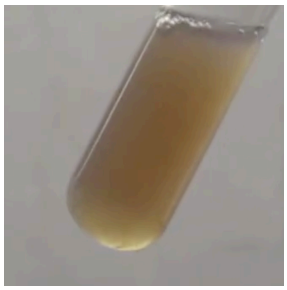
Add anhydrous PCl_5/anhydrous PCl_3/ anhydrous $SOCl_2$	Alcohol test, Carboxylic acid test.	White fumes of HCl/no white fumes

Colours of QA

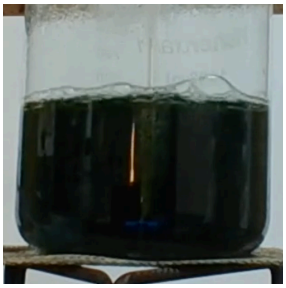
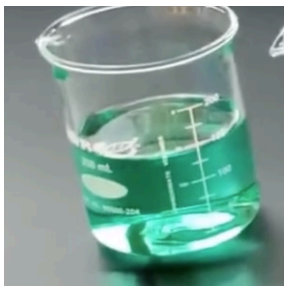
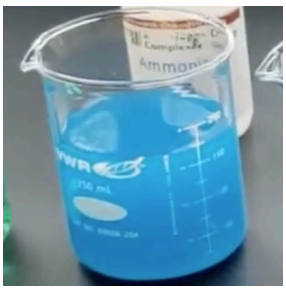
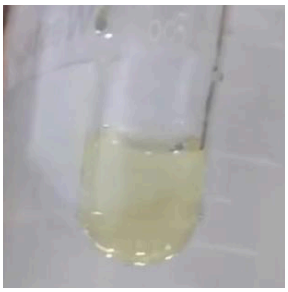
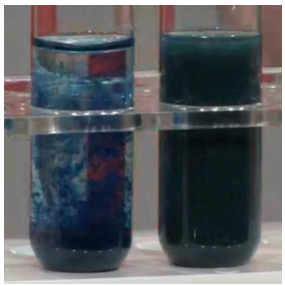
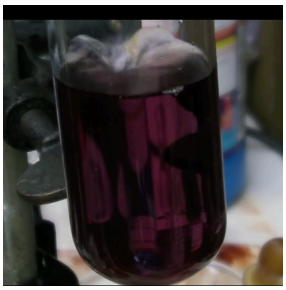
Factors to Consider for whether you should realistically study this

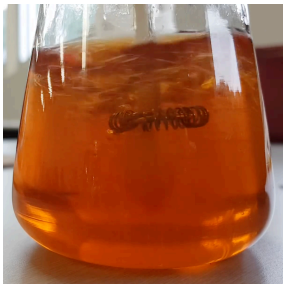
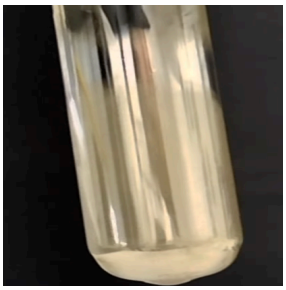
1. What grade you want to get matters. Only study this if you want an A or A1 grade. This is the most important factor. If you don't want an A or A1 grade, please focus on something more efficient like practice papers. This is useless for you.
2. Cambridge sets a QA question every year (almost every year for 'O' Levels). So you can and will secure the QA marks if you do study this.
3. Cambridge can and have tested ions which are not provided in their data booklet. If you do not know what colour it is and assume it is an ion provided in the data booklet and write the corresponding colour, you will not get the mark for that question.
    - Theoretically you can answer all questions if you've 'mastered the QA skills', but if your 'QA skills' are shit, then at least you can use this.
4. This is **extremely** excessive. More than half of the chemicals provided here are not required knowledge for the 'A' Levels, and those in red font are chemicals which will not be tested due to their negative health impacts.
5. The time period in which you study this matters. If you study this before your school covers QA in practical lessons, then during the actual practical lessons, it will help you focus on learning the 'QA skills', rather than trying to cross check the data booklet for what colour it is. Do not study this when your school covers QA in practical lessons, because it will only confuse you. You may study this nearing the 'O' levels or 'A' levels to make sure you're prepared for anything Cambridge throws at you, but only after you've studied everything else.

			
$Cu(OH)_2$ Pale blue	$[Cu(NH_3)_4(H_2O)_2]^{2+}$ Dark Blue	$Fe(OH)_2$ Green	$Fe(OH)_3$ Reddish-Brown
			
$Cr(OH)_3$ Grey-green	$[Cr(OH)_6]^{3-}$ Dark Green	$Mn(OH)_2$ Off-white	$Mn(OH)_3$ Brown
			
Non-transition metal hydroxides ⇒ White	AgCl, AgBr, AgI White, Cream, Yellow	I_2 (aq)/ I_2 (org) Brown & purple	Br_2 (aq)/ Br_2 (org) Orange & Orange-red
			
$[Cu(H_2O)_6]^{2+}$ + $[CuCl_4]^{2-}$ Green	$[Fe(SCN)(H_2O)_5]^{2+}$ Blood Red	CuI with I_2 White & Brown	MnO_2 Brown

			
*PbI_2 Yellow	ZnO hot and cold Yellow & white	*$K_2Cr_2O_7$ and Cr^{3+} Orange and Green	CrO_4^{2-} Pale Yellow
			
$[Cr(H_2O)_6]^{3+}$ Purple/Green[1]	$[Cr(NH_3)_6]^{3+}$ Purple	$[Co(H_2O)_6]^{2+}$ Pink	$[CoCl_4]^{2-}$ Dark Blue
 			
$Co(OH)_2$ (top is pure, bottom has some $[Co(NH_3)_6]^{2+}$ Dark Blue	$Co(OH)_3$ Pale Brown	$[Co(NH_3)_6]^{2+}$ Brown	$CoCO_3$ or $CoHCO_3$ Pink

[1] It appears green because it is $[CrCl_2(H_2O)_4]^+$. But you can pretend the green solution is $[Cr(H_2O)_6]^{3+}$ in our syllabus.

			
$[Co(H_2O)_6]^{3+}$ Blue green	$[Ni(H_2O)_6]^{2+}$ Green	$[Ni(NH_3)_6]^{2+}$ Blue	$[Ni(CN)_6]^{4-}$ Yellow/Orange
	 	 	 
VO_2^+/VO_3^- Pale Yellow	VO^{2+} (top has some VO_2^+, bottom is pure) Green/Blue	V^{3+} (top has some VO^{2+}, bottom is pure) Dark Blue/Green	V^{2+} (top has some V^{3+}, bottom is pure) Purple
			
$[Fe(S_2O_3)_3]^{2-}$ Violet	$[Fe(CN)_6]^{4-}$, $[Fe(CN)_6]^{3-}$ Blue & Greenish-blue respectively	FeO_4^{2-} Red-purple	$[Cu(NO_2)_4]^{2-}$ Green

			
$[Mn(H_2O)_6]^{3+}$ Red/Orange	MnO_4^{2-}, MnO_4^{3-} Dark green, Dark blue	CHI_3 Yellow	$[Fe(Ph\text{-}O)_6]^{3-}$ Violet
			
Ag (s) Tollen's Reagent Silver mirror	Cu_2O Fehling solution Brick red	2,4-DNPH Orange	