

Edexcel Chemistry A-Level

Core Practicals 07 & 15 - Analysis of unknown compounds

Flashcards

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How can a flame test be used to identify metal ions?



How can a flame test be used to identify metal ions?

- Clean wire loop with H_2SO_4 or HCl
- Dip the loop into the sample.
- Place the loop into a blue flame (using a bunsen burner).
- Record the colour of the flame.



What are some group 1 metal ion flame colours?



What are some group 1 metal ion flame colours?

<u>Ion</u>	<u>Flame colour</u>
Lithium, Li^+	Red
Sodium, Na^+	Yellow
Potassium, K^+	Lilac
Rubidium, Rb^+	Red
Caesium, Cs^+	Blue



What are some group 2 metal ion flame colours?



What are some group 2 metal ion flame colours?

<u>Ion</u>	<u>Flame colour</u>
Calcium, Ca^{2+}	Orange-red
Barium, Ba^{2+}	Green
Strontium, Sr^{2+}	Crimson
Magnesium, Mg^{2+}	None
Beryllium, Be^{2+}	None



How can you use sodium hydroxide to identify cations?



How can you use sodium hydroxide to identify cations?

- Dissolve the unknown substance in water.
- Add aqueous NaOH dropwise, until in excess and no further change occurs.



What are the results from the reactions between cations and NaOH?



What are the results from this reaction?

<u>Metal ion solution</u>	<u>Observation on adding NaOH_(aq)</u>	<u>Observation on adding excess NaOH_(aq)</u>
chromium(III) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$	Violet solution forms green precipitate	Precipitate dissolves to form a green solution
iron(II) $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$	Green solution forms green precipitate turning brown on exposure to air	Precipitate is insoluble
iron(III) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$	Yellow solution forms red-brown precipitate	Precipitate is insoluble
cobalt(II) $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$	Blue precipitate turning pink on standing	Precipitate is insoluble
copper(II) $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$	Blue solution forms blue precipitate	Precipitate is insoluble



How do you test for a saturated hydrocarbon?



How do you test for an unsaturated hydrocarbon?

Add bromine water to the sample. If the solution turns from brown to colourless then a unsaturated hydrocarbon was present.



How do you test for an aldehyde?



How do you test for an aldehyde?

- Add Tollen's reagent to a sample of the suspected aldehyde. Warm → The presence of a silver mirror confirms an aldehyde was present.
- Add Fehling's/Benedict's solution → aldehyde turns clear blue solution to brick red ppt
- Add dichromate ions (eg. $K_2Cr_2O_7$ / $Na_2Cr_2O_7$) acidified eg. with H_2SO_4 & heat → turns orange solution green



How do you test for a carboxylic acid?



How do you test for a carboxylic acid?

- Add an alcohol & acid (eg. H_2SO_4) → glue or pear-drop smell (formation of an ester).
- Add a metal carbonate → effervescence as CO_2 is released (test with limewater)
- Add a reactive metal → effervescence as H_2 is released
- Add an acyl chloride → misty fumes (HCl)



How do you test for ammonium (NH_4^+) ions?



How do you test for ammonium (NH_4^+) ions?

- Add an equal volume of NaOH to the sample. Shake.
- Warm the solution in the test tube.
- Test the gas released with damp red litmus paper.
- If it goes blue, ammonium ions are present.



How do you test for group 7 / halide ions?



How do you test for group 7 / halide ions?

- To the compound being tested, add nitric acid and silver nitrate. Record observations.
- To samples of this solution, add dilute and then concentrated ammonia.



What are the results from the reactions of halide ions with silver nitrate and ammonia?



What are the results from the reactions of halide ions with silver nitrate and ammonia?

	Cl^-	Br^-	I^-
Silver nitrate	White precipitate	Cream precipitate	Yellow precipitate
Dilute NH_3	White precipitate disappears (solution is therefore colourless)	Cream precipitate remains	Yellow precipitate remains
Concentrated NH_3	Remains colourless	Cream precipitate disappears (solution therefore colourless)	Yellow precipitate remains



How do you test for carbonate (CO_3^{2-})
and hydrogencarbonate (HCO_3^-) ions?



How do you test for carbonate (CO_3^{2-}) and hydrogencarbonate (HCO_3^-) ions?

- Add dilute acid.
- If carbonate/hydrogencarbonate ions are present, the solution will effervesce.
- You can bubble the gas given off through limewater and it should go cloudy, confirming the presence of carbonate / hydrogencarbonate ions.



How do you test for sulfate (SO_4^{2-}) ions?



How do you test for sulfate (SO_4^{2-}) ions?

- Add HCl and BaCl_2 to the suspected sulfate solution.
- If sulfate ions are present, a white precipitate of BaSO_4 will form.



What is the order of testing ions?
(Carbonate, halide and sulfate)



What is the order of testing ions? (Carbonate, halide and sulfate)

Carbonate → Sulfate → Halide

This prevents false positive results occurring i.e. Unexpected insoluble precipitates such as Ag_2SO_4 , Ag_2CO_3 and BaCO_3 could form.

