Edexcel International Chemistry A Level

CP15 - Analysis of Some Inorganic and Organic Unknowns

(A level only)

Flashcards

Describe the test for carbonate ions

(Year 1 content, see CP8)

Describe the test for carbonate ions

(Year 1 content, see CP8)

Add aqueous acid and pass the gaseous product through limewater. If a white precipitate forms and the limewater turns cloudy, carbonate ions were present (CO_2 was the gas produced).

This test is the same for HCO_3^- ions

Describe the test for SO_4^{2-} ions

(Year 1 content, see CP8)

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(Year 1 content, see CP8)

Add acidified barium chloride solution. A white precipitate of barium sulfate will form if SO_4^{2-} ions are present.

Describe the test for halide ions

(Year 1 content, see CP8)

Describe the test for halide ions

(Year 1 content, see CP8)

Add a few drops of nitric acid followed by a few drops of silver nitrate. Observe the colour of the precipitate and test solubility in ammonia solution:

AgCl - white ppt, soluble in dilute NH_3
AgBr - cream ppt, soluble in concentrated NH_3
AgI - yellow ppt, insoluble in NH_3

What order should the anion tests be done in? Why?

(Year 1 content, see CP8)

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(Year 1 content, see CP8)

Carbonate, sulfate, halide

The presence of carbonate ions may give false positive results for the other tests.

Describe the test for carbon dioxide

(Year 1 content, see CP8)

Describe the test for carbon dioxide

(Year 1 content, see CP8)

Pass the gas through limewater. If a white precipitate forms in the limewater turning it cloudy, CO_2 is present.

Describe the test for oxygen

(Year 1 content, see CP8)

Describe the test for oxygen

(Year 1 content, see CP8)

Insert a glowing splint into a test tube of the gas. If oxygen is present, the splint will relight.

Describe how to carry out the flame test

(Year 1 content, see CP8)

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(Year 1 content, see CP8)

1. Clean a nichrome wire by dipping it in concentrated HCl and placing it in a bunsen burner flame
2. Dip the wire in the unknown compound and place in the Bunsen flame
3. Observe the colour of the flame

What colour is the flame test for lithium?

(Year 1 content, see CP8)

What colour is the flame test for lithium?

(Year 1 content, see CP8)

Red

What colour is the flame test for sodium?

(Year 1 content, see CP8)

What colour is the flame test for sodium?

(Year 1 content, see CP8)

Yellow

What colour is the flame test for potassium?

(Year 1 content, see CP8)

What colour is the flame test for potassium?

(Year 1 content, see CP8)

Lilac

What colour is the flame test for rubidium?

(Year 1 content, see CP8)

What colour is the flame test for rubidium?

(Year 1 content, see CP8)

Red (red-violet)

What colour is the flame test for caesium?

(Year 1 content, see CP8)

What colour is the flame test for caesium?

(Year 1 content, see CP8)

Blue-violet

What colour is the flame test for calcium?

(Year 1 content, see CP8)

What colour is the flame test for calcium?

(Year 1 content, see CP8)

Orange-red

What colour is the flame test for strontium?

(Year 1 content, see CP8)

What colour is the flame test for strontium?

(Year 1 content, see CP8)

Red

What colour is the flame test for barium?

(Year 1 content, see CP8)

What colour is the flame test for barium?

(Year 1 content, see CP8)

Pale green

Describe the test for alkenes

(Year 1 content, see CP8)

Describe the test for alkenes

(Year 1 content, see CP8)

Add bromine water. If an alkene is present, the bromine water will change from orange to colourless.

Describe the test for halogenoalkanes

(Year 1 content, see CP8)

Describe the test for halogenoalkanes

(Year 1 content, see CP8)

Hydrolyse the halogenoalkane to release the halide ions (see CP5 for full method). Add silver nitrate then test precipitate with ammonia solution:

AgCl - white ppt soluble in dilute ammonia

AgBr - cream ppt soluble in concentrated ammonia

AgI - yellow ppt insoluble in ammonia

Describe the test for alcohols

(Year 1 content, see CP8)

Describe the test for alcohols

(Year 1 content, see CP8)

React with potassium dichromate in dilute sulfuric acid:

- Primary alcohol - if the reagents are distilled, an aldehyde forms. If the products are refluxed, a carboxylic acid is produced
- Secondary alcohol - if the reagents are refluxed, a ketone is produced
- Tertiary alcohols - cannot be oxidised

When the alcohol is oxidised, there is a colour change from orange to green.

Describe the test for carboxylic acids

(Year 1 content, see CP8)

Describe the test for carboxylic acids

(Year 1 content, see CP8)

Add sodium carbonate or sodium hydrogencarbonate. If the solution effervesces, a carboxylic acid is present.

Describe the test for aldehydes

Describe the test for aldehydes

- Add Benedict's reagent. If an aldehyde is present, the blue solution will turn cloudy green, orange and then red.
- Add Fehling's solution. If an aldehyde is present, a brick-red precipitate will form in the blue solution.
- Add Tollens' reagent. If an aldehyde is present, a silver mirror will form on the wall of the test tube.
- Add acidified potassium dichromate(VI). If an aldehyde is present, there will be a colour change from orange to green. (This colour change is also observed with primary and secondary alcohols).

Describe the test for phenol

Describe the test for phenol

Add bromine water. If phenol is present, there will be a colour change from orange to colourless and a white precipitate will form.

After test-tube reactions have been completed, what further evidence could be used to identify an organic compound?

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Mass spectrum

Infrared spectrum

NMR spectrum

Briefly describe how a mass spectrum can be used to identify an organic compound

(Year 1 content, see CP8)

Briefly describe how a mass spectrum can be used to identify an organic compound

(Year 1 content, see CP8)

m/z ratio of the molecular ion peak shows the relative formula mass.

m/z ratios of the fragment ions can be used to work out the different fragment ions formed from the compound.

Briefly explain how an infrared spectrum can be used to identify an organic compound

(Year 1 content, see CP8)

Briefly explain how an infrared spectrum can be used to identify an organic compound

(Year 1 content, see CP8)

The wavenumber of the peaks can be compared to the data book to identify which bonds are present in the compound. This is because each bond absorbs a unique frequency of infrared radiation which causes the bond to vibrate (stretch or bend).

What does a ^{13}C spectrum tell you about a compound?

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- The chemical shift values can be compared with a data book to identify the types of carbon environment in a molecule
- The number of peaks represents the number of different carbon environments

What does a proton NMR tell you about a compound?

What does a proton NMR tell you about a compound?

- The chemical shift values can be compared with a data book to identify the types of proton environment in a molecule
- The number of peaks represents the number of different proton environments
- The relative peak areas show the relative number of protons in each environment
- The splitting pattern shows the number of adjacent non-equivalent protons

What is the n+1 rule?

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The number of peaks in the splitting pattern is equal to the number of adjacent non-equivalent protons + 1

Name the first 4 splitting patterns that appear on proton NMR spectra. Use the n+1 rule to explain what they mean

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Multiplet name	Number of peaks (n+1)	Number of adjacent protons (n)
Singlet	1	0
Doublet	2	1
Triplet	3	2
Quartet	4	3

What are the ratios of peak heights in the following splitting patterns on a proton NMR spectrum: doublet, triplet and quartet?

What are the ratios of peak heights in the following splitting patterns on a proton NMR spectrum: doublet, triplet and quartet?

Doublet - 1:1

Triplet - 1:2:1

Quartet - 1:3:3:1

Describe the observations of the reactions of $Cr^{3+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

Describe the observations of the reactions of $Cr^{3+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

NaOH - green precipitate forms, dissolves in excess to form green solution of $[Cr(OH)_6]^{3-}$

NH_3 - green precipitate forms, dissolves in excess to form green solution of $[Cr(NH_3)_6]^{3+}$

Describe the observations of the reactions of $Mn^{2+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

Describe the observations of the reactions of $Mn^{2+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

NaOH - white precipitate forms (darkens in air), insoluble in excess

NH_3 - white precipitate forms (darkens in air), insoluble in excess

Describe the observations of the reactions of $Fe^{2+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

Describe the observations of the reactions of $Fe^{2+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

NaOH - dark green precipitate forms (turns orange in air), insoluble in excess

NH_3 - dark green precipitate forms (turns orange in air), insoluble in excess

Describe the observations of the reactions of $Fe^{3+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

Describe the observations of the reactions of $Fe^{3+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

NaOH - brown precipitate forms, insoluble in excess

NH_3 - brown precipitate forms, insoluble in excess

Describe the observations of the reactions of $Co^{2+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

Describe the observations of the reactions of $Co^{2+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

NaOH - blue precipitate forms (turns pink on standing), insoluble in excess

NH_3 - blue precipitate forms (turns pink on standing), dissolves in excess to form a brown solution of $[Co(NH_3)_6]^{2+}$

Describe the observations of the reactions of $Ni^{2+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

Describe the observations of the reactions of $Ni^{2+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

NaOH - green precipitate forms, insoluble in excess

NH_3 - green precipitate forms, dissolves in excess to form a blue solution of $[Ni(NH_3)_6]^{2+}$

Describe the observations of the reactions of $Cu^{2+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

Describe the observations of the reactions of $Cu^{2+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

NaOH - blue precipitate forms, insoluble in excess (slightly deeper blue colour seen)

NH_3 - blue precipitate forms, dissolves in excess to form blue solution of $[Cu(NH_3)_4(H_2O)_2]^{2+}$

Describe the observations of the reactions of $Zn^{2+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

Describe the observations of the reactions of $Zn^{2+}(aq)$ with $NaOH(aq)$ and $NH_3(aq)$

NaOH - white precipitate forms, dissolves in excess to form a colourless solution of $[Zn(OH)_4]^{2-}$

NH_3 - white precipitate forms, dissolves in excess to form a colourless solution of $[Zn(NH_3)_4]^{2+}$