

Sec 4 Chem Experiment 5.3: Tests for Known Anions

Name: _____ () Class: _____ Date: _____

Aim: To conduct anion tests to deduce the anion present in each solution

Test for aqueous anions

Anion	Test	Observations
Chloride (Cl ⁻)	Add nitric acid and then silver nitrate NOTE: Lead(II) nitrate is not used because the white ppt formed could either be PbCl ₂ or PbSO ₄ . Lead(II) nitrate test is therefore inconclusive.	White ppt is formed. <i>Implications:</i> <i>White ppt formed is AgCl</i> <i>Ionic equation is:</i> $Cl^{-}(aq) + Ag^{+}(aq) \rightarrow AgCl(s)$ <i>aq. Chloride ions (from the unknown solution) will react with aq Silver ions (from silver nitrate) to form an insoluble ppt AgCl. This is a precipitation reaction.</i>
Iodide (I ⁻)	Add nitric acid and then silver nitrate	Light yellow ppt is formed. <i>Implications:</i> <i>Pale yellow ppt formed is AgI</i> <i>Ionic equation:</i> $I^{-}(aq) + Ag^{+}(aq) \rightarrow AgI(s)$ <i>aq. Iodide ions (from the unknown solution) will react with aq Silver ions (from silver nitrate) to form an insoluble ppt AgI. This is a precipitation reaction.</i>
	Add nitric acid and then lead (II) nitrate solution	Bright yellow ppt is formed. <i>Implications:</i> <i>Bright yellow ppt formed is PbI₂</i> <i>Ionic equation:</i> $I^{-}(aq) + Pb^{2+}(aq) \rightarrow PbI_2(s)$ <i>aq. Iodide ions (from the unknown solution) will react with aq lead ions (from lead(II) nitrate) to form an insoluble ppt PbI₂. This is a precipitation reaction.</i>

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Nitrate (NO ₃ ⁻)	Add Aluminium powder/foil and warm with sodium hydroxide Or Add Devarda's Alloy (alloy containing Al, Zn and Cu) and warm with sodium hydroxide	A colourless, pungent gas is evolved. Gas turns moist red litmus paper blue. <i>Implications:</i> Gas formed is ammonia gas.
Sulfate (SO ₄ ²⁻)	Add nitric acid and barium nitrate Or Add hydrochloric acid and barium chloride	White ppt is formed. <i>Implications:</i> White ppt is BaSO₄ Ionic equation: Ba²⁺ (aq) + SO₄²⁻ (aq) → BaSO₄ (s) aq. Iodide ions (from the unknown solution) will react with aq lead ions (from lead(II) nitrate) to form an insoluble ppt PbI₂. <i>This is a precipitation reaction.</i>
Carbonate (CO ₃ ²⁻)	Add any acid	A colourless, odourless gas is evolved. Gas forms a white ppt with limewater. <i>Implications:</i> Gas formed is carbon dioxide. Metal carbonate + Acid → Salt + H₂O + CO₂

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Solutions of Anion	Tests	Observations
nitrate NO_3^-	To 2cm ³ of the solution, add dilute aqueous sodium hydroxide. Add 2 small pieces of aluminium foil. Warm the mixture gently and test the gas produced with a piece of damp/moist red litmus paper.	
carbonate CO_3^{2-}	To 2cm ³ of the solution, add dilute hydrochloric acid. Pass the gas into limewater with the use of a delivery tube.	
chloride Cl^-	To 2cm ³ of the solution, add equal volume of silver nitrate solution. To the ppt, add dilute nitric acid.	
iodide I^-	To 2cm ³ of the solution, add dilute nitric acid and then lead(II) nitrate solution. Boil the solution then cool	
iodide I^-	To 2cm ³ of the solution, add equal volume of silver nitrate solution. To the ppt, add dilute nitric acid.	
sulfate SO_4^{2-}	To 2cm ³ of the solution, add equal volume of dilute nitric acid and then barium nitrate solution	
sulfate SO_4^{2-}	To 2cm ³ of the solution, add equal volume of hydrochloric acid and then barium chloride solution	