Test for cations and anions essay sample

CATION TEST OBSERVATION Copper Cu2+ Add dilute sodium hydroxide solution e. g. in CuCl2 solution or solid. Blue precipitate of copper hydroxide, which does not dissolve in excess NaOH. Blue in solution or as a solid. CuSO4(aq) + 2NaOH(aq) (Cu(OH)2(s) + Na2SO4(aq) Or Cu2+ + 2OH- (Cu(OH)2(s) Iron (II) Fe2+ Add dilute sodium hydroxide solution e. g. in FeCl2 solution or as a solid. Often pale green A dark green gelatinous precipitate is formed that does not dissolve in excess NaOH. in colour. It turns brown on standing as it is oxidised in air to Fe(III) hydroxide, Fe(OH)3. FeCl2(aq) + 2NaOH(aq) (Fe(OH)2 (s) + 2NaCl(aq) Or Fe2+ + 2OH- (Fe(OH)2(s) Iron (III) Fe3+ Add dilute sodium hydroxide solution e. g. in FeCl3 solution or solid; often yellow in A dark rusty brown gelatinous precipitate is formed that does not dissolve in excess NaOH solution and red/brown in solid. FeCl3(aq) + 3NaOH(aq) (Fe(OH)3 (s) + 3NaCl(aq) Or Fe3+ + 3OH- (Fe(OH)3(s)

Aluminium Al3+ Add dilute sodium hydroxide solution These are colourless in solids and in solution A white precipitate forms, BUT it dissolves in excess sodium hydroxide solution, because NaAl(OH)4(aq) is soluble. Aluminium hydroxide is said to be amphoteric because it dissolves in an alkali and an acid AlCl3(aq) + 3NaOH(aq) (Al(OH)3(s) + 3NaCl(aq) Al(OH)3(s) + NaOH(aq) (NaAl(OH)4(aq) Ammonium NH4+ Add dilute sodium hydroxide solution NH4Cl and warm, test gas with pH paper A smelly alkaline gas that turns pH paper blue is given off. Ammonia is released from the ammonium salt. (NH4)2SO4 + 2NaOH(aq) (2NH3(g) + 2H2O + Na2SO4(aq) or NH4+(aq) + OH- (NH3(g) + H2O

Tests for Cations and Anions with Equations

ANION TEST OBSERVATION Carbonate CO32- Add dilute nitric acid e. g. in Na2CO3 in solution or as a solid Solid or the solution evolves a colourless gas which turns lime water milky – a white precipitate Na2CO3(s) + 2HNO3 (2NaNO3 + CO2 + H2O Ca(OH)2(aq) + CO2 (CaCO3(s) + H2O Sulphate ion SO42- Add dilute hydrochloric acid to the Substance must be in solution solution, followed by barium chlorideA white precipitate of barium sulphate forms e. g. Na2SO4(aq) solution BaCl2(aq) + Na2SO4(aq) (BaSO4(s) + 2NaCl(aq) Ionically Ba2+(aq) + SO42-(aq) (BaSO4(s) Halide ions Add dilute nitric acid to the Chloride ion Cl – solution, then add silver nitrate Silver chloride is white, silver bromide is cream, silver iodide is yellow. Bromide ion Br – solution; observe the colour. Add You can distinguish between a chloride, bromide and iodide using aqueous ammonia solution: Iodide ion I – ammonia solution and judge the AgCl is soluble in ammonia solution e. g. from KCl(aq), NaBr(aq), LiI(aq) solubility of the solid in it. AgBr is partially soluble AgI is insoluble in NH3(aq) AgNO3(aq) + KCl(aq) (AgCl(s) + KNO3(aq) Ionically for an iodide (I-) Ag+(aq) + I- (AgI(s)