

2.6 REACTIONS OF IONS IN AQUEOUS SOLUTION: METAL-EQUATIONS

Metal-aqua ions are formed when transition metal compounds dissolve in water

More likely that H⁺ ions will be released

Weakens the O-H bond

Electrons from the oxygen atoms in water molecules are attracted more strongly to the 3+ ion

Electrons from the oxygen atoms in water molecules are attracted more strongly to the 3+ ion

Metal 3+ ions have a greater charge density so are more polarising

Metal-aqua 3+ ions are more acidic than the metal-aqua 2+ ions

Some metal hydroxides are amphoteric

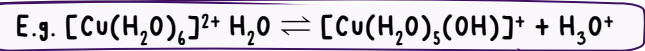
Form six coordinate bonds with water molecules

The following metal-aqua ions are formed in aqueous solution:
 [Fe(H₂O)₆]²⁺ (green solution)
 [Cu(H₂O)₆]²⁺ (blue solution)
 [Fe(H₂O)₆]³⁺ (yellow solution)
 [Al(H₂O)₆]³⁺ (colourless solution)

Hydrolysis reactions

Metal-aqua ions form acidic solutions

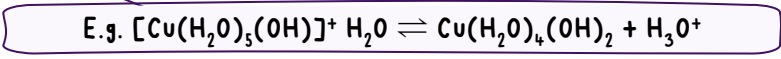
Further dissociation for the 3+ ions



Hydrolysis reactions between metal-aqua ions and water

Act as both acids and bases

Metal-aqua ions form precipitates when hydrolysed further



E.g. Aluminium hydroxide

AQA

Due to formation of CO₂

Solutions of Al³⁺ and Fe³⁺ ions produce bubbles

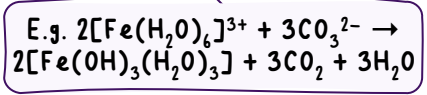
Precipitates produced with each of the four metal-aqua ions

Metal 2+ ions react to form metal carbonates in the form MCO₃

Therefore the carbonate ions react with H₃O⁺ ions

Metal 3+ ions are stronger acids

Produce products in the form M(OH)₃(H₂O)₃

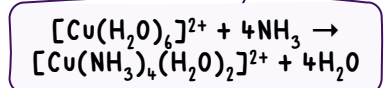


Reactions with sodium carbonate

Reactions with ammonia

Copper hydroxide precipitate will dissolve in excess ammonia

Ligand exchange reaction takes place



2.6 REACTIONS OF IONS IN AQUEOUS SOLUTION: TEST TUBE REACTIONS

Reactions with bases

Reactions with ammonia

Reactions with sodium hydroxide

Copper hydroxide precipitate will dissolve in excess ammonia

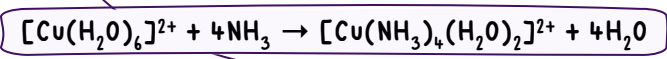
Precipitates produced with each of the four metal-aqua ions

Ligand exchange reaction takes place

Reactions to identify the metal ion present

Compare colours of all the complex ion solutions and precipitates

Aluminium hydroxide precipitate will re-dissolve in excess sodium hydroxide



Forms a deep blue solution

AQA