Redox Titrations

Examples of Redox Behaviour of Transition Metal Elements, Ions and Compounds.

Many transition elements take place in redox reactions. The equations below illustrate this behavior.

$Br_2(aq) + 2Fe^{2+}(aq) \rightarrow 2Fe^{3+}(aq) + 2Br^-(aq)$

$Zn(s) + 2Fe^{3+}(aq) \rightarrow 2Fe^{2+}(aq) + Zn^{2+}(aq)$

$MnO_4^-(aq) + 8H^+(aq) + 5Fe^{2+}(aq) \rightarrow 5Fe^{3+}(aq) + Mn^{2+}(aq) + 4H_2O(l)$

Cu^+ ions **disproportionate in water** to give Cu atoms and Cu^{2+} ions **$2Cu^+_{(aq)} \rightarrow Cu^{2+}_{(aq)} + Cu_{(s)}$**

Redox reactions are used in titrations. You **must be able** to do the calculations.

1. When **purple** acidified permanganate oxidises a substance it is reduced to **pale pink** Mn^{2+}. This is self indicating.

   $MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$ (Mn +7 → +2) **see example above with Fe^{2+}**

2. Sodium thiosulphate is a reducing agent and iodine is an oxidising agent.

   $2S_2O_3^{2-}(aq) + I_2(aq) \rightarrow S_4O_6^{2-}(aq) + 2I^-(aq)$

   We use sodium thiosulphate of known concentration to measure the concentration of an unknown iodine solution.

   The reaction is self-indicating as the low concentration of iodine near the end point appears pale yellow but the final products are colourless. However, the end point can be made much clearer by the addition of starch solution. This goes a deep blue-black colour which again goes colourless at the end point.