

**Quiz (Writing Ionic Equation)**

1. For each of the following reactions, write
  - (i) the reduction half equation,
  - (ii) the oxidation half equation, and
  - (iii) the ionic equation for the overall reaction.
  - (a) Bubbling chlorine gas into potassium bromide solution.
  - (b) Adding a piece of magnesium ribbon to concentrated nitric acid.
2. In an experiment, a student mixed acidified potassium permanganate solution and iron(II) sulphate solution together.
  - (a) Explain the colour change of the acidified potassium permanganate solution after the addition of the iron(II) sulphate solution.
  - (b) For this reaction, write the
    - (i) oxidation half equation.
    - (ii) reduction half equation.
    - (iii) ionic equation for the overall reaction.
  - (c) By using the oxidation number concept, identify the oxidizing agent and the reducing agent of this reaction.

**Suggested Answer**

1. (a) (i)  $\text{Cl}_2(\text{g}) + 2\text{e}^- \longrightarrow 2\text{Cl}^-(\text{aq})$   
(ii)  $2\text{Br}^-(\text{aq}) \longrightarrow \text{Br}_2(\text{g}) + 2\text{e}^-$   
(iii)  $\text{Cl}_2(\text{g}) + 2\text{Br}^-(\text{aq}) \longrightarrow \text{Br}_2(\text{g}) + 2\text{Cl}^-(\text{aq})$
- (b) (i)  $\text{NO}_3^-(\text{aq}) + 2\text{H}^+(\text{aq}) + \text{e}^- \longrightarrow \text{NO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$   
(ii)  $\text{Mg}(\text{s}) \longrightarrow \text{Mg}^{2+}(\text{aq}) + 2\text{e}^-$   
(iii)  $\text{Mg}(\text{s}) + 2\text{NO}_3^-(\text{aq}) + 4\text{H}^+(\text{aq}) \longrightarrow \text{Mg}^{2+}(\text{aq}) + 2\text{NO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$
2. (a) When iron(II) sulphate solution is added to acidified potassium permanganate ions are reduced to very pale pink / colourless manganese(II) ions. The green iron(II) ions are oxidized to yellow iron(III) ions.
- (b) (i)  $\text{Fe}^{2+}(\text{aq}) \longrightarrow \text{Fe}^{3+}(\text{aq}) + \text{e}^-$   
(ii)  $\text{MnO}_4^-(\text{aq}) + 8\text{H}^+(\text{aq}) + 5\text{e}^- \longrightarrow \text{Mn}^{2+}(\text{aq}) + 4\text{H}_2\text{O}(\text{l})$   
(iii)  $5\text{Fe}^{2+}(\text{aq}) + \text{MnO}_4^-(\text{aq}) + 8\text{H}^+(\text{aq}) \longrightarrow 5\text{Fe}^{3+}(\text{aq}) + \text{Mn}^{2+}(\text{aq}) + 4\text{H}_2\text{O}(\text{l})$
- (c)  $\text{KMnO}_4(\text{aq})$  (or  $\text{MnO}_4^-(\text{aq})$ ) is the oxidizing agent because the oxidation number of manganese decreases from +7 to +2.  $\text{FeSO}_4(\text{aq})$  (or  $\text{Fe}^{2+}(\text{aq})$ ) is the reducing agent because the oxidation number of iron increases from +2 to +3.