Student 3: Low Merit

NZQA Intended for teacher use only

When fresh iron(II) sulfate solution is added to acidified potassium permanganate solution, a pale green solution and a purple solution react to form an orange solution.

Justify why this is an oxidation-reduction reaction. Your answer should include:

- Species linked to the provided observations
- An explanation of oxidation and reduction in terms of electron transfer or oxidation number change
- Balanced half and full equations

Answer:

4

The potassium permanganate is purple. Each MnO_4^- gains electrons, so the MnO_4^- changes to Mn^{2+}. The purple MnO_4^- changes to colourless Mn^{2+}. 2 1
The oxidation number decreases and MnO_4^- is reduced.

3 $MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$

1 The Fe^{2+} changes to orange Fe^{3+}. Each Fe^{2+} loses an electron and its oxidation number increases. This is oxidation.

3 $Fe^{2+} \rightarrow Fe^{3+} + e^-$

The overall balanced equation for the redox reaction is:

$MnO_4^- + 8H^+ + Fe^{2+} \rightarrow Mn^{2+} + 4H_2O + Fe^{3+}$