**Student 4: High Achieved**

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:

1 The potassium permanganate is purple because of the $MnO_4^-$ ion.
The purple $MnO_4^-$ ion changes to colourless $Mn^{2+}$.

2 $MnO_4^-$ is reduced because it has gained five electrons.
Reduction is a gain of electrons.

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

1 The pale green $Fe^{2+}$ is oxidised to orange $Fe^{3+}$ because it loses an electron.
This is an oxidation reaction because there is a loss of electrons and an increase in oxidation number.

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