

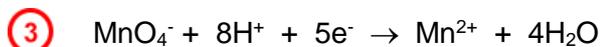
When fresh iron(II) sulfate solution is added to acidified potassium permanganate solution, a pale green solution and a purple solution react to form an orange solution.

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

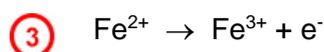
- Species linked to the provided observations
- An explanation of oxidation and reduction in terms of electron transfer or oxidation number change
- Balanced half and full equations

### Answer:

The potassium permanganate is purple. Each  $\text{MnO}_4^-$  gains electrons, so the  $\text{MnO}_4^-$  changes to  $\text{Mn}^{2+}$ . The purple  $\text{MnO}_4^-$  changes to colourless  $\text{Mn}^{2+}$ . The oxidation number decreases and  $\text{MnO}_4^-$  is reduced.



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



The overall balanced equation for the redox reaction is:

