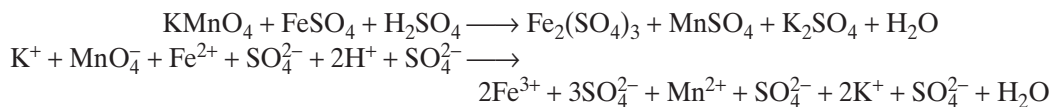
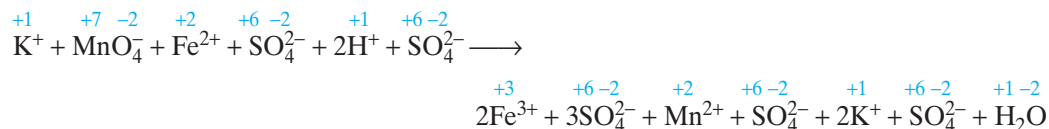


**SOLUTION**

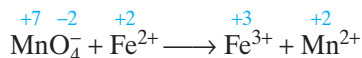
1. Write the formula equation if it is not given in the problem. Then write the ionic equation.



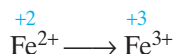
2. Assign oxidation numbers to each element and ion. Delete substances containing an element that does not change oxidation state.



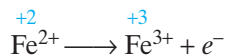
Only ions or molecules whose oxidation numbers change are retained.



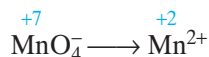
3. Write the half-reaction for oxidation. The iron shows the increase in oxidation number. Therefore, it is oxidized.



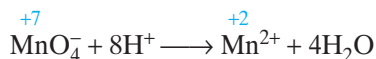
- *Balance the mass.* The mass is already balanced.
- *Balance the charge.*



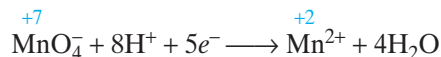
4. Write the half-reaction for reduction. Manganese shows a change in oxidation number from +7 to +2. It is reduced.



- *Balance the mass.* Water and hydrogen ions must be added to balance the oxygen atoms in the permanganate ion.



- *Balance the charge.*



5. Adjust the coefficients to conserve charge.

$$\frac{e^- \text{ lost in oxidation}}{e^- \text{ gained in reduction}} = \frac{1}{5}$$

