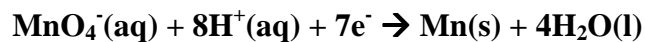|	**Marks**
• How many minutes would be required to electroplate 25.0 g of manganese by passing a constant current of 4.8 A through a solution containing MnO_4^-?	**2**

25.0 g of manganese corresponds to

$$\text{number of moles} = \frac{\text{mass}}{\text{atomic mass}} = \frac{25.0\,\text{g}}{54.94\,\text{g}\,\text{mol}^{-1}} = 0.455\,\text{mol}$$

The reduction of MnO_4^- is a 7e$^-$ process:

$MnO_4^-(aq) + 8H^+(aq) + 7e^- \rightarrow Mn(s) + 4H_2O(l)$

Production of 0.455 mol of Mn(s) requires (7×0.455) = 3.19 mol of electrons.

The number of moles of electrons passed by a current I in a time t is given by

$$\text{number of moles of electrons} = \frac{I \times t}{F}$$

$$3.19\,\text{mol} = \frac{(4.8\,\text{A}) \times t}{96485\,\text{C}\,\text{mol}^{-1}} \quad \text{so t = 64000 s = 1100 minutes}$$

Answer: **1100 minutes**