

## 5 • Reactions in Aqueous Solution

### Oxidation Numbers & RedOx

- Determine the oxidation number of each element in the following ions or compounds:
  - $\text{BrO}_3^-$
  - $\text{C}_2\text{O}_4^{2-}$
  - $\text{F}_2$
  - $\text{CaH}_2$
  - $\text{H}_2\text{SiO}_4$
  - $\text{SO}_4^{2-}$
- Determine the oxidation number of each element in the following ions or compounds:
  - $\text{SF}_6$
  - $\text{H}_2\text{AsO}_4^-$
  - $\text{UO}_2^+$
  - $\text{N}_2\text{O}_4$
  - $\text{PCl}_4^+$
  - $\text{XeO}_4^{2-}$
- Which of the following reactions is (are) oxidation-reduction reactions? Explain your answer briefly. classify the remaining reactions.
  - $\text{Zn(s)} + 2 \text{NO}_3^-(\text{aq}) + 4 \text{H}^+(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + 2 \text{NO}_2(\text{g}) + 2 \text{H}_2\text{O(l)}$
  - $\text{Zn(OH)}_2(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + 2 \text{H}_2\text{O(l)}$
  - $\text{Ca(s)} + 2 \text{H}_2\text{O(l)} \rightarrow \text{Ca(OH)}_2(\text{s}) + \text{H}_2(\text{g})$
- Which of the following reactions is (are) oxidation-reduction reactions? Explain your answer briefly. classify the remaining reactions.
  - $\text{CdCl}_2(\text{aq}) + \text{Na}_2\text{S(aq)} \rightarrow \text{CdS(s)} + 2 \text{NaCl(aq)}$
  - $2 \text{Ca(s)} + \text{O}_2(\text{g}) \rightarrow 2 \text{CaO(s)}$
  - $\text{Ca(OH)}_2(\text{s}) + 2 \text{HCl(aq)} \rightarrow \text{CaCl}_2(\text{aq}) + 2 \text{H}_2\text{O(l)}$
- In each of the following reactions, decide which reactant is oxidized and which is reduced. Designate the oxidizing agent and reducing agent.
  - $2 \text{Mg(s)} + \text{O}_2(\text{g}) \rightarrow 2 \text{MgO(s)}$
  - $\text{C}_2\text{H}_4(\text{g}) + 3 \text{O}_2(\text{g}) \rightarrow 2 \text{CO}_2(\text{g}) + 2 \text{H}_2\text{O(g)}$
  - $\text{Si(s)} + 2 \text{Cl}_2(\text{g}) \rightarrow \text{SiCl}_4(\text{l})$
- In each of the following reactions, decide which reactant is oxidized and which is reduced. Designate the oxidizing agent and reducing agent.
  - $\text{Ca(s)} + 2 \text{HCl(aq)} \rightarrow \text{CaCl}_2(\text{aq}) + \text{H}_2(\text{g})$
  - $\text{Cr}_2\text{O}_7^{2-}(\text{aq}) + 3 \text{Sn}^{2+}(\text{aq}) + 14 \text{H}^+(\text{aq}) \rightarrow 2 \text{Cr}^{3+}(\text{aq}) + 3 \text{Sn}^{4+}(\text{aq}) + 7 \text{H}_2\text{O(l)}$
  - $\text{FeS(s)} + 3 \text{NO}_3^-(\text{aq}) + 4 \text{H}^+(\text{aq}) \rightarrow 3 \text{NO(g)} + \text{SO}_4^{2-}(\text{aq}) + \text{Fe}^{3+}(\text{aq}) + 2 \text{H}_2\text{O(l)}$