

SUMMARY***Procedure for Balancing Redox Equations Using Oxidation Numbers***

- Step 1** Assign oxidation numbers and identify the atoms/ions whose oxidation numbers change.
- Step 2** Using the change in oxidation numbers, write the number of electrons transferred per atom.
- Step 3** Using the chemical formulas, determine the number of electrons transferred per reactant. (Use the formula subscripts to do this.)
- Step 4** Calculate the simplest whole number coefficients for the reactants that will balance the total number of electrons transferred. Balance the reactants and products.
- Step 5** Balance the O atoms using $\text{H}_2\text{O}_{(\text{l})}$, and then balance the H atoms using $\text{H}_{(\text{aq})}^+$.
For basic solutions only,
- Step 6** Add $\text{OH}_{(\text{aq})}^-$ to both sides equal in number to the number of $\text{H}_{(\text{aq})}^+$ present.
- Step 7** Combine $\text{H}_{(\text{aq})}^+$ and $\text{OH}_{(\text{aq})}^-$ on the same side to form $\text{H}_2\text{O}_{(\text{l})}$, and cancel the same number of $\text{H}_2\text{O}_{(\text{l})}$ on both sides.

SUMMARY***Writing Half-Reaction Equations***

- Step 1** Write the chemical formulas for the reactants and products.
- Step 2** Balance all atoms, other than O and H.
- Step 3** Balance O by adding $\text{H}_2\text{O}_{(\text{l})}$.
- Step 4** Balance H by adding $\text{H}_{(\text{aq})}^+$.
- Step 5** Balance the charge on each side by adding e^- and cancel anything that is the same on both sides.