

## Balancing Redox Reactions by the Half-Reaction Method

In this method, the reaction is broken down into 2 half-reactions, one for oxidation and another for reduction.

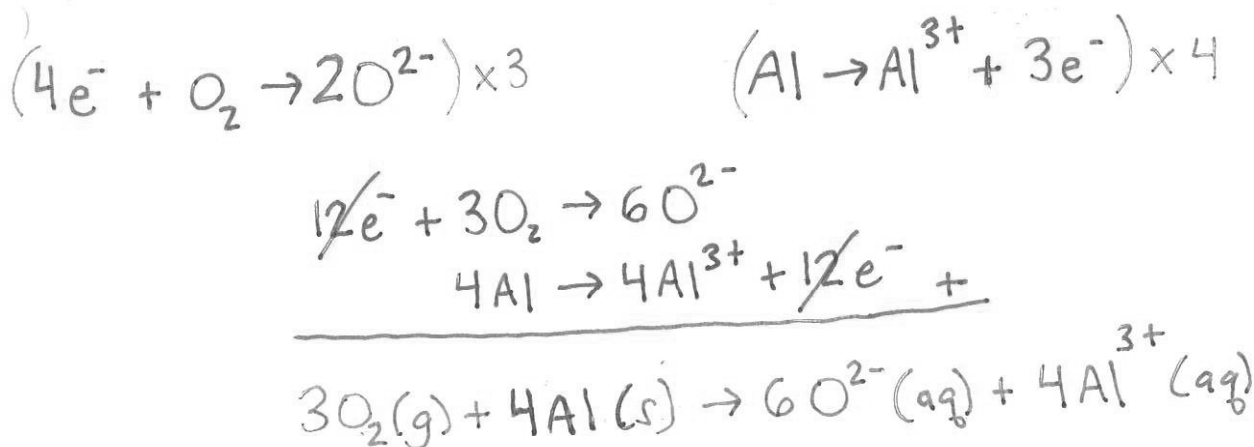
- Each half-reaction includes  $e^-$  AND is balanced for its charge.
- Then the two half-reactions are adjusted so the electrons lost and gained will be equal when combined.

### How to ACE Redox Balancing

1. Write the oxidation and reduction half-reactions (without electrons).
2. Balance half-reactions using the **ACED** technique:
  - Atoms: balance atoms first
  - Charge: balance the charge on both sides of the reaction equal by adding electrons to the side which is more positive
  - Equalize: multiply as needed so both half-reactions have the same # of electrons exchanged.
  - ADD: Add the two half-reactions, cancelling anything that appears on both sides of the equation. (Don't forget to add states in your final reaction!)  $e^-$  should ALWAYS cancel!

### Examples

Example #1:  $O_2(g) + Al(s) \rightarrow O^{2-}(aq) + Al^{3+}(aq)$



Example #2:  $Cu^{2+}(aq) + Na(s) \rightarrow Cu(s) + Na^+(aq)$

