

Oxidation and Reduction

Gaining and losing electrons

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- When atoms react they often will gain or lose electrons (form ions)

Example



Fe atom \rightarrow Fe²⁺ ion lost 2 electrons

S atom \rightarrow S²⁻ ion gained 2 electrons

□ Fe atom was oxidized (lost electrons)

□ S atom was reduced (gained electrons)

□ The oxidation half-reaction is

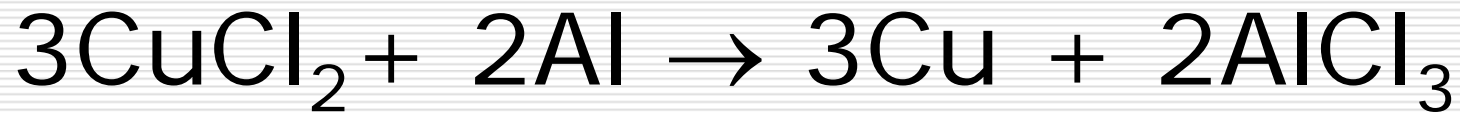


□ The reduction half-reaction is



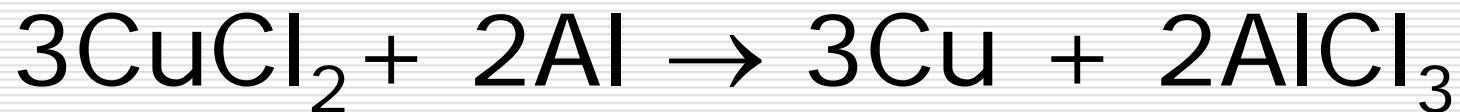
"Redox" reactions

- 2 electrons were transferred from the iron atom to the sulfur atom
 - If something is reduced, something else **MUST** be oxidized
 - The number of electrons lost by a substance must = number of electrons gained by the other substance
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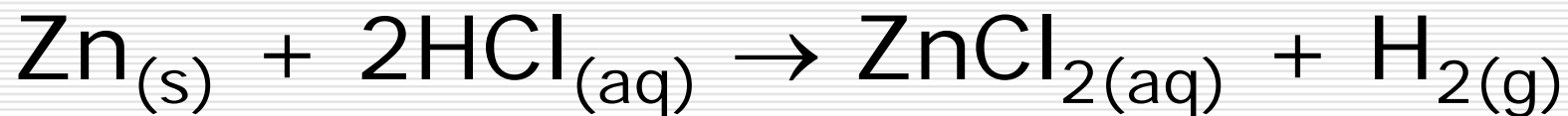
- What is reduced in the above reaction?

 - $\text{Cu}^{2+} \rightarrow \text{Cu}$ atom
 - Al atom $\rightarrow \text{Al}^{3+}$ ion
 - Cu^{2+} is gaining electrons to form atom
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- Write the reduction $\frac{1}{2}$ reaction
 - $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$
 - Write the oxidation $\frac{1}{2}$ reaction
 - $\text{Al atom} \rightarrow \text{Al}^{3+} + 3\text{e}^-$
 - How many electrons were transferred?
 - each Cu^{2+} ion gains 2e^- and there are 3 Cu^{2+} in the reaction so 6 electrons are transferred
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- The Cl^- ions do not take part in the reduction or oxidation
 - Cl^- ions are called spectators
 - Because the Cu^{2+} ion caused the Al to be oxidized, the Cu^{2+} ion is the **oxidizing agent**
 - The Al causes the Cu^{2+} ion to be reduced so Al is the **reducing agent**
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- Determine the reducing agent and oxidizing agent.
 - Reducing agent is being oxidized
 - Oxidizing agent is being reduced

 - $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^-$ oxidation $\frac{1}{2}$ reaction
 - $\text{H}^+ + 1\text{e}^- \rightarrow \text{H}$ reduction $\frac{1}{2}$ reaction
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- LEO the lion says GER
 - LEO: Loss of Electrons is Oxidation
 - GER: Gain of Electrons is Reduction
 - P 74: Q 18
 - P 75: Q 4 to 6
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