Lesson 1
Redox Reactions

Learning Goals

- ❑ I will be able to explain redox reactions in terms of electron transfer.
- ❑ I will be able to identify the oxidation and reduction half-reactions in a redox reaction

Oxidation-Reduction Reactions

Example

$$Zn(s) + CuCl_2(aq) \rightarrow Cu(s) + ZnCl_2(aq)$$

$$Zn(s) \rightarrow Zn^{2+}(aq) + 2\,e^-$$

loss of electrons

OXIDATION

$$Cu^{2+}(aq) + 2\,e^- \rightarrow Cu(s)$$

gain of electrons

REDUCTION

LEARNING CHECK

Is chlorine oxidized or reduced in the following reaction?

$$2\ \mathbf{NaBr}(aq) + \mathbf{Cl_2}(g) \rightarrow 2\ \mathbf{NaCl}(aq) + \mathbf{Br_2}(l)$$

$$\mathbf{Cl_2}(g) + 2\ \mathbf{e^-} \rightarrow 2\ \mathbf{Cl^-}(aq)$$

A gain of electrons is reduction.

Therefore, the chlorine is reduced.

Oxidation-Reduction Reactions

Example

$Zn(s) + Cu^{2+}(aq) \rightarrow Cu(s) + Zn^{2+}(aq)$ ← NET IONIC EQUATION

$Zn(s) \rightarrow Zn^{2+}(aq) + 2\ e^-$ ← OXIDATION HALF- REACTION

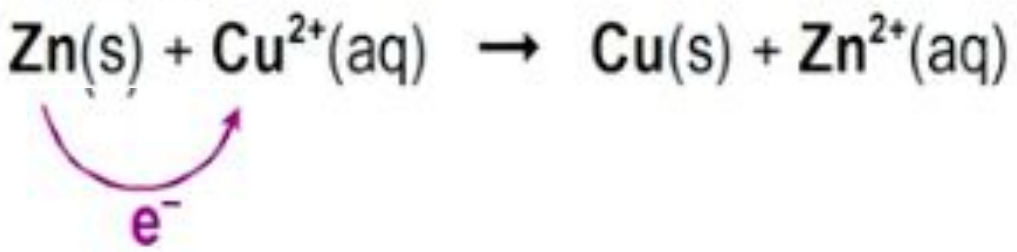
loss of electrons

OXIDATION

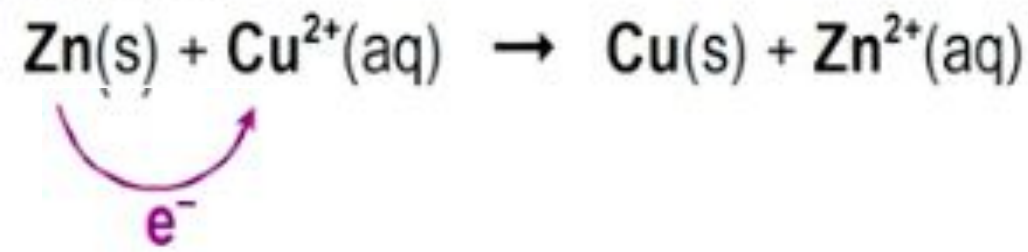
$Cu^{2+}(aq) + 2\ e^- \rightarrow Cu(s)$ ← REDUCTION HALF- REACTION

gain of electrons

REDUCTION



- Electrons lost from the zinc are gained by the copper ions.
- Redox reactions involve a transfer of electrons.
- Reduction cannot occur without oxidation and *vice versa*.



Terminology

The zinc is OXIDIZED (lost electrons).

The copper ions are the OXIDIZING AGENT (take electrons from zinc).

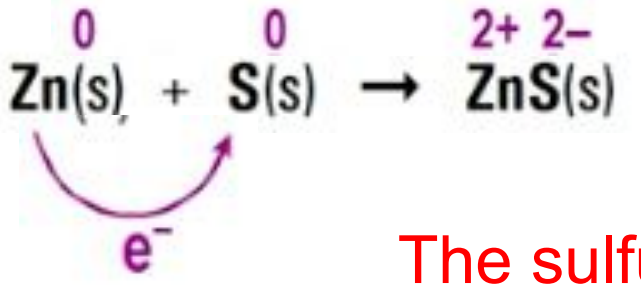
The copper ions are REDUCED (gained electrons).

The zinc is the REDUCING AGENT (gives electrons to copper ions).

LEARNING CHECK

In the following reaction, the oxidizing agent is . . .

A. zinc.
B. sulfur.
C. zinc sulfide.



The sulfur takes electrons from the zinc.
Therefore, sulfur is the oxidizing agent.

Example

$$2\ Al(s) + 3\ CuBr_2(aq) \rightarrow 3\ Cu(s) + 2\ AlBr_3(aq)$$

$$2\ Al(s) + 3\ Cu^{2+}(aq) \rightarrow 3\ Cu(s) + 2\ Al^{3+}(aq)$$ net ionic equation

$$Al(s) \rightarrow Al^{3+}(aq) + 3\ e^-$$ oxidation half-reaction

$$Cu^{2+}(aq) + 2\ e^- \rightarrow Cu(s)$$ reduction half-reaction

Success Criteria

- ❑ I can explain redox reactions in terms of electron transfer.
- ❑ I can identify the oxidation and reduction half-reactions in a redox reaction

WORK:

- Read **section 9.1** in textbook.
- Do questions **1 to 4** on **pages 601-602**
- Check your **answers** and review as necessary.