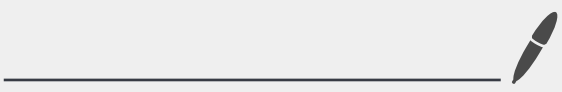


Electrochemistry

Oxidation : Loss of electrons.
Reduction: Gain of electrons.
Spectator ions: Ions that do not participate in a chemical reaction.

ex)
$Pb \rightarrow Pb^{2+}$ - Oxidation
$Sn^{2+} \rightarrow Sn$ - Reduction

Half reaction: An equation that represents only half of a redox reaction.
- Shows how one entity is either oxidized or reduced.

Zero-sum rule:
- The sum of the oxidation numbers in all atoms in an electrically neutral compound is 0.
- The sum of the oxidation numbers in all atoms in an ion containing 2+ atoms is equal to the overall charge.

ex) Assign oxidation numbers.

Na^+	Na^+: +1		
H_2SO_4	H: +1	S: +6	O: -2
Na_2CO_3	Na: +1	C: +4	O: -2

Balancing Redox Reactions

- Assign oxidation numbers
- Write half-reactions
- Balance each except H and O
- Balance H and O with H_2O and H^+
- Electrons to balance the charge.
- Add half-reactions (cancel e^-)
- Add OH^- on each side for all H^+ **IF BASIC**
- Write balanced equation

$Ag + NO_3^- \rightarrow Ag^+ + NO$ - in acidic conditions

ox. $Ag \rightarrow Ag^+$ red $NO_3^- \rightarrow NO$

$3Ag \rightarrow 3Ag^+ + 3e^-$

$NO_3^- + 4H^+ \rightarrow NO + 2H_2O$

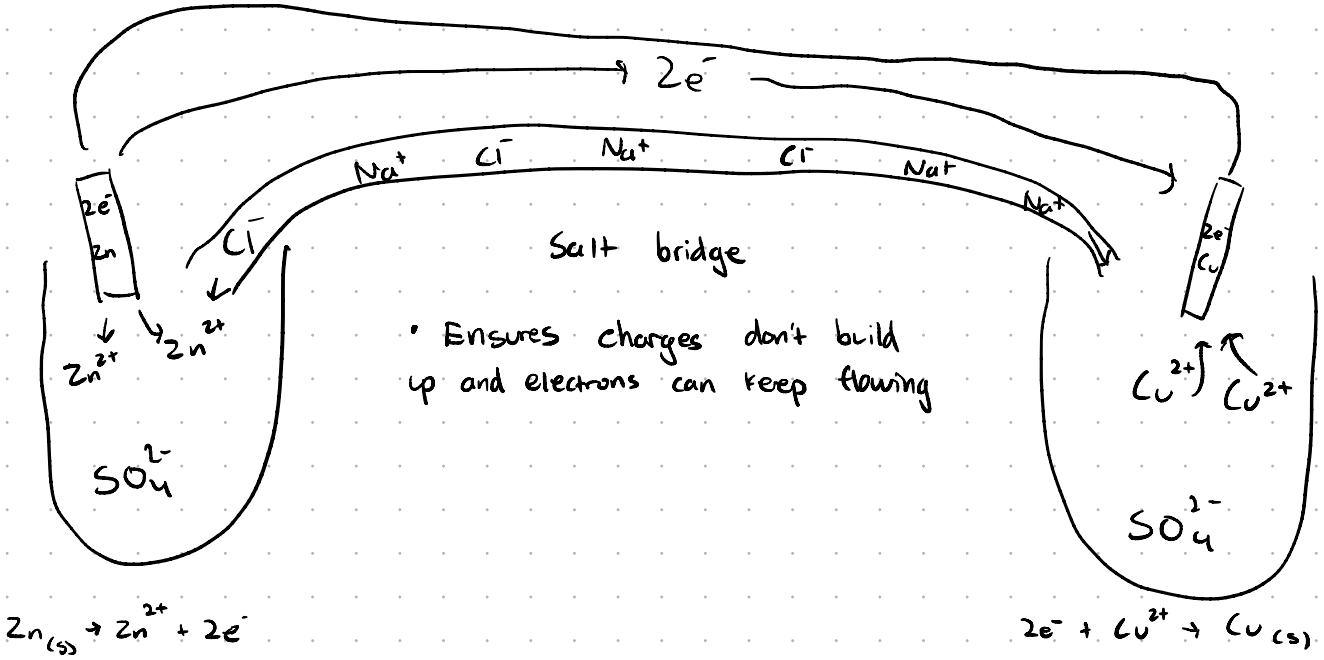
$3e^- + NO_3^- + 4H^+ \rightarrow NO + 2H_2O$

$3Ag + 3e^- + NO_3^- + 4H^+ \rightarrow 3Ag^+ + 3e^- + NO + 2H_2O$

Galvanic Cells

- A galvanic cell is a device that spontaniously converts chemical energy to electrical energy.
- The electrons are going to be moving from one reactant to another.
- The reactants are separated by a barrier.
- On either side of the barrier, one half-reaction is ocurring. The barrier is usually made semi-permeable via a salt bridge.

- There are two electrodes where electrons can travel and oxidation or reduction occurs.
  - ↳ Anode: electrons being released by an oxidation reaction.
  - ↳ Cathode: electrons being released by a reduction reaction.
- Electrodes are solid electrical conductors. The two half-cells (and their electrodes) are connected by a wire which allows electrons to travel.



- Ensures charges don't build up and electrons can keep flowing

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

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

$$2\cancel{e^-} + Zn_{(s)} + Cu^{2+} \rightarrow Zn^{2+} + Cu_{(s)} + 2\cancel{e^-}$$

$$Zn_{(s)} + Cu^{2+} \rightarrow Zn^{2+} + Cu_{(s)}$$