CONCEPT: ELECTROLYTIC CELL

Intro to Electrolytic Cells

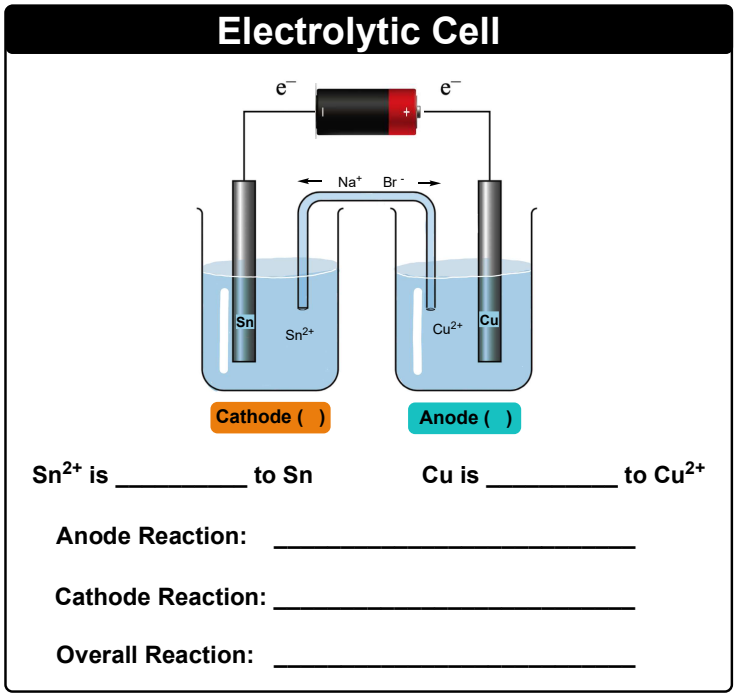
- A _____ cell that utilize *electrolysis* in order to operate. Example: ____ or _____ car batteries.
  - □ **Electrolysis:** Chemical Reactions that consume external _____ energy in order to occur.
  - □ No matter the cell, the cathode is the site of _____ and the anode is the site of _____.

EXAMPLE: In a galvanic cell, the acceptance of an electron occurs at the _____ and in an electrolytic cell it occurs at the _____.

a) cathode, cathode b) anode, anode c) anode, cathode d) cathode, anode

Electrolytic Cell Components

- Electrolytic cells use the same major components as galvanic cells, but still possess some key differences.
  - □ **Key Difference 1:** An electrolytic cell _____ electricity and requires a battery to drive the reaction forward.
  - □ **Key Difference 2:** Uses stored _____ energy and converts it into _____ energy.
  - □ **Key Difference 3:** Since the process is nonspontaneous, the cathode is _____ and the anode is _____.



Sn^{2+} is _____ to Sn **Cu is _____ to Cu^{2+}**

Anode Reaction: _____

Cathode Reaction: _____

Overall Reaction: _____

EXAMPLE: Which of the following is true about an electrolytic cell?

a) Has a positive cathode b) Has no salt bridge c) Cathode plates out d) Has a negative anode

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Spontaneity

● An Electrolytic Cell uses _____ redox reactions to consume electricity.

□ All nonspontaneous redox reactions have a _____ ΔE^{o}_{cell} value.

Spontaneity	ΔG^{o}	ΔS^{o}_{tot}	Keq	K vs Q	E^{o}cell
Nonspontaneous	ΔG^{o} __ 0	ΔS^{o}_{tot} __ 0	K __ 1	K __ Q	E^{o}cell __ 0

EXAMPLE: If the standard cell potential E^{o}_{cell} for the given redox reaction is – 0.54 V, which of the following statements is true? z

$$Zn^{2+}(aq) + Ni(s) \rightleftharpoons Zn(s) + Ni^{2+}(aq)$$

a) The redox reaction will have an equilibrium constant value that is greater than 1.

b) The redox reaction will produce electricity.

c) The redox reaction will have an equilibrium constant value that is less than 1.

d) The reaction quotient will be less than the equilibrium constant.

PRACTICE: If the overall redox reaction for an electrolytic cell is given below, what will happen to the mass of the cobalt electrode?

$$Co^{2+}(aq) + Cu(s) \rightleftharpoons Co(s) + Cu^{2+}(aq)$$

a) Its mass will increase.

b) Its mass will decrease.

c) Its mass will remain constant.

d) Not enough information is given.