

## Study Guide for CHEM 219/229

How to write a redox reaction using Electrochemical Cell notation:

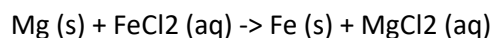
Terms to know:

- Redox Reaction: A chemical reaction that involves the transfer of electrons between species, with one species losing electrons (being oxidized) and another species gaining electrons (being reduced).
- Electrode: For the purposes of electrochemistry, a strip of metal.
- Half-cell: An electrode submerged in a solution of ions of the same metal.
- Electrochemical Cell: Two properly connected half cells. Two kinds: Galvanic and electrolytic
  - Galvanic Cell: An electrochemical cell that uses a chemical reaction to produce electrical energy.
  - Electrolytic Cell: An electrochemical cell that uses electrical energy to drive a chemical reaction.
- Anode: The half-cell where oxidation takes place.
- Cathode: The half-cell where reduction takes place.
- Salt-bridge: A porous barrier (generally a U-tube) that allows ions to move between half-cells to complete the electrical circuit.

General Cell Diagram:

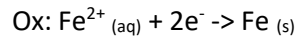
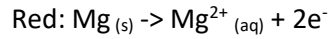


- The single lines represent the phase boundary between each electrode and its solution
- The double lines represent the salt bridge
- The anode is always written on the left of the diagram, the cathode always on the right.
- Example:
  - For the following reaction:



- We start by assigning oxidation numbers:
- Mg (s):
  - Mg O.N = 0
- FeCl<sub>2</sub> (aq):
  - Fe O.N = +2
  - Cl O.N = -1
- Fe (s):
  - Fe O.N = 0
- MgCl<sub>2</sub> (s):
  - Mg O.N = +2
  - Cl O.N = -1

- We can see that the Mg is being oxidized (it goes from a 0 to a +2 O.N), while the Fe is being reduced (goes from a +2 to a 0 O.N).
- We can then break the redox reaction into half-reactions. One reduction half-reaction and one oxidation half-reaction:



- Notice that the Cl does not appear. Because it doesn't change during the reaction, it is only a spectator ion and can be ignored.
- Each of these half reactions can then be written as a half-cell, with the oxidation half-reaction being at the anode and reduction half-reaction being at the cathode:

Anode | Solution | | Solution | Cathode

