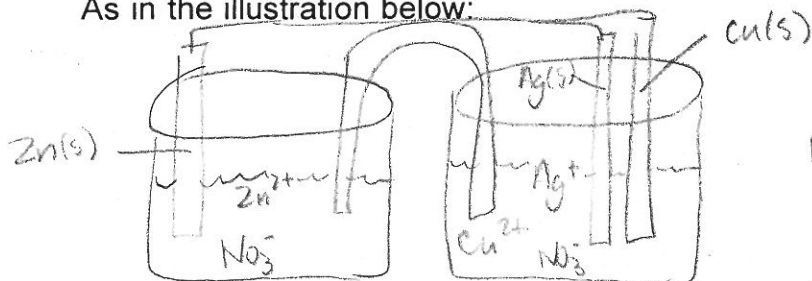


Name: Teaching Copy !!  
 Blk: \_\_\_\_\_ Date: \_\_\_\_\_

Chemistry 12  
 Electrochemistry Lesson #10  
 Selecting Preferred Reactions

When an electrochemical cell contains a mixture of substances, several different reactions MAY appear to be possible.

As in the illustration below:



Possible half-rxns

$$\text{Ag}^+ + 1e^- \rightleftharpoons \text{Ag} \quad E^\circ = 0.80\text{V}$$

$$\text{Cu}^{2+} + 2e^- \rightleftharpoons \text{Cu} \quad E^\circ = 0.34\text{V}$$

$$\text{Zn}^{2+} + 2e^- \rightleftharpoons \text{Zn} \quad E^\circ = -0.76\text{V}$$

HOWEVER, when several different reduction half-reactions can occur, the half reaction having the Highest tendency to accept e<sup>-</sup> (highest E<sup>o</sup> value) is preferred.

Therefore → Ag<sup>+</sup> will reduce to form Ag.

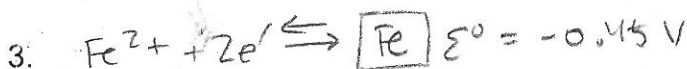
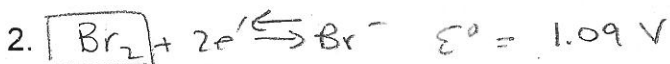
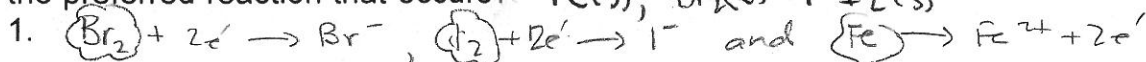
When several different oxidation half-reactions can occur, the half-reaction having the highest tendency to give an e<sup>-</sup> (lowest E<sup>o</sup> value) is preferred.

Therefore → Zn will oxidize to form Zn<sup>2+</sup>

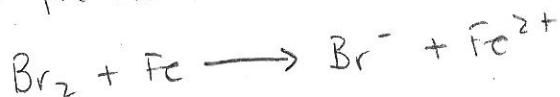
STEPS for determining the preferred half reactions:

1. list all species present (break up all compounds into IONS)
2. Start @ upper left & find first match from your list ⇒ this species will undergo reduction
3. Start @ bottom right & find first match from your list ⇒ this species will undergo oxidation

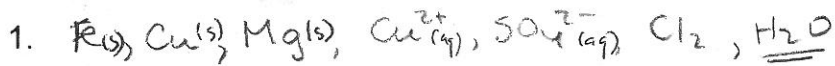
Example 1. An iron strip is placed in a mixture of Br<sub>2</sub> (aq) and I<sub>2</sub> (aq). What is the preferred reaction that occurs? Fe(s), Br<sub>2</sub>(aq) + I<sub>2</sub>(aq)



∴ The preferred rxn is:



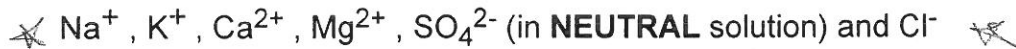
Example 2. A beaker contains an iron nail wrapped with both a piece of copper and a piece of magnesium ribbon, immersed in an aqueous solution containing  $\text{CuSO}_4$  and some dissolved  $\text{Cl}_2$ . What is the overall preferred reaction?



SPECTATOR IONS:

Any ion capable of being **REDUCED** will be a spectator if another ion in the same solution has a greater tendency to REDUCE. Similarly; any ion capable of being **OXIDIZED** will be a spectator if another ion in the same solution has a greater tendency to OXIDIZE.

The following ions are generally considered to be spectators:



**FOR HOMEWORK:** Do exercise **47 (all letters)** on page 228 then Read pgs 228- 233 (Applied electrochemistry) and answer questions 49, 51-54 and 56.