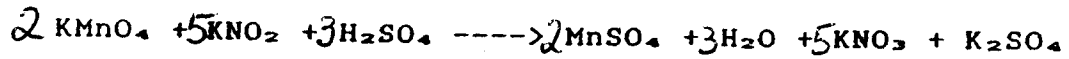


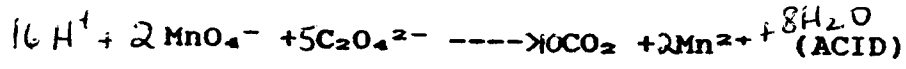
Key.

Electrochemistry #6

- Balance the equation and indicate the
 - oxidizing agent. KMnO_4
 - reducing agent. KNO_2
 - the element being reduced. Mn
 - the element being oxidized. N

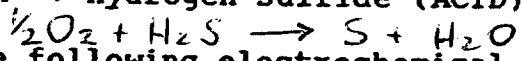


- Balance the equation and indicate the
 - oxidizing agent. MnO_4^-
 - reducing agent. $\text{C}_2\text{O}_4^{2-}$
 - the element being reduced. Mn
 - the element being oxidized. C

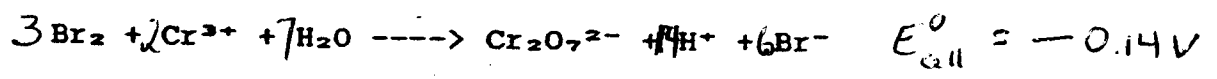


- Write the net ionic electrochemical equation for:

Oxygen + hydrogen sulfide (ACID)



- Balance the following electrochemical reaction and determine the cell E° value.

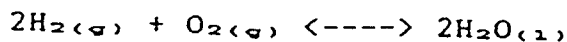


- An iron-nickel electrochemical cell uses a salt bridge to join a half-cell containing a strip of iron in a 1.0 M solution of Fe^{2+} to a half-cell which contains a strip of nickel in a 1.0 M Ni^{2+} solution. A voltmeter connects the two metal strips.

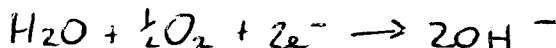
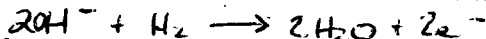
- In which cell does reduction occur? Ni^{2+}/Ni
- Write the two half-cell reactions involved.
 $\text{Ni}^{2+} + 2\text{e}^- \rightarrow \text{Ni}$ $\text{Fe} \rightarrow \text{Fe}^{2+} + 2\text{e}^-$
- Which metal is the anode?
 Fe
- In which direction are electrons passing through the voltmeter?
 From Fe through voltmeter to Ni
- What is the expected initial voltmeter reading? 0.19V
- What would be the effect on the voltmeter reading if the Fe^{2+} concentration only were increased to 2.0 M?
- What would be the effect if only the $[\text{Ni}^{2+}]$ were decreased to 0.50 M?
 Voltage would decrease
- What is the voltmeter reading when the cell reaches equilibrium?

0.00 V

6. A fuel cell converts about 75% of the available chemical energy into usable electric energy. One type of fuel cell is based on the combustion of hydrogen forming water:

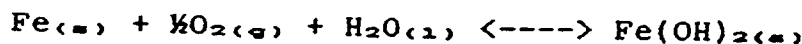


- (a) Write the anode reaction occurring in basic solution.
 (b) Write the cathode reaction also occurring in basic solution.
 (c) Would a low or high gas pressure give the better E° value? Explain.



high gas pressure, gases are reactants so eq shifts

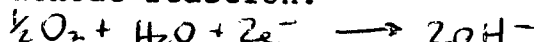
7. Corrosion of iron involves the oxidation of iron into Fe^{2+} products when impurities such as copper serve as the cathode half cell where the reduction of oxygen occurs.



Further oxidation of $\text{Fe}(\text{OH})_2$ by oxygen yields $\text{Fe}(\text{OH})_3$.

- (a) What two factors are involved in corrosion of iron?
 (b) Write the anode reaction.
 (c) Write the cathode reaction.
8. (a) Draw a diagram for an experimental setup that demonstrates how a copper-plated spoon could be plated with silver.
 (b) Identify the cathode and anode materials and the electrolytic solution.
9. Predict the principal product discharged at each electrode during the electrolysis of these 1 M solutions. Assume platinum electrodes are used.

Oxygen gas + moisture



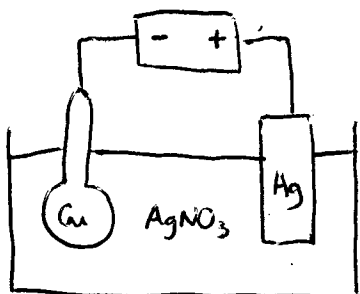
See below

Cathode = copper spoon Solution = silver nitrate
 anode = silver metal

- (a) KI Anode: I_2
 Cathode: $\text{H}_2 + \text{OH}^-$
 (b) H_2SO_4 Anode: $\text{O}_2 + \text{H}^+$
 Cathode: H_2SO_3 ; H_2O
 (c) HCl Anode: Cl_2
 Cathode: ~~H_2SO_3~~ H_2

10. Explain why chromium, aluminum or magnesium metal does not corrode as rapidly as a less active metal such as iron.

8(a)



Iron oxide flakes off, allowing moist air to come into contact with fresh metal. The other metal oxides are more likely to form an impermeable layer on the metal.