**SCH 4UI Exam Review Unit #5 - Electrochemistry**

1. Assign oxidation numbers to the atoms in the following species
   1. HCl

1+ 1-

* 1. LiH

1+ 1-

* 1. HClO3

1+5+ 2-

* 1. H2O

1+ 2-

* 1. H2O2

1+ 1-

* 1. CaO

2+ 2-

* 1. CaF2

2+ 1-

* 1. NO3-

5+ 2-

* 1. S2O32-

2+ 2-

* 1. Cl-

1-

* 1. ClO-

1+ 2-

* 1. ClO2-

3+ 2-

* 1. ClO3-

5+ 2-

* 1. ClO4-

7+ 2-

1. Balance the following redox equations
   1. CuO + NH3 🡪 Cu + N2

6~~2~~H+ + 6~~2~~e- + 3CuO 🡪 3Cu + 3H2O x3

2NH3 🡪 N2 + 6H+ + 6e-

3CuO + 2NH3 🡪 3Cu + 3H2O + N2

* 1. Cl2 🡪 ClO- + Cl-

H2O + Cl2 🡪 ClO- + Cl- + 2H+

* 1. I2 + Cl2 🡪 IO3- + Cl- (acidic)

6H2O + I2 🡪 2IO3- + 12H+ + 10e-

10~~2~~e- + 5Cl2 🡪 10~~2~~Cl- x5

6H2O + I2 + 5Cl2 🡪 2IO3- + 12H+ +10Cl-

* 1. S2- + Cr2O72- 🡪 S + Cr3+ (acidic)

3S2- + 🡪 3S + 6~~2~~e- x3

14H+ +6e-+ Cr2O72- 🡪 2Cr3+ + 7H2O

14H+ +Cr2O72- 3S2- + 🡪 3S + 2Cr3+ + 7H2O

* 1. Zn + NO3- 🡪 ZnO22- + NH3 (basic)

4OH- + Zn + ~~2H~~~~2~~~~O~~ 🡪 ZnO22- + ~~(4H~~~~+~~ ~~+ 4OH-)~~ 2H2O + 2e- x4

(9 H+ + 9OH-)6~~9~~H2O + NO3- 8e-🡪 NH3 + ~~3H~~~~2~~~~O~~ + 9OH-

NO3- + 7OH- + 4Zn🡪 4ZnO22- + 2H2O + NH3

1. Write three different spontaneous reactions in which zinc is oxidized

Zinc will be oxidized through a spontaneous reaction by choosing a reaction with a stronger oxidizing agent

Zn(s) + Fe2+(aq) 🡪 Zn2+(aq) + Fe(s)

Zn(s) + Ni2+(aq) 🡪 Zn2+(aq) + Ni(s)

Zn(s) + 2Ag+(aq) 🡪 Zn2+(aq) + 2Ag(s)

1. For a galvanic cell involving zinc and silver
   1. Determine which element is the anode and cathode

Zinc is the stronger reducing agent, so it will be oxidized, making it the anode  
Ag will be reduced, so it will be the cathode

* 1. Draw the galvanic cell

e-

Zn

Ag

salt bridge KCl

oxidation reduction

anode cathode

Cl-

K+

Zn2+(aq) Ag+(aq)

* 1. Write the half-reactions and overall reaction.

Zn(s) 🡪 Zn2+(aq) + 2e-

2Ag+(aq) + 2e- 🡪 2Ag(s) x2

Zn(s) + 2Ag+(aq) 🡪 Zn2+(aq) + 2Ag(s)