Name _____   Block: _____   Date: _____

Chemistry 12
Electrochemical Cells

1. Fill in the following table using your reduction table.

Metal/ion	Metal/ion	Cathode	Cathode Half-rxn	Anode	Anode Half-rxn
Ag/Ag$^+$	Fe/Fe^{2+}	Ag (higher)	Ag$^+$ + e$^-$ → Ag	Fe (lower)	Fe → Fe^{2+} + 2e$^-$
Zn/Zn^{2+}	Pb/Pb^{2+}				
Ni/Ni^{2+}	Al/Al^{3+}				
Au/Au^{3+}	Ag/Ag$^+$				
Mg/Mg^{2+}	H$_2$/H$^+$				
Co/Co^{2+}	Sn/Sn^{2+}				

2. Electrochemical cells convert _____ energy into _____ energy.

3. _____ is the electrode where oxidation occurs.

4. Electrons are _____ at the anode.

5. _____ is the electrode where reduction occurs.

6. In the half-rxn at the cathode, e$^-$'s are on the _____ side of the equation.

7. Electrons flow from the _____ toward the _____ in the _____.

8. Cations ((+) ions) flow from the _____ beaker toward the _____ beaker through

    the _____.

9. Anions ((-) ions flow from the _____ beaker to the _____ beaker through the

    _____.

10. The higher half-rx on the table is the one for the _____ and is not reversed.

11. The lower half-rx on the table is the one for the _____ and is reversed.

12. Electrons do not travel through the _____ _____, only through the _____.

13. Ions (cations & anions) do not travel through the wire but only through the _____ _____.

14. The salt bridge can contain any _____.

15. The anode will _____ (gain/lose) mass as it is _____ (oxidized/reduced).

16. The cathode will _____ mass as it is _____ (oxidized/reduced).

17. A cell is made up as follows. A piece of Ni foil is immersed in a beaker of $NiCl_2$ solution and a strip of Cu foil is immersed in a beaker of $CuSO_4$ solution. The metal electrodes are connected b a wire and the beakers are connected by a salt bridge. The net ionic equation for the reaction is:
$$Ni + Cu^{2+} \rightarrow Ni^{2+} + Cu$$
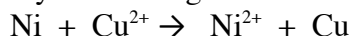
    a. Which electrode is the anode? _____

    b. Toward which electrode do the SO_4^{2-} ions migrate? _____

    c. Which way do the electrons flow in the wire? _____

    d. If 0.025 mol of Cu(s) is produced in the reaction, how many moles of electrons flow through the wire?

    e. Toward which electrode do the Ni^{2+} ions migrate after being formed? _____

18. An electrochemical cell is made by placing a weighted strip of Sn in a beaker containing 1 M $SnSO_4$ and a weighed strip of Ag in a beaker containing 1 M $AgNO_3$. The metal strips are connected by a wire and the beakers are connected by a salt bridge. After several hours the Sn electrode decreases in mass.

    a. What is the net ionic equation for the reaction? _____

    b. Which electrode is the cathode? _____

    c. Toward which electrode do the Ag^+ ions migrate? _____

    d. Which way do the electrons flow in the wire? _____

    e. Does the Ag electrode gain or lose mass? _____

    f. If 0.010 mol of Sn(s) goes into the solution, how many moles of electrons flow through the wire?

    g. If 0.020 mol of Sn goes into the solution, how many moles of Ag are involved in the reaction?

    h. How many moles of electrons flow through the salt bridge in part (g)?