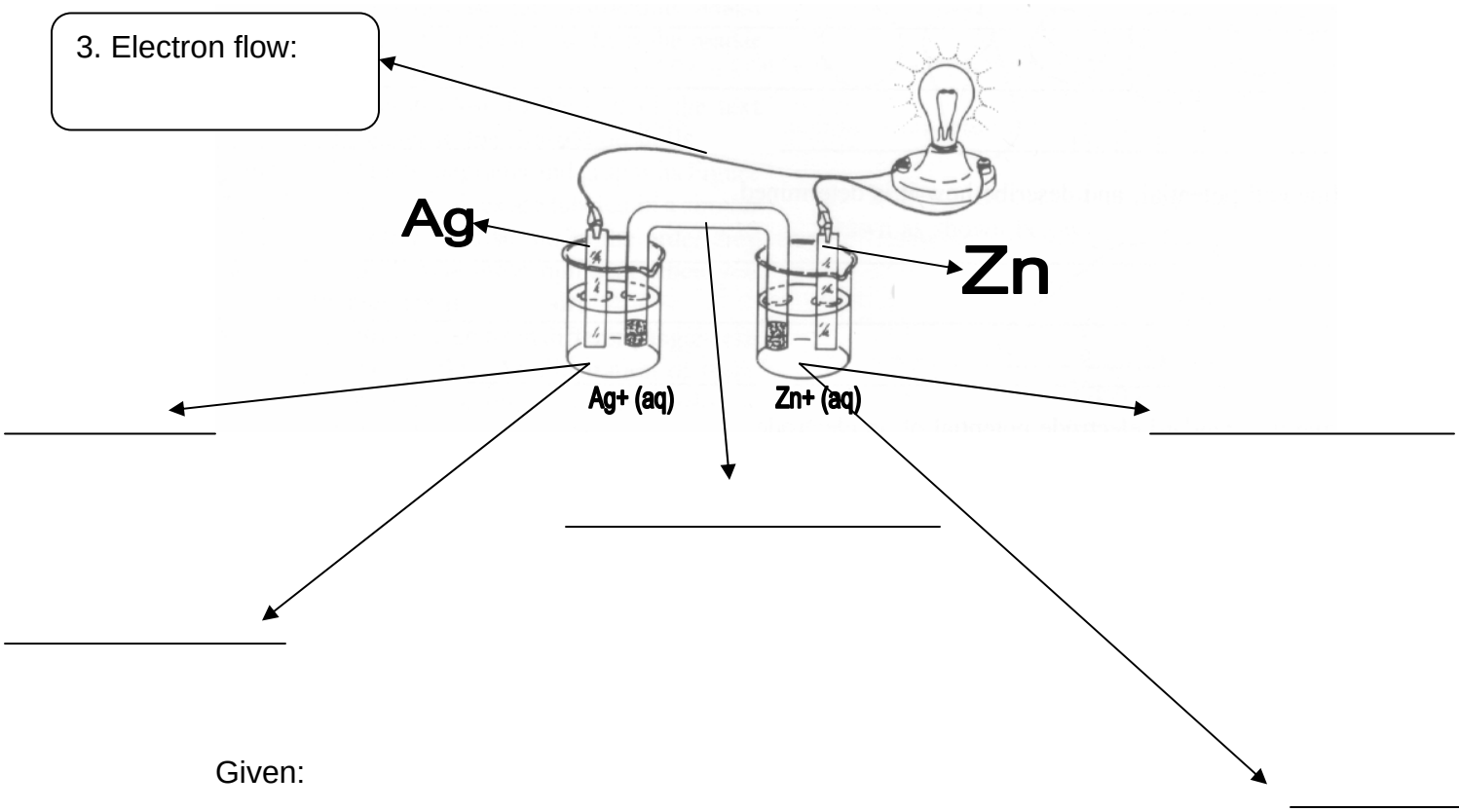
General Chemistry
Mr. MacGillivray
Quiz #41:
Electrochemistry



Given:

$Ag^{+} + e^{-} \Rightarrow Ag \qquad E^{0} = +0.80\ V$

$Zn^{2+} + 2e^{-} \Rightarrow Zn \qquad E^{0} = -0.76\ V$

The above chemical reaction is spontaneous.

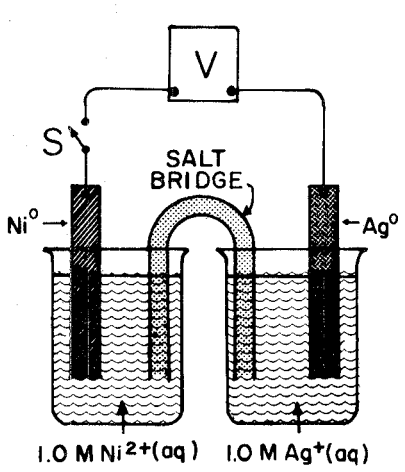
1. Write the BALANCED reaction for the above chemical reaction. You may express the reaction with half-reactions, but be sure to combine them into ONE balanced reaction for your final answer.

2. Fill in the blanks above with the above terms:
   Anode Cathode Salt bridge Oxidation Reduction

3. Indicate the direction of electron flow in the blank provided.

Electrochemistry Name_____

____1. Base your answer to the following question on the diagram of the chemical cell at 298 K and on the equation below.



$$Ni^0(s) + 2Ag^+(aq) \rightarrow Ni^{2+}(aq) + 2Ag^0(s)$$

When the switch is closed, the potential (E^o) of this cell is

1) 0.54 V
2) 1.06 V
3) 1.32 V
4) 1.86 V

____2. Given the chemical cell reaction:

$$2\ Ag^+ + Zn^0 \rightarrow 2\ Ag^0 + Zn^{2+}$$

What is the net potential (E^0) for the cell?

1) 1.56 V
2) 2.36 V
3) 0.84 V
4) 0.04 V

____3. Given the reaction

$$Al^0 + 3\ Ag^+ \rightarrow Al^{3+} + 3\ Ag^0.$$

What is the cell voltage (E^o) for the overall reaction?

1) 0.86 V
2) 1.78 V
3) 2.46 V
4) 3.38 V

____4. According to Reference Table X, the half-reaction,

$$Mn(s) \rightarrow Mn^{2+} + 2e^-$$

has a potential (E^0) of

1) +1.51 volts
2) –1.51 volts
3) +1.19 volts
4) –1.19 volts

____5. According to Reference Table *X*, what is the standard electrode potential (E^o) for the oxidation of Cu(s) to Cu^{2+}?

1) +0.52
2) +0.34
3) –0.52
4) –0.34

____6. In order for a redox reaction to be spontaneous, the potential (E^o) for the overall reaction must be

1) greater than zero
2) zero
3) between zero and –1
4) less than –1

____7. Which expression correctly represents a balanced reduction half-reaction?

1) $Na^+ + e^- \rightarrow Na$
2) $Na \rightarrow Na^+ + e^-$
3) $Cl_2 + 2e^- \rightarrow Cl^-$
4) $2\ Cl^- \rightarrow Cl_2 + 2e^-$

Standard Reduction Table
25°C

Half-Reaction	E° (V)
$H_2O_2+2H^++2e^- \rightarrow 2H_2O$	1.78
$PbO_2+4H^++SO_4^{2-}+2e^- \rightarrow PbSO_4+2H_2O$	1.69
$MnO_4^-+4H^++3e^- \rightarrow MnO_2+2H_2O$	1.68
$MnO_4^-+8H^++5e^- \rightarrow Mn^{2+}+4H_2O$	1.51
$PbO_2+4H^++2e^- \rightarrow Pb^{2+}+2H_2O$	1.46
$Cl_2+2e^- \rightarrow 2Cl^-$	1.36
$O_2+4H^++4e^- \rightarrow 2H_2O$	1.23
$Br_2+2e^- \rightarrow 2Br^-$	1.09
$NO_3^-+4H^++3e^- \rightarrow NO+2H_2O$	0.96
$Ag^++e^- \rightarrow Ag$	0.80
$I_2+2e^- \rightarrow 2I^-$	0.54
$Cu^++e^- \rightarrow Cu$	0.52
$O_2+2H_2O+4e^- \rightarrow 4OH^-$	0.40
$Hg_2Cl_2+2e^- \rightarrow 2Hg+2Cl^-$	0.34
$Cu^{2+}+2e^- \rightarrow Cu$	0.34
$SO_4^{2-}+4H^++2e^- \rightarrow H_2SO_3+H_2O$	0.20
$Cu^{2+}+e^- \rightarrow Cu^+$	0.16
$2H^++2e^- \rightarrow H_2$	0.00
$Fe^{3+}+3e^- \rightarrow Fe$	–0.036
$Pb^{2+}+2e^- \rightarrow Pb$	–0.13
$Sn^{2+}+2e^- \rightarrow Sn$	–0.14
$Ni^{2+}+2e^- \rightarrow Ni$	–0.23
$PbSO_4+2e^- \rightarrow Pb+SO_4^{2-}$	–0.35
$Cd^{2+}+2e^- \rightarrow Cd$	–0.40
$Fe^{2+}+2e^- \rightarrow Fe$	–0.44
$Cr^{3+}+3e^- \rightarrow Cr$	–0.73
$Zn^{2+}+2e^- \rightarrow Zn$	–0.76
$2H_2O+2e^- \rightarrow H_2+2OH^-$	–0.83
$Mn^{2+}+2e^- \rightarrow Mn$	–1.18
$Al^{3+}+3e^- \rightarrow Al$	–1.66
$Mg^{2+}+2e^- \rightarrow Mg$	–2.37
$Na^++e^- \rightarrow Na$	–2.71
$Ca^{2+}+2e^- \rightarrow Ca$	–2.76
$K^++e^- \rightarrow K$	–2.92
$Li^++e^- \rightarrow Li$	–3.05

Increasing strength as reducing agent ↓