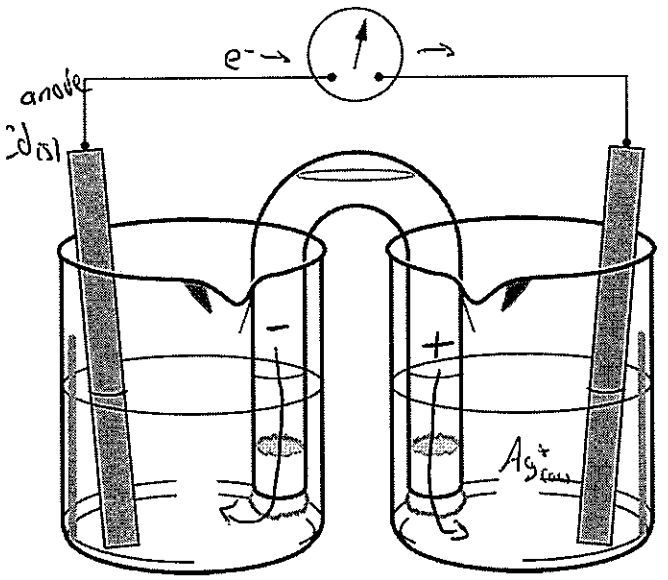
KEY

Chemistry 30: Electrochemistry
Voltaic Cells Quiz

For the following cell, use the given cell notation to identify the strongest oxidizing and reducing agents. Write chemical equations to represent the cathode, anode, and net cell reactions. Label cathode and anode, electron flow, and ion movement. Label the oxidation half cell and the reduction half cell. Predict the cell potential. (The arrow shows direction of electron flow)

1. $Cd(s) \mid Cd(NO_3)_2(aq) \parallel AgNO_3(aq) \mid Ag(s)$



cat: $2[Ag^+ + 1e^- \rightarrow Ag_{(s)}]$

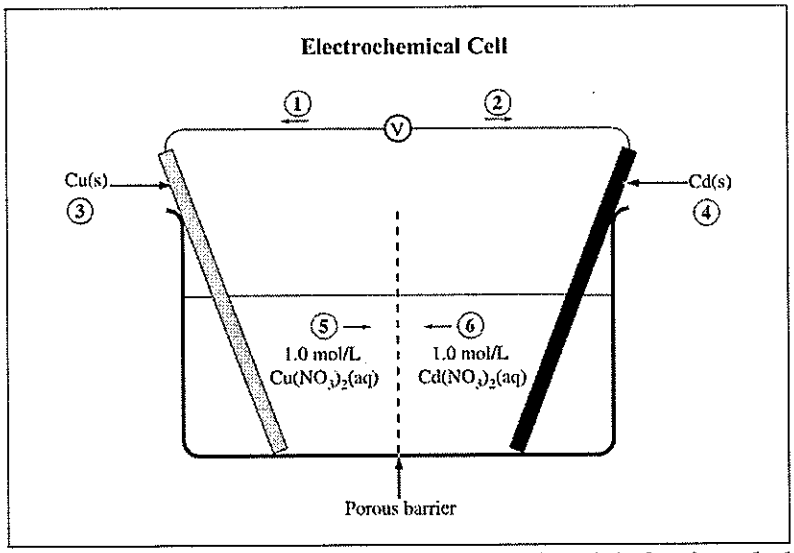
an: $Cd_{(s)} \rightarrow Cd^{2+}_{(aq)} + 2e^-$

net: $2Ag^+_{(aq)} + Cd_{(s)} \rightarrow 2Ag_{(s)} + Cd^{2+}_{(aq)}$

$E_{cell} = +0.80V - -0.40V$

$= \boxed{+1.20V}$

Use the following diagram to answer the next question.



2. Match the numbers in the diagram above with their appropriate labels given below.

Anode	4
Cathode	3
Anion movement	5
Electron movement	1

3. Calculate the cell potential for the cell above.

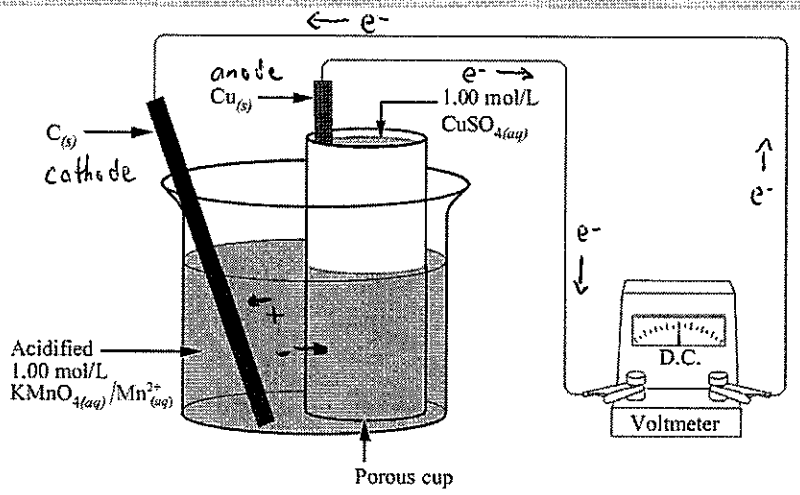
$E_{cell} = +0.34V - -0.40V = \boxed{+0.74V}$

Label Cell

SOA: H^+, MnO_4^-

SRA: $Cu|Cu^{2+}$

A chemistry student constructs the cell shown below.



4. The net equation and the predicted voltage for the operating cell are

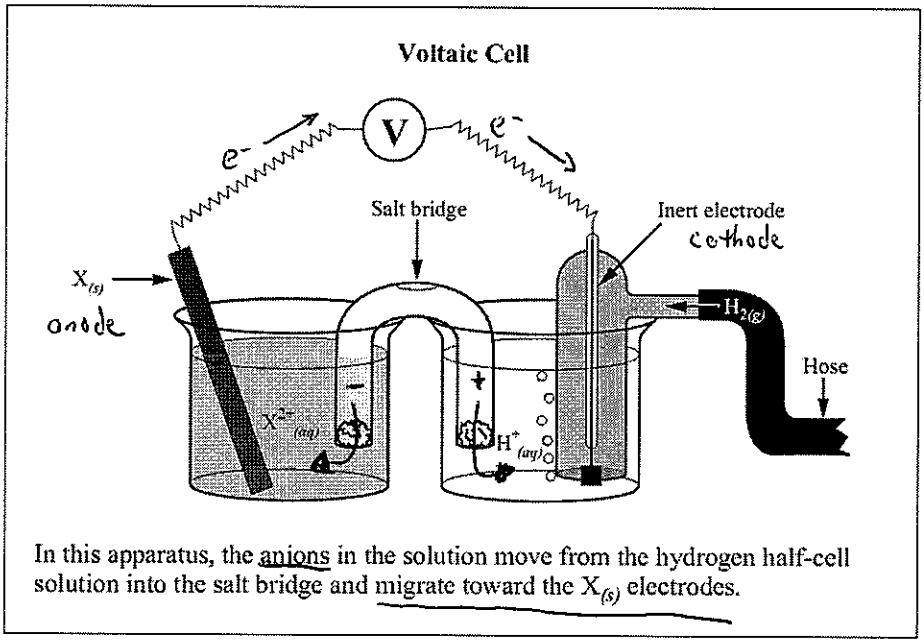
A. $MnO_4^-{}_{(aq)} + 8\,H^+{}_{(aq)} + Cu_{(s)} \rightarrow Mn^{2+}{}_{(aq)} + 4\,H_2O_{(l)} + Cu^{2+}{}_{(aq)}$ $\quad E°_{net} = +1.17$ V

B. $MnO_4^-{}_{(aq)} + 8\,H^+{}_{(aq)} + Cu_{(s)} \rightarrow Mn^{2+}{}_{(aq)} + 4\,H_2O_{(l)} + Cu^{2+}{}_{(aq)}$ $\quad E°_{net} = +1.85$ V

C. $2\,MnO_4^-{}_{(aq)} + 16\,H^+{}_{(aq)} + 5\,Cu_{(s)} \rightarrow 2\,Mn^{2+}{}_{(aq)} + 8\,H_2O_{(l)} + 5\,Cu^{2+}{}_{(aq)}$ $\quad E°_{net} = +1.17$ V

D. $2\,MnO_4^-{}_{(aq)} + 16\,H^+{}_{(aq)} + 5\,Cu_{(s)} \rightarrow 2\,Mn^{2+}{}_{(aq)} + 8\,H_2O_{(l)} + 5\,Cu^{2+}{}_{(aq)}$ $\quad E°_{net} = +1.85$ V

Use the following information to answer the next two questions.



5. As this cell operates, electrons flow from

A. X(s) to the inert electrode and the pH in the hydrogen half-cell increases

B. X(s) to the inert electrode and the pH in the hydrogen half-cell decreases

C. the inert electrode to X(s) and the pH in the hydrogen half-cell increases

D. the inert electrode to X(s) and the pH in the hydrogen half-cell decreases

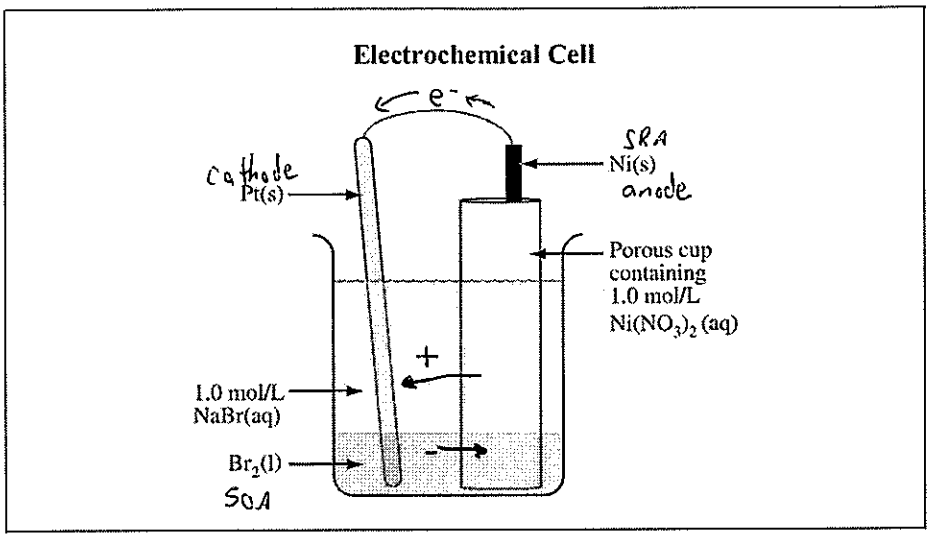
$E_{cell} = E_{cat} - E_{an}$

$0.45V = 0.00V - ?$

$E_{anode} = -0.45V$

6. If the voltmeter reads +0.45 V under standard conditions, then X(s) is most likely

A. Ni(s) B. Fe(s) C. Zn(s) D. Mg(s)



7. Write the cathode and anode half reactions along with the net reaction for the cell above.

cat: $Br_2 + 2e^- \rightarrow 2Br^-_{(aq)}$

an: $Ni_{(s)} \rightarrow Ni^{2+}_{(aq)} + 2e^-$

net: $Br_{2(l)} + Ni_{(s)} \rightarrow Ni^{2+}_{(aq)} + 2Br^-_{(aq)}$

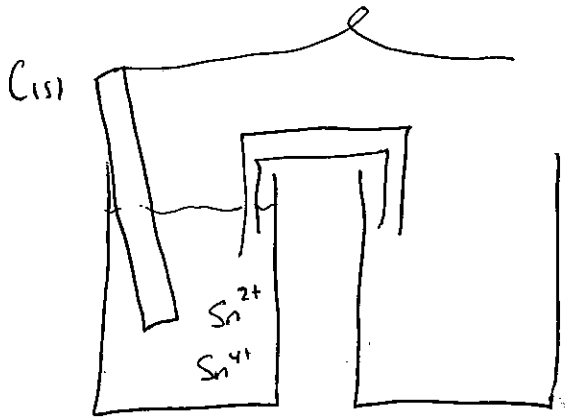
8. Calculate the cell potential for the electrochemical cell in the diagram.

$E_{cell} = +1.07\ V - -0.26\ V = \boxed{+1.33\ V}$

9. If the $Cu^{2+}(aq)$ / Cu(s) reduction half-reaction was assigned a reduction potential value of 0.00 V for an electrode potential table, then the $Ni^{2+}(aq)$ / Ni(s) half-reaction on that table would have a reduction potential value of

A. +0.26 V B. +0.08 V C. –0.26 V (D.) –0.60 V

10. Draw a voltaic cell that contains the tin (IV) standard half cell and has a cell potential of under 1.00 V.



if cathode is Sn^{2+}/Sn^{4+} cell, then other cell must be above $Cr_{(s)}/Cr^{2+}$

" anode " " " " " " " below $MnO_2 + H^+$