

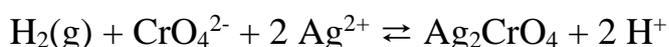
Question 1

A Daniell cell is an electrochemical cell consisting of a half cell with a copper electrode in a copper(II)solution and a half cell with a zinc electrode in a zinc solution. We use a Daniell cell with 0.20 M $\text{Cu}(\text{NO}_3)_2$ solution and 0.010 M $\text{Zn}(\text{NO}_3)_2$ solution. Calculate the cell potential of this cell at 25° C. Assume that all activities are equal to the molarities.

Data: $E^\ominus_{\text{Cu}/\text{Cu}^{2+}} = + 0,34 \text{ V}$
 $E^\ominus_{\text{Zn}/\text{Zn}^{2+}} = - 0,76 \text{ V}$
 $F = 9.6485 \cdot 10^4 \text{ C mol}^{-1}$

Question 2 (test 2012)

Calculate the standard cell potential of the cell with the following reaction:



Use the standard potentials given below.

Question 3

The electromotive force (E_{EMF}) of a cell

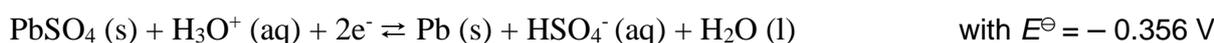
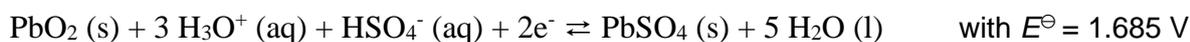
$\text{Pt} | \text{H}_2(\text{g}) | \text{H}^+(\text{aq}) + \text{Cl}^-(\text{aq}) | \text{AgCl}(\text{s}) | \text{Ag}(\text{s})$ is +0.322 V at 25°C. The partial pressure of hydrogen gas is 1 bar. Make a sensible assumption regarding the activity of Cl^- .

Calculate the pH of the electrolyte solution.

Data:	$2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{H}_2$	$E^\ominus = + 0.00 \text{ V}$
	$\text{AgCl} + \text{e}^- \rightarrow \text{Ag} + \text{Cl}^-$	$E^\ominus = + 0.22 \text{ V}$
	$\text{Ag}_2\text{CrO}_4 + 2 \text{e}^- \rightarrow 2 \text{Ag} + \text{CrO}_4^{2-}$	$E^\ominus = + 0.45 \text{ V}$
	$\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag}$	$E^\ominus = + 0.80 \text{ V}$
	$\text{Cl}_2 + 2 \text{e}^- \rightarrow 2 \text{Cl}^-$	$E^\ominus = + 1.36 \text{ V}$
	$\text{Ag}^{2+} + \text{e}^- \rightarrow \text{Ag}^+$	$E^\ominus = + 1.98 \text{ V}$

Additional material:**Question 4 (test 2009)**

One cell of a lead battery as used in a car has the following half reactions ($T = 298 \text{ K}$):



A car battery consists of six of these cells in series.

A battery like this has a cell potential of 12.06 V when loaded and a pH of 0.50 at $p = p^\ominus$.

- Calculate the cell potential (electromotive force) of this battery under standard conditions.
- Calculate the activity of $\text{HSO}_4^-(\text{aq})$ in a loaded battery.