Chemistry 225 Semester 04-2016
Homework for Submission #7

Answer the following questions and submit them for marking on or before 6 pm on Monday 5th December. Only answers showing full working can attract full marks. Express your answer to the correct number of significant figures. Answers showing evidence of copying will attract zero marks. Place your answers neatly in the spaces provided on this question paper.

The following is a list of some standard electrode potentials at 298K. The arrangement is alphabetical.

HALF-CELL	***E^{θ}/Volt***
$Zn^{2+}(aq) \mid Zn(s)$	-0.7618
$Cu^{2+}(aq) \mid Cu(s)$	+0.3419
$Fe^{3+}(aq) \mid Fe^{2+}(aq)$	+0.771
$I_2(s) \mid I^-(aq)$	+0.5355
$Ni^{2+}(aq) \mid Ni(s)$	-0.257
$Sr^{2+}(aq) \mid Sr(s)$	-2.889
$Sn^{4+}(aq) \mid Sn^{2+}(aq)$	+0.151
$Cu^{2+}(aq) \mid Cu^{+}(aq)$	+0.153

1) The above potentials are measured relative to the standard electrode potential for the standard hydrogen half-cell (SHE): $Pt(s)|H^+(aq)|H_2(g)$ at 25°C. Precisely what is meant by the term *standard* in this context? (2 marks)

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2) Consider the cell:

$$Zn(s) \mid Zn^{2+}(aq, 1M) \parallel Fe^{3+}(aq, 1M), Fe^{2+}(aq, 1M) \mid Pt(s)$$

a) Calculate the e.m.f. of the cell, E°_{cell} and state which electrode is the source of electrons for the external circuit. (4 marks)

b) Write down a balanced equation for the reaction occurring in the cell. (Make sure that you have the correct ***direction*** of reaction.) (2 marks)

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c) Calculate the equilibrium constant for the reaction at 298 K. (3 marks)

d) Calculate the e.m.f. of the cell which is 0.100 M in Zn^{2+}, Fe^{2+} and Fe^{3+} at 298 K.

e) Calculate ΔG for situation described in (d). What does the sign of ΔG tell you? (3 marks)

3) From the table pick out the species which is

a) the strongest reducing agent and (1 mark)

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b) the strongest oxidizing agent. (1 mark)

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4) Consider the cell:

$$Ag(s)|Ag^{+}(aq,1M)||Br^{-}(aq,\ 1M)|Cl^{-}(aq,\ 1M)|AgBr(s)|Ag(s)$$

The half reactions are:

$$Ag(s) \rightarrow Ag^{+}(aq) + e^{-} \ldots \text{ on the left and}$$

$$AgBr(s) + e^{-} \rightarrow Ag(s) + Br^{-}(aq) \ldots \text{ on the right.}$$

Given also that, at 298 K:

$$E^{\circ}_{red}(AgBr \mid Ag, Br^{-}) = 0.0711$$

$$E^{\circ}_{red}(Ag^{+} \mid Ag) = 0.7999$$

a) Write the overall equation for the cell reaction.

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b) Calculate the solubility product of AgBr at 298 K.