CHM 152
Quiz 10

Spring 2009
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Name Key

1. For the Galvanic cell utilizing the following materials,
(a) Write the overall cell reaction
(b) Calculate E^o_{cell}
(c) Identify the cathode and anode
(d) Calculate ΔG^o for the reaction

materials: Ni metal in $Ni^{2+}_{(aq)}$ Fe metal in $Fe^{2+}_{(aq)}$

GIVEN: $Ni^{2+} + 2\,e^- \rightarrow Ni$ $E^o = -.23$ V

$Fe^{2+} + 2\,e^- \rightarrow Fe$ $E^o = -.44$ V ← will reverse

$\Delta G = -nFE_{cell}$ $F = 96485$ C/mole e^-

(a) $Ni^{2+} + Fe \rightarrow Ni + Fe^{2+}$

(b) $-.23V + .44V = +.21V$

(c) cathode = Ni (reduction)
anode = Fe (oxidation)

(d) $\Delta G^\circ = -nFE^\circ_{cell} = -2\ mole\ e^- \left(\frac{96485C}{1\ mole\ e^-}\right)(+.21V)$

$= -4.1 \times 10^4 J = \boxed{-41\ kJ}$

BONUS: Write the electron configurations for Fe and Fe^{2+}

Fe $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$

Fe^{2+} $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$