10/10

Quiz 1
Chem6C
Electrochemistry

Name Key
PID number
Remote number

Directions: You have 20 minutes. A 3x5 index card is permitted. You will get a **0** on the quiz if a cell phone makes a noise, use of a graphing calculator, or cheating occurs. Good luck!

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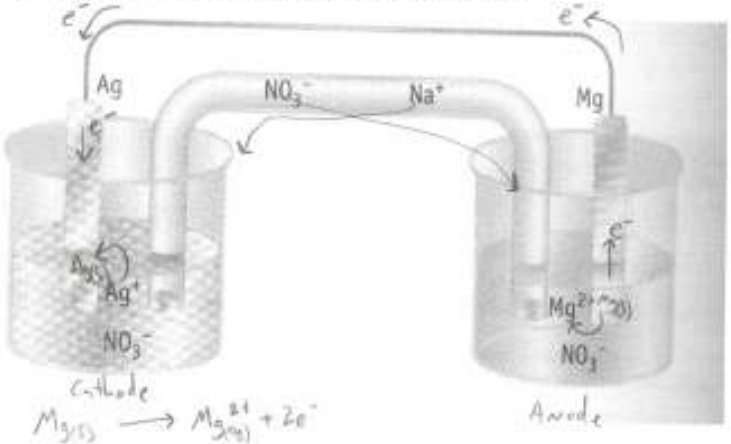
1.) Magnesium metal is oxidized and silver ions are reduced in a Galvanic cell.

(a) Label each part of the cell diagram below. This includes using arrows to show electron flow, solid and aqueous metal flow, electrolyte flow, anode, cathode, reduction, and oxidation.
(b) Write equations for the half-reactions occurring at the anode and cathode, and write an equation for the net reaction of the cell.
(c) Write this oxidation/reduction reaction using proper cell notation.



Anode $Mg_{(s)} \longrightarrow Mg^{2+}_{(aq)} + 2e^-$

Cathode $2e^- + 2Ag^+_{(aq)} \longrightarrow 2Ag_{(s)}$

Net $Mg_{(s)} + 2Ag^+_{(aq)} \longrightarrow Mg^{2+}_{aq} + 2Ag_{(s)}$

$Mg_{(s)} \mid Mg^{2+}_{(aq)}, 1M \parallel Ag^+_{aq}, 1M \mid Ag_{(s)}$

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2.) Using a +, −, or 0 what are the signs of E° and ΔG° for a product-favored oxidation-reduction reaction?

$E^\circ =$ +

$\Delta G^\circ =$ −

3) Balance the following redox equations and calculate E° of the reaction. All occur in Basic solution.

Final Answer E° = 1.1 V

$\Delta G^\circ = -212.3\ KJ$

3 $Zn(s) + Cu(OH)_2(s) \longrightarrow Zn(OH)_4^{2-}(aq) + Cu(s)$

$4OH^- + 4H_2O + Zn(s) \longrightarrow Zn^{+2}(OH)_4^{2-} + 2e^- + 4H_2O \quad E^\circ = .763$

$2H_2O + 2e^- + Cu^{+2}(OH)_2^{-1}(s) \longrightarrow Cu(s) + 2H_2O + 2OH^- \quad E^\circ = .337\ V$

$E^\circ = 1.100$

$2OH^- + Zn(s) + Cu(OH)_2(s) \longrightarrow Zn(OH)_4^{2-} + Cu(s)$

$\Delta G^\circ = -nFE^\circ \Rightarrow -(2)(96,485)\frac{C}{mol}(1.1) = -2.123 \times 10^5\ J$

or

$212.3\ KJ$

5.) Circle the element among those listed below which is the best reducing agent (Low E°)

E°

(a) Cu .337
(b) Zn -.763
(c) Fe -.44
(d) Ag .7994
(e) Cr -.91

-0.763 V is the lowest Reduction potential. This equates to the highest oxidation potential and therefore the best reducing agent.

- Intensive property - properties independent of the size of the system and only have meaning for systems in equilibrium states: P, T

- Extensive - These properties have values regardless of equilibrium. M, V

a) Intensive properties (or intensity Factors) are those that have the same value for the system and its individual parts, Ex. T, P, Density, molar properties

b) Extensive prop. (or capacity Factors) are those dependent on the Amounts and are additive, that is, the value for the system is the sum of the values for its individual parts Ex. V, Mass, Internal energy ΔU, Enthalpy ΔH, entropy ΔS etc. The quotient of 2 extensive properties may give meaningful intensive property Ex. Density = $\frac{\text{mass}}{\text{volume}}$

Molar volume = $\frac{\text{volume}}{\text{number moles}}$

Chemical potential = $\frac{\text{Free energy}}{\text{number moles}}$