Quiz #1: Electrochemistry and Chemical Kinetics

PROBLEM 1 (10 points)

A galvanic cell has the following cell reaction:

$$D(s) + 2\ Zn^{2+}(aq) \rightarrow 2\ Zn(s) + D^{4+}(aq) \qquad E^{o} = 0.18V$$

a) Is the reaction spontaneous? If so, which equation can verify it? (1 point)

YES, USING FARADAY'S LAW WE CAN SEE THAT G< 0

b) Which compound is the anode? Write the half-reaction. What chemical reaction occurs at the anode? (3 points)

$D(s) \rightarrow D^{4+}(aq) + 4e$

Oxidation occurs at the anode

c) What is the standard potential of the D^{4+} / D redox couple if the standard potential for Zn^{2+}/Zn is -0.76V? (3 points)

$E_{cell} = E_{cathode} - E_{anode}$

$0.18 = -0.76 - E_{anode}$

E= -0.94V

d) Write a cell diagram for the aforementioned galvanic cell (3 points)

$D(s)|\ D^{4+}(aq)\ ||\ Zn^{2+}(aq)|\ Zn(s)$

Problem 2-6: Multiple Choice (2 points each)

2) If the standard potentials for the couples A^+/A, B^+/B, C^+/C are +2.0V, +1.0V, and - 0.5V respectively, which is the strongest oxidizing agent?

A) C
B) B^+
C) C^+
D) **A^+**
E) A

3) If the standard potentials for the couples A^+/A, B^+/B, C^+/C are +2.0V, +1.0V, and - 0.5V respectively, which is the strongest reducing agent?

A) C
B) B^+
C) C^+
D) A^+
E) A

4) If the standard emf of the following cell is 0.91V, what is the standard potential of the Zn/Zn^{2+} electrode?

$Zn(s)|\ Zn^{2+}\ (aq)\ ||\ H^+,\ H_2\ (aq)|\ Pt(s)$

A) 0.91V
B) -0.91V
C) 0.09V
D) -0.09V
E) 0 V

5) If the standard emf of the following cell is 0.91V, what is the standard potential of the H^+/H_2 electrode?

A) 0.91V
B) -0.91V
C) 0.09V
D) -0.09V
E) 0 V

6) The standard voltage of the cell $A(s)\ |\ AB(s)\ |\ B^-(aq)\ ||\ C^+(aq)\ |\ C(s)$ is 0.1V at 25 Celsius. What is the equilibrium constant?

A) 12
B) 36
C) 49
D) 52
E) 68