CH102 // Spring 2019 Thursday
Discussion Quiz #10

Name: _____ TF: _____ Time: _____

1. (8 points) This question concerns a concentration cell with positive voltage at 25ºC, constructed from hydrogen half-cells of different hydronium ion concentration and sealed so that their hydrogen gas pressure can be controlled. In one half-cell the hydronium concentration is 3.0 M and the hydrogen gas pressure is 0.75 atm, and in the other half-cell the hydronium concentration is 0.030 M and the hydrogen gas pressure is 11.25 atm. Platinum electrodes are used to connect the cell to an external circuit.
   a. Write the line notation of the cell. Indicate for each species and its concentration or pressure.

$H_2\,(g, 11.25atm) \Leftrightarrow 2H^+(aq, 0.030M) + 2e$
$2H^+(aq, 3.0M) + 2e \Leftrightarrow H_2\,(g, 0.75atm)$

$H_2\,(g, 11.25atm) + 2H_3O^+(aq, 3.0M) \rightarrow H_2\,(g, 0.75atm) + 2H_3O^+(aq, 0.030M)$; $n_e=2$

$Pt(s)\|H_2(g, 11.25atm) \mid H_3O^+(aq, 0.030M)\| H_3O^+(aq, 3.0M) \mid H_2(g, 0.75atm) \mid Pt(s)$ (**4 points need to include states and pressures and concentrations)**

Calculate the cell voltage at 25 ºC

$$Q=\frac{[H2\,(g,0.75atm)]\cdot[H3O^+(aq,0.030M)]^2}{[H2\,(g,11.25atm)]\cdot[H3O^+(aq,3.0M)]^2}=6.667\cdot10^{-6}$$

$E^o=0V$

E = ___0.15V_____ V

$$E = E^o - \frac{0.05912V}{2} logQ = -\frac{0.05912V}{2} \cdot \boldsymbol{log}(6.66\cdot10^{-6})=0.15V$$

2. (2 points) For each of the following, circle all that are true.
   a. If $Q < 1$, then…

$E < 0$	$E = 0$	$E > 0$	$E^o < 0$	$E^o = 0$	$E^o > 0$	***E* > *E*º**	$E < E^o$

Friday

1. (8 points) This question concerns a concentration cell with positive voltage at 25ºC, constructed from hydrogen half-cells of different hydronium ion concentration and sealed so that their hydrogen gas pressure can be controlled. In one half-cell the hydronium concentration is 2.0 M and the hydrogen gas pressure is 0.85 atm, and in the other half-cell the hydronium concentration is 0.020 M and the hydrogen gas pressure is 12.25 atm. Platinum electrodes are used to connect the cell to an external circuit.
   a. Write the line notation of the cell. Indicate for each species and its concentration or pressure.

$H_2\,(g, 12.25atm) \Leftrightarrow 2H^+(aq, 0.020M) + 2e$
$2H^+(aq, 2.0M) + 2e \Leftrightarrow H_2\,(g, 0.85atm)$

$H_2\,(g, 12.25atm) + 2H_3O^+(aq, 2.0M) \rightarrow H_2\,(g, 0.85atm) + 2H_3O^+(aq, 0.020M)$; $n_e=2$

$Pt(s)\|H_2(g, 12.25atm) \mid H_3O^+(aq, 0.020M)\|\| H_3O^+(aq, 2.0M) \mid H_2(g, 0.85atm) \mid Pt(s)$

   b. Calculate the cell voltage at 25 °C

$Q=\frac{[H2\,(g,0.85atm)]\cdot[H3O^+(aq,0.020M)]^2}{[H2\,(g,12.25atm)]\cdot[H3O^+(aq,2.0M)]^2}=6.939\cdot10^{-6}$

E = ___0.15V_____ V

$E^o=0V$

$E = E^o - \frac{0.05912V}{2} log Q = - \frac{0.05912V}{2} \cdot \boldsymbol{log}(6.939\cdot10^{-6})=0.15V$

2. (2 points) For each of the following, circle each relation that must be true.
   b. If $Q < 1$, then…

$E < 0$	$E = 0$	$E > 0$	$E^o < 0$	$E^o = 0$	$E^o > 0$	***E* > *E*°**	$E < E^o$