

CH102 // Spring 2019 Thursday  
Discussion Quiz #10

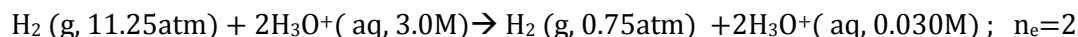
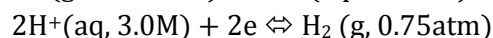
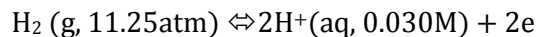
Name: \_\_\_\_\_

TF: \_\_\_\_\_

Time: \_\_\_\_\_

1. (8 points) This question concerns a concentration cell with positive voltage at 25°C, 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.



**Pt(s)|H<sub>2</sub>(g, 11.25atm) | H<sub>3</sub>O<sup>+</sup>(aq, 0.030M)|| H<sub>3</sub>O<sup>+</sup>(aq, 3.0M) | H<sub>2</sub>(g, 0.75atm) | Pt(s) (4 points need to include states and pressures and concentrations)**

Calculate the cell voltage at 25 °C

$$Q = \frac{[\text{H}_2(\text{g}, 0.75\text{atm})] \cdot [\text{H}_3\text{O}^+(\text{aq}, 0.030\text{M})]^2}{[\text{H}_2(\text{g}, 11.25\text{atm})] \cdot [\text{H}_3\text{O}^+(\text{aq}, 3.0\text{M})]^2} = 6.667 \cdot 10^{-6}$$

$$E^\circ = 0\text{V}$$

$$E = \underline{\quad 0.15\text{V} \quad} \text{V}$$

$$E = E^\circ - \frac{0.05912\text{V}}{2} \log Q = - \frac{0.05912\text{V}}{2} \cdot \log(6.66 \cdot 10^{-6}) = 0.15\text{V}$$

2. (2 points) For each of the following, circle all that are true.

a. If  $Q < 1$ , then...

$$E < 0$$

$$E = 0$$

$$E > 0$$

$$E^\circ < 0$$

$$E^\circ = 0$$

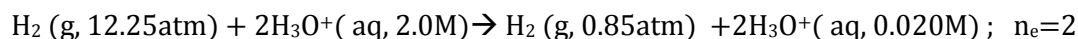
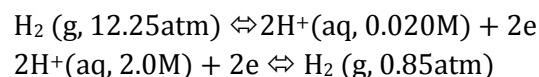
$$E^\circ > 0$$

$$\underline{E > E^\circ}$$

$$E < E^\circ$$

## Friday

1. (8 points) This question concerns a concentration cell with positive voltage at 25°C, 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.



- b. Calculate the cell voltage at 25 °C

$$Q = \frac{[\text{H}_2(\text{g}, 0.85\text{atm})] \cdot [\text{H}_3\text{O}^+(\text{aq}, 0.020\text{M})]^2}{[\text{H}_2(\text{g}, 12.25\text{atm})] \cdot [\text{H}_3\text{O}^+(\text{aq}, 2.0\text{M})]^2} = 6.939 \cdot 10^{-6}$$

$E = \underline{\hspace{1cm}} 0.15\text{V} \underline{\hspace{1cm}} \text{V}$

$$E^\circ = 0\text{V}$$

$$E = E^\circ - \frac{0.05912\text{V}}{2} \log Q = - \frac{0.05912\text{V}}{2} \cdot \log(6.939 \cdot 10^{-6}) = 0.15\text{V}$$

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

$E < 0 \quad E = 0 \quad E > 0 \quad E^\circ < 0 \quad E^\circ = 0 \quad E^\circ > 0 \quad \underline{E > E^\circ} \quad E < E^\circ$