

Chemistry-4311
November 14, 2014

Quiz #9

Name Key

$R = 8.314 \text{ J/mol-K} = 0.08206 \text{ L-atm/mol-K} = 1.987 \text{ cal/mol-K}$, $N_A = 6.02 \times 10^{23}$, $F = 96,500 \text{ C}$

1. Matching (Use a letter only once)

ΔG_r° for an electrochemical cell is i.

The equilibrium constant and standard emf E° are related by f.

For an electrochemical cell operating spontaneously, the sign of the emf potential E is a.

The Nernst equation is h.

The membrane potential ΔE for K^+ ions is e.

- a. positive
- b. $E^\circ = \ln K$
- c. $E = -RT \ln Q$
- d. $\Delta S - T\Delta H$
- e. $0.257 \text{ V} \ln \{ [K^+]_{\text{ex}} / [K^+]_{\text{in}} \}$
- f. $E^\circ = RT \ln K / vF$
- g. negative
- h. $E = E^\circ - RT \ln Q / vF$
- i. $-vFE^\circ$
- j. $0.257 \text{ V} \ln [K^+]$

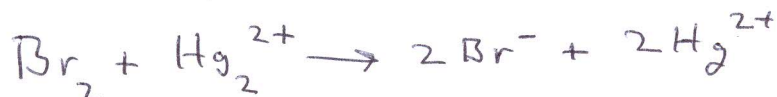
② 2. $E^\circ = 1.507 \text{ V}$ for the reduction reaction $\text{MnO}_4^- + 8\text{H}^+ + 5\text{e}^- \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$. Show how to calculate the biological standard reduction potential $E^{\circ'}$.

$$E^{\circ'} = E^\circ - \frac{RT}{vF} \ln \frac{1}{[1 \times 10^{-7}]^8}$$

③ 3. An electrochemical cell consists of the half-cells



a. What is the chemical reaction for the cell?



b. Calculate E° for the cell

$$\begin{array}{r} 1.087 \text{ V} \\ - 0.92 \text{ V} \\ \hline 0.167 \text{ V} \end{array}$$