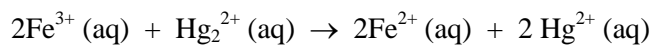
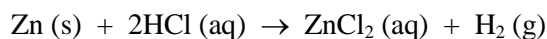


**REVIEW QUESTIONS**  
**Final Exam**

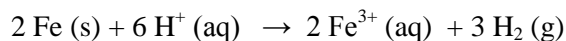
- Which oxidizing agent shown below will oxidize  $\text{Br}^-$  but not  $\text{Cl}^-$ ?
  - $\text{HNO}_3$
  - $\text{K}_2\text{Cr}_2\text{O}_7$  (in acid)
  - $\text{KMnO}_4$  (in acid)
- The equilibrium constant ( $K_c$ ) for the reaction shown below is  $9.1 \times 10^{-6}$  at  $25^\circ\text{C}$ . What is  $\Delta G^\circ$  for this reaction at this temperature?



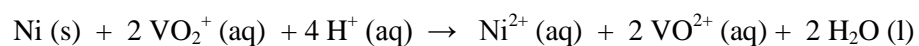
- Write half reactions and cell notation for a cell that has the following overall reaction:



- Calculate the equilibrium constant  $K$  for the following reaction at  $25^\circ\text{C}$  from standard electrode potentials.



5. The free energy change ( $\Delta G$ ) for the reaction  $A(g) \rightarrow B(g)$  is zero under certain conditions. The standard free energy change ( $\Delta G^\circ$ ) for this reaction is  $-42.5$  kJ. Which of the statements below must be true about this reaction?
- a) The concentration of the product is greater than the concentration of the reactant.
  - b) The reaction is at equilibrium.
  - c) The concentration of the reactant is greater than the concentration of the product.
6. Calculate the cell potential of a cell of a cell operating with the following reaction at  $25^\circ\text{C}$ , in which  $[\text{VO}_2^+] = 0.010\text{M}$ ,  $[\text{H}^+] = 1.0\text{M}$ ,  $[\text{Ni}^{2+}] = 2.0\text{M}$ , and  $[\text{VO}^{2+}] = 2.0\text{M}$ .



7. Which process is spontaneous at  $298\text{K}$ ? (Hint: Use data in appendix II in your text to calculate  $\Delta G^\circ$ , and then calculate  $\Delta G$  for non-standard non-standard conditions)
- a)  $\text{H}_2\text{O}(l) \rightarrow \text{H}_2\text{O}(g, 1\text{ atm})$
  - b)  $\text{H}_2\text{O}(l) \rightarrow \text{H}_2\text{O}(g, 0.10\text{ atm})$
  - c)  $\text{H}_2\text{O}(l) \rightarrow \text{H}_2\text{O}(g, 0.010\text{ atm})$

**ANSWERS:**

- 1)  $\text{K}_2\text{Cr}_2\text{O}_7$  (in acid)
- 2) 29 kJ
- 3)  $\text{Zn (s)} \mid \text{Zn}^{2+} \text{ (aq)} \parallel \text{H}^+ \text{ (aq)} \mid \text{H}_2 \text{ (g)} \mid \text{Pt}$
- 4)  $K=4.5 \times 10^3$
- 5) a
- 6) 1.08 V
- 7) c