CEM 142 Exam III WN 05 Name _____

$\Delta G = -n F E_{cell}$

$E = mc^2$

$E_{cell} = E°_{cell} - \frac{0.0592}{n} \log Q$

$\Delta G = \Delta H - T\Delta S$

rate = kN

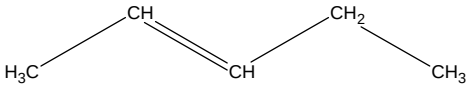
$c = 3.00 \times 10^8$ m/s

F = 96485 J/V

1. (4) How many electrons are transferred in the following reaction?

$$6\ Br^-_{(aq)} + Cr_2O_7^{2-}{}_{(aq)} + 14\ H^+ \rightarrow 2\ Cr^{+3}_{(aq)} + 7\ H_2O_{(l)} + 3\ Br_{2(g)}$$

2. (4) How many neutrons are emitted when a californium-249 nucleus (element 98) is bombarded with a Nitrogen-15 nucleus produce a Unp (element 105) – 262 nucleus?

3. (4) name the following: 

4. (4) If the entropy of a system decreases during a reversible process, what can you say about the entropy change of the surroundings?

5. (4) In a certain spontaneous process, the system undergoes an entropy change (ΔS) of -34 J/K. What can be said about the sign and magnitude of $\Delta S_{surround}$?

6.(4) Consider the reaction $C_2H_{6(g)} \rightarrow C_2H_{4(g)} + H_{2(g)}$ ΔH = -337 kJ, ΔS = -100 J/K. At what temperatures (if any) will this reaction be spontaneous?

5. (7) In both heavy duty and alkaline cells, the reactants and products are solids instead of solutions. Why do you suppose that is? Give me a reason that does NOT include the fact that putting liquids inside sealed metals containers is bad. Hint: E°.

6. (12) Define Mass defect and use it to account for all that energy associated with nuclear reactions.

7. (18) A voltaic cell is constructed that uses the following reaction:

$$Zn_{(s)} + Cd^{+2} \rightarrow Zn^{+2} + Cd_{(s)}$$

What is the voltage of this cell when $[Cd^{+2}] = 0.510$ M and $[Zn^{+2}] = 1.50$ M. The reduction potential of Cd^{+2} is –0.403 V and the reduction potential for Zn^{+2} is –0.763 V. Then calculate the ΔG of the reaction.

V
kJ

8. (15) Organic questions

a. Sketch the structure of cyclohexane (3 pts)

b. Write and balance the equation for the complete combustion of cyclohexane (6 pts)

c. The molar heat of combustion of cyclohexane is -4291 kJ/mol. Calculate the heat of combustion per CH_2 group in kJ/mol. (6 pts)

kJ/mol

8. (12) As a future member of the educated class, you will need to be able to explain the difference between fusion generated power and fission generated power. Explain why fusion power is so much better than fission generated power. Then explain why we haven't been able to make a working fusion reactor yet.

9. (12) Calculate $\Delta G°_{rxn}$ by two different methods for the following. Box your answers.

$$2\ SO_3(g) \rightarrow 3\ O_2(g) + 2\ S(s)$$