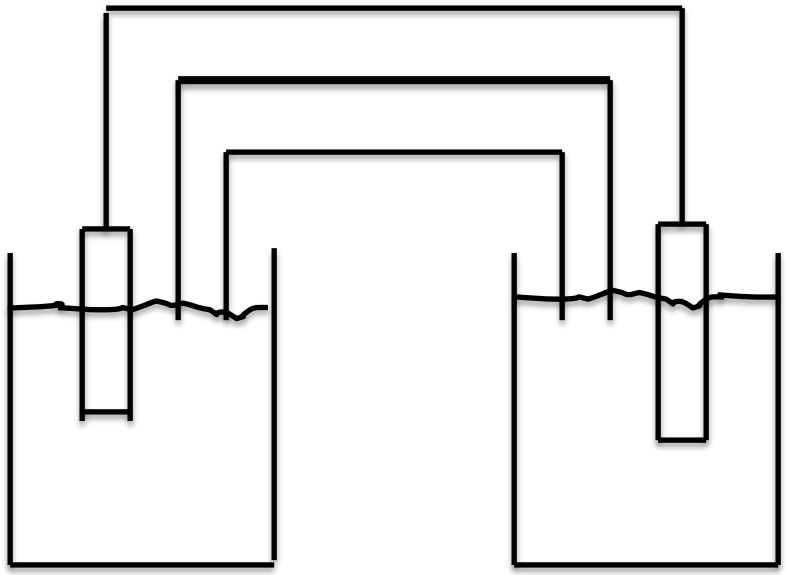
Chem. 112 **Pratice Exam 1**

For the following cell reaction at 25^0 C:

Ce^{3+} | Ce^{4+} .80M || Pb^{2+} | Pb^0 0.015M

Label the diagram:

a) Show the location of each species
b) Label all parts of the cell (salt bridge, cathode, anode, + electrode, - electrode etc.)
c) Show the flow of electrons
d) Write the half reaction under each beaker
e) Label oxidation and reduction reactions



f) Calculate E^0 for the cell:

Answer_____

g) Calculate the EMF (E) for this cell under the given conditions

Answer_____

h) Calculate Keq cell reaction at 25^0 C under standard conditions:

Answer_____

i) Calculate Δ G

Answer_____

j) Would this reaction be spontaneous? _____ Give 3 brief reasons:

1)_____

2) _____

3) _____

2) Calculate the value of ΔH_{rxn} for the following reaction:
$3\ C\ (s) + 4\ H_2\ (g) \rightarrow 4\ C_3H_8\ (g)$

Given:
$C_3H_8\ (g) + 5\ O_2 \rightarrow 3\ C\ O_2\ (g) + 4H_2O\ (g)$ $\Delta H_{rxn} = -2043.1\ kJ$

$C\ (s) + O_2\ (g) \rightarrow C\ O_2\ (g)$ $\Delta H_{rxn} = -393.5 kJ$

$2H_2\ (g) + O_2\ (g) \rightarrow 2H_2O\ (g)$ $\Delta H_{rxn} = -483.6\ kJ$

Show all steps:

Answer_____

3) Balance the following equation given the two half reactions. Determine the voltage of the Galvanic (spontaneous) cell under standard conditions.

$HOCl_{(aq)} + H^+\ (aq) + 2e^- \rightarrow Cl^-\ (aq) + H_2O\ (l)$ $E^0 =$ _____
$NO_3^-\ (s) + 4\ H^+(aq) + 3e^- \rightarrow NO\ (g) + 2\ H_2O\ (l)$ $E^0 =$ _____

$E^0_{cell} =$_____

What is the oxidizing agent?_____

What is the reducing agent?_____

4) How many Amps would be required to plate out 25.00 gram of Tin onto a some iron if the current were passed through a solution of $Sn(NO_3)_s$ for 3.00 hours?

5)What is the oxidation state of arsenic in $HAsO_4$ _____

6) How many electrons are gained or lost when

$Mn(OH)_2$ becomes MnO_2? _____

SO_3 becomes H_2SO_4_____

7) Use the half reaction method to balance the following redox equation:

ClO_3- (aq) becomes Cl_2 (g) and Cr^{3+} (aq) becomes $Cr_2O_7^{2-}$ (aq) in acidic solution:

What is the emf of the cell?

Is it spontaneous?_____ Reason_____

8) 35.08 g of Zinc Oxide are added to 45.00g of water at 22.5 ^{0}C. The temperature is measured to go up to 24.3 ^{0}C. What is the heat of reaction in KJ/Mol?

Answer_____

9) For the following reaction calculate the entropy change for the reaction, enthalpy change for the reaction and the Gibbs free energy for the reaction and state wheter the reaction is spontaneous or not.

SO_2 (g) + 1/2O_2 (g) ➔ SO_3 (g)

Species	$\Delta H_{f\,(KJ/mol)}$	S^0 J/molK
SO_2 (g)	-296.8	242.2
O_2 (g)	0	205.2
SO_3(g)	-395.7	256.8

Answer_____

Is this reaction likely to be spontaneous or nonspontaneous?

_____ Reason_____

If this reaction is not spontaneous, state how it could be made to be spontaneous. If it is spontaneous state specifically how it could be made to be nonspontaneous. Include calculations and numerical values in your answer.

10) List a possible set of four quantum numbers (n,ℓ,$m\ell$,ms) in order, for the highest energy electron in iodine . Refer to the periodic table as necessary. **Enter four numbers separated by commas (e.g., 3,2,-2,1/2)**

11) Give a combination of four quantum numbers that could be assigned to an electron occupying a 4d orbital. **Express your answers using one significant figure. Enter your answers separated by commas.**

12) Draw the orbital diagram that represents the ground state of Cd^{2+}

13) Give the set of four quantum numbers that could represent the last electron added (using the Aufbau principle) to the Pt atom.

14) Give the set of four quantum numbers that could represent each electron gained to form the O **ION** from the oxygen atom. Give both sets of quantum numbers.

15) Briefly describe the photo electric effect explain what it tells about the nature of light.

16) Determine the wavelength of light emitted when an electron in a hydrogen atom makes a transition from an orbital in n= 6 to n=5.

What would be the frequency of the emitted electromagnetic energy?

Would this be in the visible spectrum?_____ Explain_____