

Chem 303 In-Class Exam 2

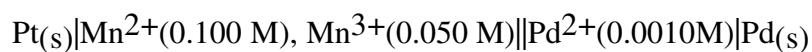
Name _____

Useful information: $E = E^\circ - \frac{0.0592V}{n} \log Q$, $E^\circ = \frac{0.0592V}{n} \log K$, $\Delta G^\circ = -RT \ln K$,

$R = 8.314 \text{ J/molK}$, $q = n \cdot F$, $F = 9.65 \times 10^4 \text{ C/mol}$, $E = E_{\text{red}} - E_{\text{ox}}$

(1)(30 points)

(a) Draw a picture of the following cell.



(b) Calculate the E° for the cell above.

(c) What is the measured E for the above cell?

(2)(30 points) (a) Why is EDTA a good molecule for complexometric titrations?

(b) What conditions have to be fulfilled for a practical EDTA titration? (one that will give you precise and accurate data in a reasonable amount of time)

(c) What are three different EDTA titration methods? How do they work?(3)

(6) To a (25.00 mL) solution of Al^{3+} was added 25.00 mL of 0.100 M Na_2EDTA at $\text{pH} = 10$. After stirring for 10 min, Eriochrome Black T was added and the solution titrated with 0.0120 M Mg^{2+} to an the endpoint. If it took 12.22 mL of the Mg^{2+} solution to reach the endpoint, what was the concentration of the original aluminum solution?

Chem 303 Take-Home Exam 2

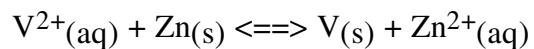
Name _____

You may use your book and notes on this portion of the exam, but you may not collaborate with anyone else on it.

(1) A solution of 0.0200 M (50.00 mL) Fe^{2+} was titrated with 0.0500 M Na_2EDTA at $\text{pH} = 8.00$. Plot pFe^{2+} vs mL EDTA added from 0 to 35 mL using a spreadsheet. Plot the points every 0.50 mL. Include the spreadsheet and an explanation.

$\log K_f = 14.32$ and $\alpha_4 = 5.6 \times 10^{-3}$

(4) For the following reaction, determine E° , ΔG° , and K .



(4)(15 points) A solution of 0.0500 M Na_2EDTA (25.00 mL) was added to a 50.00 mL solution of Al^{3+} . Eriochrome Black T was added and 5.10 mL of a 0.0455 M Mg^{2+} solution was needed to reach the endpoint. What was the original concentration of Al^{3+} ?

(5) Using EDTA titrations, devise a method to determine the specific amount of each metal in a water sample containing Al^{3+} , Fe^{3+} , and Ca^{2+} .

(6) precipitation problem