

*Pay attention to Significant Figures in all calculations.*

1. (20 points) Each of the following substances was used in one of the experiments that you should have performed thus far in Quant lab. For each substance, state the experiment in which it was used and explain its specific function. Use appropriate chemical reactions in your answers whenever possible. Do not exceed the allotted space!

(a)  $\text{Fe}(\text{NO}_3)_3$

(b) Urea,  $(\text{H}_2\text{N})_2\text{CO}$

(c) potassium thiocyanate

(d) nitrobenzene

(e) dichlorofluorescein



5. (8 points) **SHOW ALL WORK.** As a TA for Quant lab, you need to prepare 1.00 L of a  $\text{Fe}_2(\text{SO}_4)_3$  (FM = 400.0) solution that has a pFe value of 2.50. Determine the mass of  $\text{Fe}_2(\text{SO}_4)_3$  that you would need and briefly describe how you would prepare the solution.
6. (8 points) **SHOW ALL WORK.** In a typical acid-base procedure, a student dissolved 5.2645 g of dry KHP (FM = 204.22) in some DI water and then diluted to the mark in a 500-mL volumetric flask. He then carefully transferred 100.00 mL of this solution to a clean flask and titrated with 26.75 mL of a  $\text{Ba}(\text{OH})_2$  solution to the phenolphthalein endpoint. Calculate the molarity of the  $\text{Ba}(\text{OH})_2$  solution.

7. Methylamine,  $\text{CH}_3\text{NH}_2$  (FM = 31.06) is an organic base with  $\text{pK}_b = 3.36$ . In a Gen Chem acid-base experiment, a 25.00 mL portion of 0.1250 M  $\text{CH}_3\text{NH}_3\text{Cl}$  was titrated with 0.1000 M KOH.

(a) (5 points) Consider the *neutralization* reaction that occurs during the titration and write *balanced chemical reactions* for each of the following.

*molecular equation:*

*net-ionic equation:*

(b) (5 points) **SHOW ALL WORK.** Determine the volume (in mL) of KOH solution that is required to reach the equivalence point.

(c) (10 points) **SHOW ALL WORK.** *Include the appropriate equilibrium reaction.* Calculate the pH of the  $\text{CH}_3\text{NH}_3\text{Cl}$  solution before the titration is started.

7. continued.....

- (d) (10 points) **SHOW ALL WORK.** *Include the appropriate equilibrium reaction.*  
Calculate the pH of the solution after 10.00 mL of titrant is added.

- (e) (10 points) **SHOW ALL WORK.** *Include appropriate equilibrium reaction.*  
Calculate the pH of the solution at the equivalence point.