

Chemistry 121  
Spring 2005  
Test 2, FORM A

Name: \_\_\_\_\_

Instructions: You have 75 minutes to complete this 100-point exam. You may use a simple scientific calculator. No programmable calculators allowed.

**I. Multiple Choice** (15 pts, 3 points each) Carefully and clearly circle the best answer. If you circle two answers, *one of which is correct*, you will receive 1 point.

1. Which reaction represents the balanced net ionic reaction of  $\text{TiCl}_2$  with  $\text{Pb}(\text{NO}_3)_2$ ?
  - a.  $\text{Ti}^{2+} + 2 \text{NO}_3^- \rightarrow \text{Ti}(\text{NO}_3)_2 (\text{s})$
  - b.  $\text{Ti}^{4+} + 4 \text{NO}_3^- \rightarrow \text{Ti}(\text{NO}_3)_4 (\text{s})$
  - c.  $\text{Pb}^+ + \text{Cl}^- \rightarrow \text{PbCl} (\text{s})$
  - d.  $\text{Pb}^{2+} + 2 \text{Cl}^- \rightarrow \text{PbCl}_2 (\text{s})$
  - e. None of the above.
  
2. Which reaction represents the balanced net ionic reaction of  $\text{HNO}_3$  with  $\text{Fe}(\text{OH})_3$ ?
  - a.  $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$
  - b.  $3 \text{H}^+ + \text{Fe}(\text{OH})_3 \rightarrow 3 \text{H}_2\text{O} + \text{Fe}^{3+}$
  - c.  $\text{HNO}_3 + \text{OH}^- \rightarrow \text{H}_2\text{O} + \text{NO}_3^-$
  - d.  $\text{HNO}_3 + \text{Fe}(\text{OH})_3 \rightarrow \text{H}_2\text{O} + \text{Fe}(\text{NO}_3)_3$
  - e. None of the above.
  
3. If a reaction has a 73.2% yield and the actual yield was 23.4 g, what is the theoretical yield?
  - a. 0.320 g
  - b. 3.13 g
  - c. 32.0 g
  - d. 1710 g
  - e. None of the above
  
4. Which of the following is not a polyprotic acid?
  - a.  $\text{H}_2\text{SO}_4$
  - b.  $\text{H}_3\text{PO}_4$
  - c.  $\text{H}_2\text{CO}_3$
  - d.  $\text{HNO}_3$
  - e. None of the above
  
5. An acid-base reaction can also be referred to as:
  - a. An oxidation-reduction.
  - b. A precipitation.
  - c. A proton transfer.
  - d. An indicator.
  - e. None of the above.

## II. Solubility, Precipitates and Chemical Reactions

1. (10 pts) In the table below, indicate if a precipitate will form when  $\text{Fe}(\text{NO}_3)_3$  is mixed with the ionic compounds in column "X". **If a precipitate forms, give the formula of the precipitate.**

X	$\text{Fe}(\text{NO}_3)_3$	
	Will ppt form? (Y/N)	Formula of ppt
$\text{AlCl}_3$		
$\text{Na}_2\text{CO}_3$		
$\text{K}_2\text{SO}_4$		
$\text{Li}_3\text{PO}_4$		
$\text{AgNO}_3$		

2. (15 pts) Write the balanced complete, total ionic and net ionic equations for the reaction of zinc (I) sulfate with strontium chloride.

a. Complete

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b. Total Ionic

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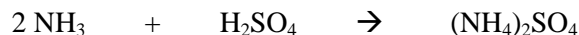
c. Net Ionic

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3. (5 pts) Write the balanced equation for the combustion of  $\text{C}_9\text{H}_{18}$ .

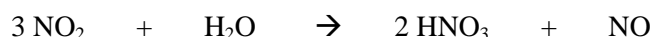
**III. Calculations:** Show all work in the space provided. Partial credit will be given for correct work. If I cannot read the work, it will not be graded.

1. (15 pts) Most window cleaners are aqueous solutions of ammonia,  $\text{NH}_3$ . A 10.00 L sample of a particular window cleaner requires 21.25 L of 0.1008 M  $\text{H}_2\text{SO}_4$  for its titration. What is the molarity of the ammonia in the window cleaner? The balanced reaction is given below.

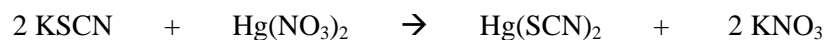


2. (10 pts) What mass of iron sulfate is contained in 25.0 mL of 0.125 M FeSO<sub>4</sub>? (MM of FeSO<sub>4</sub> = 151.9 g/mol)

3. (15 pts) The final step in the production of nitric acid involves the reaction of nitrogen dioxide with water. How many kilograms of nitric acid are produced from 15.0 kg of NO<sub>2</sub> (MM of NO<sub>2</sub> = 46.0 g/mol, MM of HNO<sub>3</sub> = 63.0 g/mol)



4. (15 pts) “Serpents in the grass, “or “Pharaoh’s Serpents,” is a common firework in which pellets of mercuric thiocyanate are burned with ammonium dichromate to yield black squirmy snakes slithering on the cement. Mercuric thiocyanate, Hg(SCN)<sub>2</sub> can be produced by the reaction of potassium thiocyanate with mercuric nitrate. How many grams of Hg(SCN)<sub>2</sub> are produced from the reaction of 150. g of KSCN with 1.25 L of 0.25 M Hg(NO<sub>3</sub>)<sub>2</sub>? (MM of KSCN = 97.18 g/mol, MM of Hg(SCN)<sub>2</sub> = 316.75 g/mol)



5. (10 pts) A common pesticide contains thallium (I) sulfate. Dissolving thallium (I) sulfate in water and adding sodium iodide precipitates thallium iodide. How many grams of thallium (I) iodide can be produced with 1.2L of 0.255 M Tl<sub>2</sub>SO<sub>4</sub>? (MM of TlI = 331.3 g/mol)

