

Chemistry 121
Spring 2004
Test 2
FORM A

Name: KEY

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

$$^{\circ}F = \left(\frac{9^{\circ}F}{5^{\circ}C}\right)(^{\circ}C) + 32^{\circ}F$$

$$^{\circ}C = \left(\frac{5^{\circ}C}{9^{\circ}F}\right)(^{\circ}F - 32^{\circ}F)$$

$$1 \text{ in} = 2.54 \text{ cm}$$

$$1000\text{g} = 1\text{kg}$$

$$1000 \text{ mg} = 1 \text{ g}$$

I. MULTIPLE CHOICE: (30 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. The correct chemical formula for sodium phosphate is:

- a. SPO_4
- b. S_3PO_4
- c. NaPO_4
- d. Na_3PO_4

2. Which of these is NOT soluble in water?

- a. NaCl
- b. AgCl
- c. BaCl_2
- d. KCl

3. In a balanced reaction, _____ are balanced.

- a. molecules
- b. moles
- c. atoms
- d. protons

4. Which of the following is the net ionic reaction of $\text{Fe}(\text{NO}_3)_3$ with NaOH ?

- a. $\text{Fe}(\text{NO}_3)_3 + 3 \text{NaOH} \rightarrow \text{Fe}(\text{OH})_3 (\text{s}) + 3 \text{NaNO}_3$
- b. $\text{Fe}(\text{NO}_3)_3 + 3 \text{Na}^+ + 3 \text{OH}^- \rightarrow \text{Fe}(\text{OH})_3 (\text{s}) + 3 \text{Na}^+ + 3 \text{NO}_3^-$
- c. $\text{Fe}^{3+} + 3 \text{NO}_3 + 3 \text{NaOH} \rightarrow \text{Fe}(\text{OH})_3 (\text{s}) + 3 \text{NaNO}_3$
- d. $\text{Fe}^{3+} + 3 \text{OH}^- \rightarrow \text{Fe}(\text{OH})_3 (\text{s})$

5. Which of the following will totally dissociate in water?

- a. $\text{Fe}(\text{OH})_3$
- b. LiOH
- c. $\text{Cu}(\text{OH})_2$
- d. $\text{Zn}(\text{OH})_2$

6. The point in a titration where the acid is exactly neutralized is called the:

- a. Neutral Point
- b. Indicator Point
- c. Standard Point
- d. End Point

D

7. Sodium chloride (NaCl) is a(n):

- a. Electrolyte
- b. Nonelectrolyte
- c. Acid
- d. Base

A

8. What are the products of a combustion reaction?

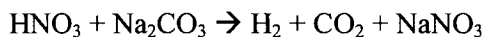
- a. C, H and O
- b. C, H, O and N
- c. CO and H₂O
- d. CO₂ and H₂O

D

9. What are the correct stoichiometric coefficients to balance the following equation?

- a. 2, 1, 1, 1, 2
- b. 1, 1, 1, 1, 1
- c. 2, 1, 1, 1, 1
- d. 2, 2, 2, 1, 1

A



10. Which ion (if any) will react with sulfate ion to form a precipitate?

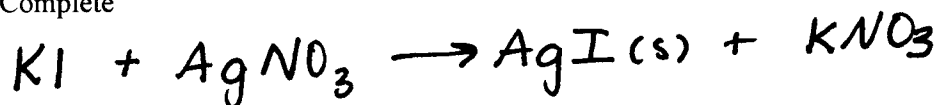
- a. Na⁺
- b. K⁺
- c. Ca²⁺
- d. None of these

C

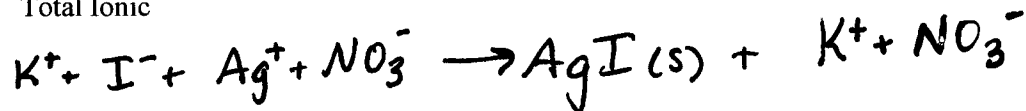
II. Short Answer and Calculations (80 pts): Clearly indicate your answer in the space provided. Partial credit will be given for correct work. If I cannot read the work, it will not be graded.

1. (15 pts) Write the complete, total ionic and net ionic equations for the reaction of aqueous potassium iodide with aqueous silver (I) nitrate.

a. Complete



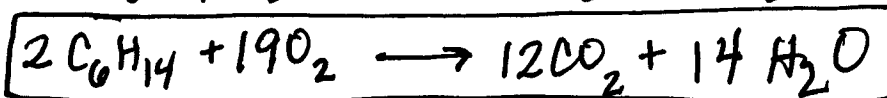
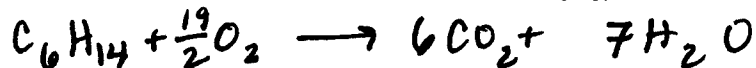
b. Total Ionic



c. Net Ionic



2. (5 pts) Write the balanced reaction for the combustion of C₆H₁₄.



3. (10 pts) If 5.75 g of lithium carbonate is dissolved in enough water to make 0.500 L of solution, what is the molarity of lithium carbonate? (MM of $\text{Li}_2\text{CO}_3 = 73.893 \text{ g/mol}$)

?? mol/L

$$\frac{5.75 \text{ g Li}_2\text{CO}_3}{0.500 \text{ L}} \times \frac{1 \text{ mol Li}_2\text{CO}_3}{73.893 \text{ g Li}_2\text{CO}_3} = 0.156 \frac{\text{mol}}{\text{L}}$$

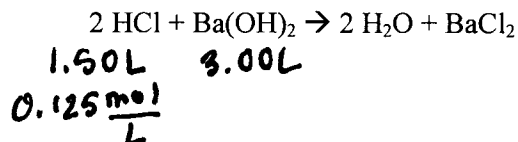
4. (10 pts) How many milliliters of 5.0 M NaOH are required to make 100.00 mL of 0.200 M NaOH?

$$M_1 V_1 = M_2 V_2$$

$$(5.0 \text{ M})(V_1) = (0.200 \text{ M})(100.00 \text{ mL})$$

$$V_1 = 4.0 \text{ mL}$$

5. (15 pts) If 1.50 L of 0.125 M HCl is exactly neutralized by 3.00 L of $\text{Ba}(\text{OH})_2$, what is the molarity of the base?



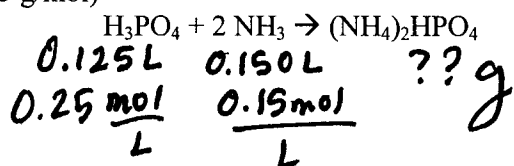
① Calculate moles of base

$$1.50 \text{ L} \times \frac{0.125 \text{ mol HCl}}{\text{L}} \times \frac{1 \text{ mol Ba}(\text{OH})_2}{2 \text{ mol HCl}} = 0.0938 \text{ mol Ba}(\text{OH})_2$$

② Calculate concentration

$$\frac{0.0938 \text{ mol Ba}(\text{OH})_2}{3.00 \text{ L}} = 0.0313 \text{ M Ba}(\text{OH})_2$$

6. (15 pts) Diammonium Phosphate (DAP) is a common component of fertilizer. $(\text{NH}_4)_2\text{HPO}_4$ is manufactured by the reaction of ammonia and phosphoric acid. How many grams of $(\text{NH}_4)_2\text{HPO}_4$ can be formed from 0.125 L of 0.25 M H_3PO_4 and 0.150 L of 0.15 M NH_3 . (MM of $(\text{NH}_4)_2\text{HPO}_4$ 132.055 g/mol)



$$0.125 \text{ L} \times \frac{0.25 \text{ mol H}_3\text{PO}_4}{\text{L}} \times \frac{1 \text{ mol } (\text{NH}_4)_2\text{HPO}_4}{1 \text{ mol H}_3\text{PO}_4} \times \frac{132.055 \text{ g } (\text{NH}_4)_2\text{HPO}_4}{\text{mol } (\text{NH}_4)_2\text{HPO}_4} = 4.13 \text{ g } (\text{NH}_4)_2\text{HPO}_4$$

$$0.150 \text{ L} \times \frac{0.15 \text{ mol NH}_3}{\text{L}} \times \frac{1 \text{ mol } (\text{NH}_4)_2\text{HPO}_4}{2 \text{ mol NH}_3} \times \frac{132.055 \text{ g } (\text{NH}_4)_2\text{HPO}_4}{\text{mol } (\text{NH}_4)_2\text{HPO}_4}$$

$$= \boxed{1.49 \text{ g } (\text{NH}_4)_2\text{HPO}_4}$$

NH_3 is LR

7. (10 pts) What is the percent yield of a reaction that has an actual yield of 1.25 g and a theoretical yield of 8.75 g?

$$\frac{1.25 \text{ g}}{8.75 \text{ g}} \times 100 = 14.3 \%$$