

Name: KEY

**Chemistry 121**  
**Fall 2003**  
**Exam 2**  
**75 minutes/100 pts**

**FORM A**

Instructions: You have 75 minutes to complete this 100-point exam. Indicate your exam form on the line marked "SUBJECT" on the scantron. You may only use non-programmable scientific calculators. **NO GRAPHING CALCULATORS ALLOWED!**

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

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

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

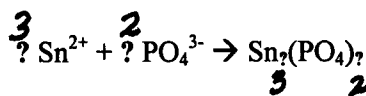
$$1000\text{g} = 1\text{kg}$$

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

I. MULTIPLE CHOICE: (80 pts, 4 points each) Indicate the best answers on the scantron using a #2 pencil.

1. When the following equation is balanced, what is the number that appears before the symbol Sn<sup>2+</sup>?

- B
- a. 2
  - b. 3
  - c. 4
  - d. 5

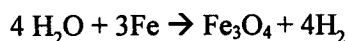


2. The ions present in solid silver chromate, Ag<sub>2</sub>CrO<sub>4</sub>, are

- A
- a. Ag<sup>+</sup> and CrO<sub>4</sub><sup>2-</sup>
  - b. Ag<sup>+</sup>, Cr<sup>6+</sup> and O<sup>2-</sup>
  - c. Ag<sup>2+</sup> and CrO<sub>4</sub><sup>4-</sup>
  - d. Ag<sup>+</sup>, Cr<sup>3+</sup> and O<sup>2-</sup>

3. How many moles of Fe are needed to produce 10.0 mol of H<sub>2</sub>?

- A
- a. 7.50 mol
  - b. 13.3 mol
  - c. 13.0 mol
  - d. 15.0 mol



$$10.0 \text{ mol H}_2 \times \frac{3 \text{ mol Fe}}{4 \text{ mol H}_2} = 7.50 \text{ mol Fe}$$

4. What volume 0.550 M MgCl<sub>2</sub> contains 1.1 moles of MgCl<sub>2</sub>?

- B
- a. 0.605 L
  - b. 2.00 L
  - c. 0.500 L
  - d. 1.65 L

$$1.1 \text{ mol MgCl}_2 \times \frac{\text{L}}{0.550 \text{ mol MgCl}_2} = 2.00 \text{ L}$$

5. How many milliliters of 10.0 M HCl are required to make 100.00 mL of 0.200 M HCl?

- D
- a. 1.00 mL
  - b. 10.0 mL
  - c. 5.00 x 10<sup>3</sup> mL
  - d. 2.00 mL

$$M_1 V_1 = M_2 V_2$$

$$(10.0 \text{ M})(V_1) = (0.200 \text{ M})(100.00 \text{ mL})$$

$$V_1 = 2.00 \text{ mL}$$

6. The balanced equation for the complete combustion of cyclohexane is:

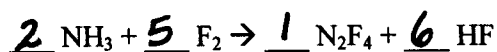
- B
- a. C<sub>6</sub>H<sub>12</sub> + 18 O<sub>2</sub> → 6 CO<sub>2</sub> + 6 H<sub>2</sub>O
  - b. C<sub>6</sub>H<sub>12</sub> + 9 O<sub>2</sub> → 6 CO<sub>2</sub> + 6 H<sub>2</sub>O
  - c. C<sub>6</sub>H<sub>12</sub> + 6 O<sub>2</sub> → 6 CO<sub>2</sub> + 6 H<sub>2</sub>O
  - d. 2 C<sub>6</sub>H<sub>12</sub> + 18 O<sub>2</sub> → 12 CO<sub>2</sub> + 6 H<sub>2</sub>O

7. In a balanced chemical equation, what is balanced?

- A
- a. Atoms
  - b. Moles
  - c. Molecules
  - d. Atoms and molecules

8. When the equation below is properly balanced, the respective coefficients are:

- C
- a. 2, 1, 1, 6
  - b. 2, 3, 1, 6
  - c. 2, 5, 1, 6
  - d. 2, 10, 1, 6



9. What is the actual yield of a reaction that has a percent yield of 78.6% and a theoretical yield of 52.3 g?

- B  a. 66.5 g  
 b. 41.1 g  
c.  $1.50 \times 10^3$  g  
d. 26.3 g

$$\frac{\text{act}}{52.3\text{g}} \times 100 = 78.6\% \quad \text{act} = 41.1\text{g}$$

10. Which of the following is a strong base?

- C  a.  $\text{Fe}(\text{OH})_3$   
 b.  $\text{Zn}(\text{OH})_2$   
 c.  $\text{Sr}(\text{OH})_2$   
d.  $\text{Al}(\text{OH})_3$

11. Which of the following is predicted to be insoluble in water?

- C  a. NaBr  
 b.  $\text{K}_2\text{SO}_4$   
 c. FeS  
d.  $(\text{NH}_4)_2\text{S}$

12. Which of these acids will dissociate 100%?

- D  a.  $\text{C}_6\text{H}_5\text{CO}_2\text{H}$   
 b.  $\text{H}_3\text{SO}_3$   
 c.  $\text{CH}_3\text{CO}_2\text{H}$   
 d. HF

← mistake on test, everyone was told to answer D.

13. The correct chemical formula of potassium sulfide is:

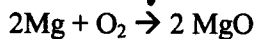
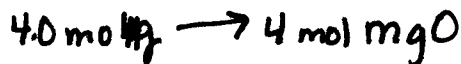
- B  a. KS  
 b.  $\text{K}_2\text{S}$   
c.  $\text{KSO}_4$   
d.  $\text{K}_2\text{SO}_4$

14. A solution that conducts electricity is called a (n)

- A  a. Electrolyte.  
 b. Nonelectrolyte.  
c. Precipitate.  
d. Coefficient.

15. Given the following balanced reaction, which reactant is limiting if you have 4.0 mol Mg and 4.0 mol  $\text{O}_2$ ?

- A  a. Mg  
 b.  $\text{O}_2$   
c. MgO  
d. None



16. The reaction of silver nitrate and magnesium chloride produces \_\_\_\_\_ as a precipitate.

- C  a.  $\text{Mg}(\text{NO}_3)_2$   
 b.  $\text{MgCl}_2$   
 c. AgCl  
d.  $\text{AgNO}_3$

17. All the following compounds are soluble in water except for:

- D**
- a.  $\text{Na}_3\text{PO}_4$
  - b.  $\text{Fe}(\text{ClO}_4)_2$
  - c.  $\text{MnCl}_2$
  - (d)**  $\text{CaSO}_4$

18. In an acid-base titration, the point at which the moles of base added equal the moles of acid is called the:

- B**
- a. Indicator point.
  - (b)** End point.
  - c. Buret point.
  - d. Acid point.

19. The net ionic equation for the neutralization of nitric acid with iron (II) hydroxide is:

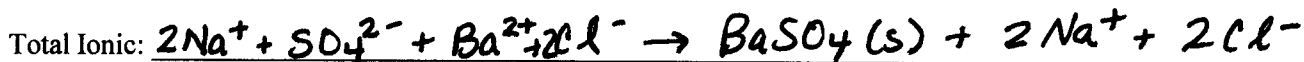
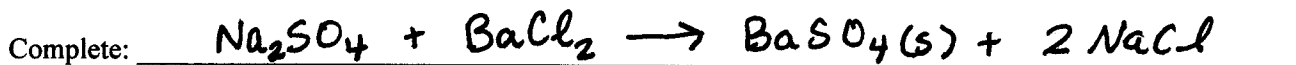
- C**
- a.  $2 \text{HNO}_3 + \text{Fe}(\text{OH})_2 \rightarrow 2 \text{H}_2\text{O} + \text{Fe}(\text{NO}_3)_2$
  - b.  $\text{HNO}_3 + \text{OH}^- \rightarrow \text{H}_2\text{O} + \text{NO}_3^-$
  - (c)**  $2 \text{H}^+ + \text{Fe}(\text{OH})_2 \rightarrow 2 \text{H}_2\text{O} + \text{Fe}^{2+}$
  - d.  $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$

20. Acetic acid ( $\text{CH}_3\text{CO}_2\text{H}$ ) is a(n):

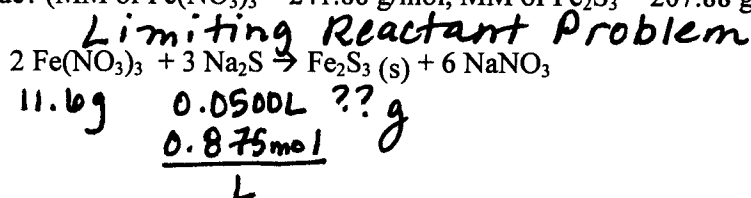
- B**
- a. Strong acid.
  - (b)** Weak acid.
  - c. Nonelectrolyte.
  - d. Common indicator.

II. Balancing and Calculations (30 pts, 10 pts each): 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. Write the complete, total ionic and net ionic equation for the reaction of sodium sulfate with barium chloride.



2. What mass of iron (III) sulfide is produced from the reaction of 11.6g of iron(III) nitrate with 0.0500 L of 0.875 M sodium sulfide? (MM of  $\text{Fe}(\text{NO}_3)_3 = 241.88 \text{ g/mol}$ , MM of  $\text{Fe}_2\text{S}_3 = 207.88 \text{ g/mol}$ )

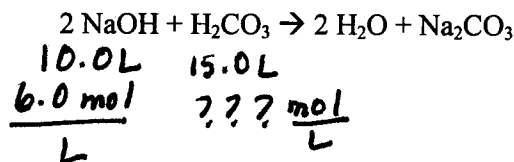


$$11.6\text{g Fe}(\text{NO}_3)_3 \times \frac{\text{mol Fe}(\text{NO}_3)_3}{241.88\text{g Fe}(\text{NO}_3)_3} \times \frac{1\text{mol Fe}_2\text{S}_3}{2\text{mol Fe}(\text{NO}_3)_3} \times \frac{207.88\text{g Fe}_2\text{S}_3}{\text{mol Fe}_2\text{S}_3} = 4.98\text{g Fe}_2\text{S}_3$$

$$0.0500\text{L} \times \frac{0.875\text{mol Na}_2\text{S}}{\text{L}} \times \frac{1\text{mol Fe}_2\text{S}_3}{3\text{mol Na}_2\text{S}} \times \frac{207.88\text{g Fe}_2\text{S}_3}{\text{mol Fe}_2\text{S}_3} = \boxed{3.03\text{g Fe}_2\text{S}_3}$$

$\text{Na}_2\text{S}$  is limiting reactant.

3. If 10.0 L of 6.0 M NaOH neutralizes 15.0 L of carbonic acid, what is the molarity of the acid?



$$10.0\text{L} \times \frac{6.0\text{mol NaOH}}{\text{L}} \times \frac{1\text{mol H}_2\text{CO}_3}{2\text{mol NaOH}} = 30.\text{mol H}_2\text{CO}_3$$

$$M = \frac{30.\text{mol H}_2\text{CO}_3}{15.0\text{L}} = \boxed{2.0\text{M H}_2\text{CO}_3}$$