

Name: _____

**GENERAL CHEMISTRY
CHEM. 111 SEC. 003**

EXAM III

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Spring 2004

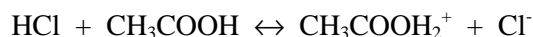
Answer all the questions. **DO NOT** write on this examination paper; use the blank sheets at the back of the exam for your answers. Credit will not be given for numerical questions unless all relevant calculations are shown. Please give answers to all numerical questions to 3 significant figures.

1. a) Give the Arrhenius definition of:

- i) an acid
- ii) a base

8 points

b) For the following reaction using the Brønsted – Lowry acid/base definition what is:



- i) the acid
- ii) the base
- iii) the conjugate acid
- iv) the conjugate base

8 points

c) Arrange the following acids in order of increasing strength.

Nitric acid, Acetic acid, Formic acid, Hydrogen fluoride

4 points

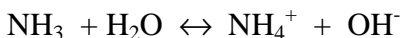
2. a) Calculate the pH and pOH of a 0.017M solution of hydrochloric acid.

10 points

b) A solution has a pH of 7.8. Calculate the hydronium and hydroxide concentration in the solution.

10 points

3. a) For the following reaction:



- i) Write the equilibrium expression (K_{eq})
ii) Write the base dissociation constant expression (K_{b})

10 points

- b) For the following solutions:

0.1M NaNO_3
0.1M NaCH_3COO
0.1M NH_4Cl

- i) Would you expect them to be acidic, basic or neutral?
ii) Explain your answers in (i) above.

10 points

4. a) Silver chromate is a sparingly soluble material in water. Calculate the equilibrium concentrations of silver ions and chromate ions in solution.

10 points

- b) For the following reaction at 1000K the equilibrium constant K_{p} is 158. If the partial pressure of oxygen at equilibrium is 0.136atm, what are the partial pressures of nitrogen dioxide and nitrogen oxide?



10 points

5. a) 10.71 grams of sodium hydroxide are dissolved in water to produce 250 mL of solution. Calculate the pH of the solution.

10 points

- b) A series of solution have the following pH's:

pH = 2.1
pH = 7.0
pH = -1.3
pH = 10.9

Indicate if the solutions are basic, acidic or neutral.

5 points

- c) Calculate the pH of a 0.1M solution of acetic acid.

5 points

b) $p_{\text{no}_3} = 7.98 \times 10^{-3} \text{ atms}$

5. a) $\text{pH} = 14.03$

b) $\text{pH} = 2.1$ acidic
 $\text{pH} = 7.0$ neutral
 $\text{pH} = -1.3$ acidic
 $\text{pH} = 10.9$ basic

c) $\text{pH} = 2.88$