

CHM 152  
Exam 2

Spring 2008  
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Name \_\_\_\_\_

Question	Points
1 - 5	25
6	14
7	10
8	15
9	14
10	10
11	12
total	100

The back page contains a periodic chart and may be detached.

$$\text{pH} = \text{pK}_a - \log \left( \frac{[\text{HA}]}{[\text{A}^-]} \right)$$

1. Which of these designates the equilibrium constant for a weak base ionization reaction in water?

- a)  $K_a$                       b)  $K_b$                       c)  $K_{sp}$                       d)  $Q_{sp}$

2. Which aqueous solution would have the highest pH?

- a) .10 M KCl                      c) .10 M  $KC_2H_3O_2$   
b) .10 M KOH                      d) .10 M HBr

3. Which aqueous solution would have the lowest pH?

- a) .10 M NaCl                      c) .10 M  $HClO_3$   
b) .10 M  $KClO_2$                       d) .10 M KOH

4. When a weak base is titrated with a strong acid, the pH at the equivalence point is.....

- a) 7.00                      b) above 7                      c) below 7                      d) 10.65

5. Which action would increase the solubility of  $CaCO_{3(s)}$ ?

- a) add  $HCl_{(aq)}$                       c) add  $K_2CO_{3(aq)}$   
b) add  $NaOH_{(aq)}$                       d) add  $CaCl_{2(aq)}$

6.(14) Calculate the pOH,  $[H^+]$ , and  $[OH^-]$  for an aqueous solution that has a pH of 4.95. Show your work.

7.(10) Calculate the pH of a mixture that is .015 M  $\text{HClO}_{(aq)}$  and .0026 M  $\text{HCl}_{(aq)}$ . Show your work.

$$K_a (\text{HClO}) = 3.5 \times 10^{-8}$$

8.(15) Calculate the pH of a .15 M  $\text{NaF}_{(aq)}$  solution. Show your work.

$$K_a (\text{HF}) = 7.2 \times 10^{-4}$$

9.(14) (a) Calculate the pH of a 1.00 L buffer solution that is .450 M benzoic acid and .400 M sodium benzoate. (b) Calculate the pH of the buffer after the addition of .040 moles of  $\text{H}^+$ . Show your work.

$$K_a (\text{benzoic acid, HC}_7\text{H}_5\text{O}_2) = 6.4 \times 10^{-5}$$

10.(10) Consider the titration of 25.00 mL of .200 M  $\text{HNO}_{2(\text{aq})}$  with .160 M  $\text{NaOH}_{(\text{aq})}$ . Pick ONE of the following points along the titration curve and calculate the pH of the solution at that point. Circle the point that you choose and show your work.

$$K_a (\text{HNO}_2) = 4.0 \times 10^{-4}$$

Equivalence Point or  
0 mL of base added or  
15.00 mL base added

11.(12) Calculate the solubility (25 °C) of  $\text{Ag}_2\text{CrO}_4$ . Show your work.

$$K_{\text{sp}} (\text{Ag}_2\text{CrO}_4, 25 \text{ }^\circ\text{C}) = 9.0 \times 10^{-12}$$