Name: _____

Honors Chapter 19 Practice Sheet

Section 19.1:

1. Finish the following reactions.

   a. $HCl + OH^- \rightarrow$

   b. $NH_3 + H_2O \rightarrow$

2. Fill in the following charts.

original acid	conjugate base
HNO_3	
H_2O	
H_3O^+	

original base	conjugate acid
OH^-	
SO_4^{2-}	
HCO_3^-	

3. Which of the following represent conjugate acid-base pairs?
   a. H_2O, H_3O^+
   b. OH^-, HNO_3
   c. H_2SO_4, SO_4^{-2}
   d. $HC_2H_3O_2$, $C_2H_3O_2^-$

Section 19.2:

4. Calculate the $[H^+]$ in a solution in which $[OH^-] = 2.0 \times 10^{-2}$ M. Is this solution acidic, neutral, or basic?

5. What is the pH of a solution in which $[H^+] = 0.0015$M? Identify the solution as an acidic, neutral, or basic.

6. What is the hydroxide ion concentration of a solution with a pOH of 9.77? Identify the solution as an acidic, neutral, or basic.

7. What is the pH, pOH, $[H^+]$, and $[OH^-]$ for a 0.156 molar solution of hydrochloric acid?

Section 19.3:

8. List 3 strong acids and 3 strong bases.

9. What is the generic formula to solve for K_a?

10. Calculate K_a for a system initially containing 0.1M acetic acid, if the $[H^+]$ is 5.44×10^{-4}M at equilibrium.

11. A student prepared a 0.25M solution of formic acid and measured its pH. The pH is 2.17. What is the K_a?

Section 19.4:

12. Finish and BALANCE the following neutralization reaction.

$HNO_3 + Mg(OH)_2 \rightarrow$

13. What is the difference in the equivalence point and the end point of a titration?

14. A 100mL sample of 0.50M HCl is titrated with 0.10M NaOH. What volume of the NaOH solution is required to reach the endpoint of the titration?

15. Titration reveals that 11.6 mL of 3.0 M sulfuric acid are required to neutralize the sodium hydroxide in 25.00 mL of NaOH solution. What is the molarity of the NaOH solution?

Section 19.5:

16. What is a buffer and how is it made?

17. Are the following salt solutions acidic, basic, or neutral?
    a. KNO_3 b. $LiC_2H_3O_2$ c. $MgCl_2$

Additional Exercises:

18. A student carries out a titration using an indicator that changes color slightly past the equivalence point of pH 8. If 50.0 mL of 0.1 M KOH was added to a 100 mL sample of a monoprotic acid at the actual equivalence point, which of the following concentrations for the acid would the student obtain using the indicator?
    a.
    b. slightly less than 0.050 M c. slightly more than 0.050 M

d. slightly less than 0.20 M e. slightly more than 0.20 M

19.

20. Refer to the following reactions that occur in an aqueous solution when carbon dioxide and water combine to form carbonic acid.

$$CO_2 + H_2O \rightarrow H_2CO_3$$
$$H_2CO_3 + H_2O \rightarrow H_3O^+ + HCO_3^-$$
$$HCO_3^- + H_2O \rightarrow H_3O^+ + CO_3^{2-}$$

Which of the following represent Bronsted-Lowry conjugate acid-base pairs?

a. H_2O and H_2CO_3
b. H_2CO_3 and H_3O^+
c. CO_2 and HCO_3^-
d. H_2O and H_3O^+

20. Which of the following best explains the relationship between conjugate acid-base pairs?

a. The acid and the base differ by one proton (H^+ ion).
b. The conjugate base differs from the base by one proton (H^+ ion).
c. The conjugate base differs from the acid by one proton (H^+ ion).
d. The conjugate acid and conjugate base differ by one proton (H^+ ion).

21. Which of the following statements is true of the reaction represented below?

$$F^- + H_2O \leftrightarrow HF + OH^-$$

a. OH^- is the conjugate acid of H_2O.
b. LF is the conjugate base of F^-.
c. HF and H_2O are conjugate acid-base pairs.
d. HF and H_2O are both Bronsted-Lowry acids.

22. In the forward and reverse reactions below, H_2O acts as

$$CH_3COOH + H_2O \leftrightarrow CH_3COO^- + H_3O^+$$
$$NH_3 + H_2O \leftrightarrow NH_4^+ + OH^-$$

a. an acid only.
b. a base only.
c. an acid and a base.
d. an acid, a conjugate acid, a base and a conjugate base.

23. Which of the following has amphoteric properties? (Hint: Ionic compounds dissociate in solutions.)

a.
b. hydrofluoric acid
c. aluminum hydroxide
d. ammonia
e. hydrogen peroxide

Questions 24 – 26 refer to the titration of a solution of a weak monoprotic acid with a 0.1 M strong base NaOH. The titration curve is shown below.

24. What is the value of the pH where the number of moles of strong base added is equal to the number of moles of weak acid in the initial solution?
    a. 7.00
    b. 7.45
    c. 8.73
    d. 10.00

25. At which pH are the concentration of the weak acid and its conjugate base approximately equal?
    a. 2.88
    b. 4.75
    c. 6.13
    d. 7.00

26. In which of the following pH ranges does the solution act most like a buffer?
    a. 2.88 and 6.13
    b. 4.75 and 7.45
    c. 6.13 and 11.29
    d. 11.29 and 12.25

27. Which of the following has the lowest conductivity in a 0.1 M solution?
    a. $CuSO_4$ b. KOH c. $BaCl_2$ d. HF e. HNO_3
28. It is suggested that SO_2 (molar mass 64 grams), which contributes to acid rain, could be removed from a stream of waste gas by bubbling the gas through 0.25 molar KOH, thereby producing K_2SO_3. What is the maximum mass of SO_2 that could be removed by 1,000 liters of the KOH solution?
    a. 4.0 kg
    b. 8.0 kg
    c. 16 kg
    d. 20 kg
    e. 40 kg

29. The pH of 0.1 molar ammonia is approximately …
    a. 1 b. 4 c. 7 d. 11 e. 14

30. When phenolphthalein is used as an indicator in a titration of an HCl solution with a solution of NaOH, the indicator undergoes a color change from clear to red at the end point of the titration. This color change occurs abruptly because …
    a. phenolphthalein is a very strong acid that is capable of rapid dissociation.
    b. the solution being titrated undergoes a large pH change near the end point of the titration.
    c. phenolphthalein undergoes an irreversible reaction in basic solution
    d. OH^- acts as a catalyst for the decomposition of phenolphthalein.
    e. phenolphthalein is involved in the rate-determining step of the reaction between H_3O^+ and OH^-.

a.