Chemistry 12

Acid Base Part 2 Review Package

Name:
Date:
Block:

I. Multiple Choice

1. Consider the following data:

Solution	Initial pH	Final pH
1	1.0	4.0
2	2.0	6.0
3	6.0	3.0
4	9.0	3.0

In which solution has the $[H_3O^+]$ increased 1000 times?

A. 1
B. 2
C. 3
D. 4

2. A solution is amber with neutral red and colourless with phenolphthalein. The approximate pH of the solution is:

A. 4
B. 6
C. 8
D. 10

3. Consider the following equilibrium for an acetic acid buffer solution:

$$CH_3COOH + H_2O \rightleftharpoons CH_3COO^- + H_3O^+$$

When a small amount of acid is added to this system, and equilibrium is reestablished,

A. $[CH_3COO^-]$ and pH have both increased
B. $[CH_3COOH]$ and pH have both decreased
C. $[CH_3COO^-]$ has decreased and pH remains relatively constant
D. $[CH_3COOH]$ has decreased and pH remains relatively constant.

4. The stoichiometric point of a titration is reached when 35.50 mL 0.40 M HBr is added to a 25.00 mL sample of LiOH. The original [LiOH] is:

A. 0.014 M
B. 0.024 M
C. 0.28 M
D. 0.57 M

5. A buffer solution can be prepared by mixing equal numbers of moles of:

A. NH_4Cl and HCl
B. NaCl and NaOH
C. Na_2CO_3 and $NaHCO_3$
D. $NaCH_3COO$ and NaOH

6. Which of the following, when dissolved in water, produces a **basic** solution?

A. KCl
B. $NaClO_4$
C. Na_2CO_3
D. NH_4NO_3

7. The net ionic equation for the hydrolysis of Na_2CO_3 is:

A. $H_2O + Na^+ \leftrightharpoons NaOH + H^+$
B. $H_2O + 2Na^+ \leftrightharpoons Na_2O + 2H^+$
C. $H_2O + CO_3^{2-} \leftrightharpoons H_2CO_3 + O^{2-}$
D. $H_2O + CO_3^{2-} \leftrightharpoons HCO_3^- + OH^-$

8. When 1.0 M NH_3 is titrated with 1.0 M HCl, the most suitable indicator is:

A. methyl violet.
B. indigo carmine.
C. phenolphthalein.
D. bromcresol green.

9. All buffer solutions are able to

A. maintain pH at 7.00.
B. neutralize acidic solutions only.
C. maintain a relatively constant pH.

10. The most appropriate indicator for the titration of 0.50 M CH_3COOH with 0.50 M NaOH is (ICE table calculation necessary!)

A. methyl red.
B. indigo carmine.
C. phenolphthalein.
D. bromcresol green.

11. An indicator is useful for a titration when its K_a is close to

A. K_w / K_b
B. the pH at the equivalence point.
C. the $[H^+]$ at the equivalence point.
D. the concentration of the acid form of the indicator.

12. In order to change the pH of a solution from 2.0 to 4.0 to the $[H_3O^+]$ must:

A. decrease by a factor of 100
B. decrease by a factor of 2
C. increase by a factor of 2
D. increase by a factor of 100

13. Which of the following represents the predominant reaction between HCO_3^- and water?

A. $2HCO_3^- + H_2O \leftrightharpoons H_3O^+ + CO_3^{2-} + OH^- + CO_2$
B. $HCO_3^- + H_2O \leftrightharpoons H_3O^+ + CO_3^{2-}$
C. $HCO_3^- + H_2O \leftrightharpoons H_2CO_3 + OH^-$
D. $2HCO_3^- \leftrightharpoons H_2O + 2CO_2$

14. Which of the following applies at the transition point for all indicators, HInd?
    A. [HInd] = [Ind^-]
    B. [H_3O^+] = [OH^-]
    C. [Ind^-] = [H_3O^+]
    D. [HInd] = [H_3O^+]

15. Which of the following 1.0M solutions would have a pH greater than 7.00?
    A. HCN
    B. NH_4Cl
    C. KNO_3
    D. $NaCH_3COO$

16. What is the pH of the solution formed when 0.040 mol $NaOH_{(s)}$ is added to 2.00 L of 0.020M HCl?
    A. 7.00
    B. 1.70
    C. 1.40
    D. 0.00

17. A buffer solution may contain equal moles of
    A. strong acid and its conjugate base.
    B. weak acid and strong base.
    C. weak acid and its conjugate base.
    D. strong acid and strong base.

I. Problems

1. Determine the pH of a 0.75M solution of $Sr(HSO_3)_2$.

2. Consider the salt sodium oxalate ($Na_2C_2O_4$). When a few drops 1.0M solution of sodium oxalate is added to phenolphthalein indicator the solution turns pink. Write a hydrolysis equation and an equilibrium expression to explain the shift that caused the indicator to change colour.

3. a) Calculate the pH of the solution produced when 9.00 mL of 0.200 M NaOH has been added to 20.0 mL of 0.200 M HCOOH.

b) How many mL of NaOH have been added at equivalence point?

c) Calculate the pH at the equivalence point of this titration.