

Name:
College ID:
Thomas Edison State University
General Chemistry II with Labs (CHE-122)
Section no.:
Semester and year:

Written Assignment 5: Acids, Bases, and Salts

Answer all assigned questions and problems, and show all work.

1. List general properties of acids and bases. (See Section 4.3.) (2 points)
2. Give Arrhenius's and Brønsted-Lowry definitions of acids and bases. (2 points)
3. Identify each of the following species as a Brønsted-Lowry acid, base, or both: (a) HI, (b) CH_3COO^- , (c) H_2PO_4^- , (d) HSO_4^- . (2 points)
4. Balance the following equations and write the corresponding ionic and net ionic equations: (3 points)
 - a. $\text{HBr} + \text{NH}_3 \rightarrow$
 - b. $\text{Ba}(\text{OH})_2 + \text{H}_3\text{PO}_4 \rightarrow$
 - c. $\text{HClO}_4 + \text{Mg}(\text{OH})_2 \rightarrow$
5. Identify the acid-base conjugate pairs in each of the following reactions: (5 points)
 - a. $\text{CH}_3\text{COO}^- + \text{HCN} \rightleftharpoons \text{CH}_3\text{COOH} + \text{CN}^-$
 - b. $\text{HCO}_3^- + \text{HCO}_3^- \rightleftharpoons \text{H}_2\text{CO}_3 + \text{CO}_3^{2-}$
 - c. $\text{H}_2\text{PO}_4^- + \text{NH}_3 \rightleftharpoons \text{HPO}_4^{2-} + \text{NH}_4^+$

- d. $\text{HClO} + \text{CH}_3\text{NH}_2 \rightleftharpoons \text{CH}_3\text{NH}_3^+ + \text{ClO}^-$
e. $\text{CO}_3^{2-} + \text{H}_2\text{O} \rightleftharpoons \text{HCO}_3^- + \text{OH}^-$

(Reference: Chang 15.5)

6. Calculate the pH of each of the following solutions: (2 points)
a. 0.0010 M HCl
b. 0.76 M KOH

(Reference: Chang 15.17)

7. Calculate the hydrogen ion concentration in mol/L for solutions with the following pH values: (4 points)
a. 2.42
b. 11.21
c. 6.96
d. 15.00

(Reference: Chang 15.19)

8. How much NaOH (in grams) is needed to prepare 546 mL of solution with a pH of 10.00? (5 points)

(Reference: Chang 15.25)

9. Classify each of the following species as a weak or strong acid: (9 points)
a. HNO_3
b. HF
c. H_2SO_4
d. HSO_4^-

- e. H_2CO_3
- f. HCO_3^-
- g. HCl
- h. HCN
- i. HNO_2

(Reference: Chang 15.33)

10. Which of the following statements is/are true for a 0.10 M solution of a weak acid HA? (8 points)

- a. The pH is 1.00.
- b. $[\text{H}^+] \gg [\text{A}^-]$
- c. $[\text{H}^+] = [\text{A}^-]$
- d. The pH is less than 1.

(Reference: Chang 15.35)

11. The K_a for benzoic acid is 6.5×10^{-5} . Calculate the pH of a 0.10 M benzoic acid solution. (5 points)

(Reference: Chang 15.43)

12. The pH of an acid solution is 6.20. Calculate the K_a for the acid. The initial acid concentration is 0.010 M. (5 points)

(Reference: Chang 15.45)

13. Calculate the percent ionization of benzoic acid at the following concentrations: (8 points)

- a. 0.20 M
- b. 0.00020 M

(Reference: Chang 15.47)

14. A 0.040 M solution of a monoprotic acid is 14 percent ionized. Calculate the ionization constant of the acid. (4 points)

(Reference: Chang 15.49)

15. Calculate the pH for each of the following solutions: (8 points)

- a. 0.10 M NH_3
- b. $0.050\text{ M C}_5\text{H}_5\text{N}$ (pyridine)

(Reference: Chang 15.55)

16. What is the original molarity of a solution of ammonia whose pH is 11.22? (4 points)

(Reference: Chang 15.57)

17. Predict the acid strengths of the following compounds: H_2O , H_2S , and H_2Se . (6 points)

(Reference: Chang 15.67)

18. What is a salt? Define salt hydrolysis. Categorize salts according to how they affect the pH of a solution. (3 points)

(Reference: Chang 15.73)

19. Calculate the pH of a 0.36 M CH_3COONa solution. (5 points)

(Reference: Chang 15.81)

20. Calculate the pH of a 0.42 M NH_4Cl solution. (5 points)

(Reference: Chang 15.82)

21. How many grams of NaCN would you need to dissolve in enough water to make exactly 250 mL of solution with a pH = 10.00? (5 points)

(Reference: Chang 15.129)