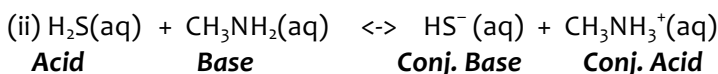
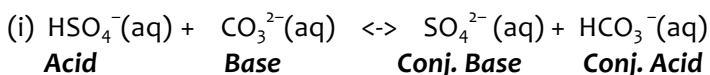


Homework Set 11 Solutions

(Distributed 11/30/16; Due on 12/7/16)

Read Chapters 16 and 18 in Zumdahl and complete the listed questions from the text:
Chapter 16: 9, 15, 31, 36, 54, 102; Chapter 18: 4, 33, 56, 86; as well as the following problems:

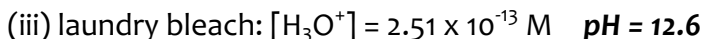
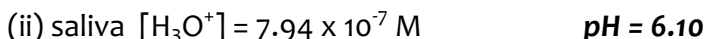
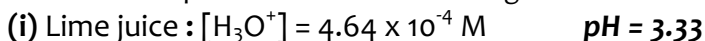
A. Identify the Brønsted-Lowry acid, base, conjugate acid and conjugate base in the following equations:



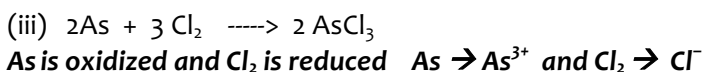
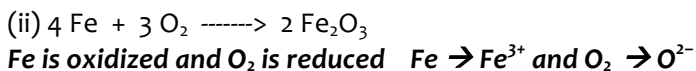
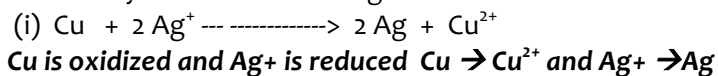
B. What are $[\text{H}_3\text{O}^+]$ and $[\text{OH}^-]$ for solutions with the following pH values:



C. What is the pH of each of the following solutions:



D. Identify the materials being oxidized or reduced in the equations shown:



Problems from Zumdahl:

Chapter 16:

- 9.(a) HF = acid; H₂O = base F⁻ = conjugate base H₃O⁺ = conjugate acid
(b) CN⁻ = base; H₂O = acid; HCN = conjugate acid; OH⁻ = conjugate base
(c) HCO₃⁻ = base; H₂O = acid; H₂CO₃ = conjugate acid; OH⁻ = base

15. (a) HSO₃⁻ + H₂O -----> SO₃²⁻ + H₃O⁺
(b) CO₃²⁻ + H₂O -----> HCO₃⁻ + OH⁻
(c) H₂PO₄⁻ + H₂O -----> HPO₄²⁻ + H₃O⁺
(d) C₂H₃O₂⁻ + H₂O -----> HC₂H₃O₂ + OH⁻

31. (a) [H⁺] = 4.3 x 10⁻¹¹ M; basic (b) [H⁺] = 1.1 x 10⁻⁵ M; acidic
(c) [H⁺] = 2.3 x 10⁻⁹ M; basic (d) [H⁺] = 1.6 x 10⁻³ M; acidic

36. (a) [OH⁻] = 6.03 x 10⁻⁴ M (b) [OH⁻] = 4.21 x 10⁻⁶ M
(c) [OH⁻] = 8.04 x 10⁻⁴ M

54. (a) 5.358 (b) 3.64 (c) 5.97 (d) 0.480

102. (a) [H⁺] = 3.9 x 10⁻⁶ M (b) [H⁺] = 1.1 x 10⁻² M
(c) [H⁺] = 1.2 x 10⁻¹² M (d) [H⁺] = 7.8 x 10⁻¹¹ M

Chapter 18:

4. (a) Na is oxidized; nitrogen is reduced (b) Mg is oxidized; Cl is reduced
(c) Al is oxidized; Br is reduced (d) Mg is oxidized; Cu is reduced

33. Zn is oxidized; H⁺ is reduced

56. Cd + 2OH⁻ -----> Cd(OH)₂ + 2e⁻ (oxidation)
NiO₂ + 2 H₂O + 2e⁻ -----> Ni(OH)₂ + 2 OH⁻ (reduction)

- 86.(a) Al is oxidized; H is reduced
(b) H is reduced; I is oxidized
(c) Cu is oxidized; H is reduced.