Answers to Test-2 (Spring 2007)

✓ Please come to my office hours or talk to your classmates if you cannot get the right answers. If you find any grading error, please let me know.

I. Multiple choices:

1A.(a); 1B. (a)
2A. (a); 2B. (a)
3 (b)
4 (b)
5 (b)
6 (a)
7 (a)
8 (a)
9 (c)
10 (a)
11 (a)
12 (c)
13 (c)
14 (d)
15 (a)

II. Problems:

1.

- $BaSO_4\,(s) \quad <=> \quad Ba^{2+} + SO_4^{2-}$
- $HCl + H_2O \quad <=> \quad H_3O^+ + Cl^-$
- $2H_2O \quad <=> \quad H_3O^+ + OH^-$
- $SO_4^{2-} + H_3O^+ \quad <=> \quad HSO_4^- + H_2O$

(a) Mass balance equations:

$[Ba^{2+}] = [SO_4^{2-}] + [HSO_4^-]$

$[H_3O^+] = [Cl^-] + [OH^-] - [HSO_4^-] = C_{HCl} + [OH^-] - [HSO_4^-] = 0.0100 + [OH^-] - [HSO_4^-]$

$[Cl^-] = C_{HCl} = 0.0100$

(b) Charge balance equation:

$2[Ba^{2+}] + [H_3O^+] = 2[SO_4^{2-}] + [HSO_4^-] + [OH^-] + [Cl^-]$

(c) Equlibrium-constant expressions

$K_{sp} = [Ba^{2+}]\,[SO_4^{2-}]$

$K_w = [H_3O^+]\,[OH^-]$

$$K_b = \frac{[HSO_4^-]}{[SO_4^{2-}][H_3O^+]}$$

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2. See Example 7-14 on Lecture note (slides 44-47 on Chapter 7).

III. Bonus

1. See Example 9-8 on Lecture note of Chapter 8B (slides 31-33 on Chapter 8B).