Problem of the Day 33 CHEM 1252

1. What is the K_{sp} for barium sulfate if 1.0 mg of $BaSO_4$ dissolves in 400.0 mL of water? (The total volume of the solution is also 400.0 mL.)

Concentration of Ba^{2+}

$[Ba^{2+}]$ = 5

Concentration of SO_4^{2-}

$[SO_4^{2-}]$ = 5

Calculate K_{sp}

K_{sp}= 4

2. In class, we examined weak acid/strong base titrations. The concepts developed can be applied to weak base/strong acid titrations in an analogous manner. This type of titration can also be broken down into four regions: (1) before any acid is added, (2) after some acid is added but before the equivalence point, (3) at the equivalence point, and (4) after the equivalence point. Let's explore a weak base/strong acid titration

a) Classify each of the four regions discussed above for the weak base/strong acid titration. Circle one for each region.

Region 1: Before any acid is added.

Strong Acid Calculation Strong Base Calculation

Weak Acid Calculation Weak Base Calculation

Buffer Solution Calculation 1

Region 2: After some acid is added but before the equivalence point.

Strong Acid Calculation Strong Base Calculation

Weak Acid Calculation Weak Base Calculation

Buffer Solution Calculation 1

Region 3: At the equivalence point.

Strong Acid Calculation Strong Base Calculation

Weak Acid Calculation Weak Base Calculation

Buffer Solution Calculation 1

Region 4: After the equivalence point.

Strong Acid Calculation Strong Base Calculation

Weak Acid Calculation Weak Base Calculation

Buffer Solution Calculation 1

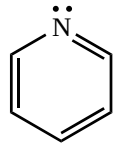
2. (cont'd) The reaction involves the titration of 25.00 mL of 0.0400 M pyridine with 0.0500 M HCl. Pyridine is a weak base with $K_b = 1.69 \times 10^{-9}$.

b) What is the pH of the solution before any acid is added? PYR is the abbreviation for pyridine and $PYRH^+$ is the conjugate acid.

	PYR	+	H_2O	⇌	$PYRH^+$	+	HO^-
start	1				1		1
change	1				1		1
final	1				1		1

8

c) Complete the titration reaction.



pyridine + H^+ →

2

d) How many millimoles (or moles) of pyridine are present in 25.00 mL of a 0.0400 M solution?

2

e) What is the volume of HCl needed to reach the equivalence point?

2

f) What is the pH of the solution after 10.00 mL of HCl has been added?

8

g) What is the pH at the equivalence point?

	$PYRH^+$			⇌	PYR	+	H^+
start	1				1		1
change	1				1		1
final	1				1		1

8

h) What is the pH after 25.00 mL of HCl has been added?

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