CHEMISTRY 31

Quiz 5 - 10 minutes Fall, 2016

Name _____

Using activities (but not needing to use the systematic method), calculate the pH for a solution containing 0.0050 M $Ba(OH)_2$. The K_w (dissociation constant) of water is 1.0×10^{-14}. Assume that Ba^{2+} does not react any further in water.

a) What is the ionic strength of the solution? (4 pts)

$Ba(OH)_2 \rightarrow Ba^{2+} + 2OH^-$ so $[Ba^{2+}] = 0.0050$ M and $[OH^-] = 0.010$ M

$\mu = 0.5\{[Ba^{2+}](+2)^2 + [OH^-](-1)^2\} = 0.5(0.0050 \cdot 4 + 0.010 \cdot 1) = 0.5(0.030) =$ ***0.015 M***

b) Using the activity coefficient table (below) and the true definition of the pH, determine the pH (4 sig fig.s) of the solution. (6 pts)

	Activity Coefficients			
Ionic Strength	0.005 M	0.010 M	0.015 M	0.030 M
H^+	0.934	0.913	0.900	0.874
OH^-	0.926	0.900	0.882	0.844

(Select the closest the ionic strength closest to your calculated value from a)). The systematic approach is not needed.

$K_w = \gamma(H^+)[H^+]\gamma(OH^-)[OH^-]$ and $pH = -\log\{\gamma(H^+)[H^+]\} = -\log\{K_w/\gamma(OH^-)[OH^-]\}$

$pH = -\log[1.0 \times 10^{-14}/(0.882 \cdot 0.010)] = -\log(1.13 \times 10^{-12}) =$ ***11.95***

Note: can also solve as $pH = 14 - pOH = 14 + \log\{\gamma(OH^-)[OH^-]\}$