

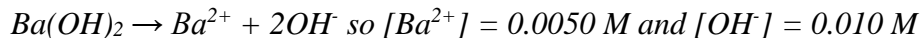
### CHEMISTRY 31

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)<sub>2</sub>. The K<sub>w</sub> (dissociation constant) of water is 1.0 x 10<sup>-14</sup>. Assume that Ba<sup>2+</sup> does not react any further in water.

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



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

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 <sup>+</sup>	0.934	0.913	0.900	0.874
OH <sup>-</sup>	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.

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

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

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