Calculating Concentrations of Acids and Bases Answer Key

1. **(a)** $0.384\ \text{mol HBr(aq)} \times \dfrac{1}{0.350\,\text{L}} = 1.10\,\dfrac{\text{mol}}{\text{L}}\,\text{HBr(aq)}$

(b) $1.23\,\text{mol NaOH(aq)} \times \dfrac{1}{2.5\,\text{L}} = 0.49\,\dfrac{\text{mol}}{\text{L}}\,\text{NaOH(aq)}$

2. **(a)** $5.67\,\text{g HCl(aq)} \times \dfrac{1\,\text{mol}}{36.46\,\text{g}} \times \dfrac{1}{3.5\,\text{L}} = 0.044\,\dfrac{\text{mol}}{\text{L}}\,\text{HCl(aq)}$

(b) $20.5\,\text{g Ba(OH)}_2\text{(aq)} \times \dfrac{1\,\text{mol}}{171.35\,\text{g}} \times \dfrac{1}{2.00\,\text{L}} = 0.0598\,\dfrac{\text{mol}}{\text{L}}\,\text{Ba(OH)}_2\text{(aq)}$

3. **(a)** $c_1V_1 = c_2V_2$

$$\left(2.00\,\frac{\text{mol}}{\text{L}}\right)\left(0.0500\,\text{L}\right) = c_2\left(1.50\,\text{L}\right)$$

$$c_2 = 0.0667\,\frac{\text{mol}}{\text{L}}\,\text{HClO}_4\text{(aq)}$$

(b) $c_1V_1 = c_2V_2$

$$\left(0.20\,\frac{\text{mol}}{\text{L}}\right)\left(0.0300\,\text{L}\right) = c_2\left(0.100\,\text{L}\right)$$

$$c_2 = 0.060\,\frac{\text{mol}}{\text{L}}\,\text{LiOH(aq)}$$

4. **(a)** $\dfrac{0.35\,\text{mol HI(aq)}}{\text{L}} \times \dfrac{1\,\text{mol } H_3O^+\text{(aq)}}{1\,\text{mol HI(aq)}} = 0.35\,\text{mol } H_3O^+\text{(aq)}$

(b) $\dfrac{0.380\,\text{mol Sr(OH)}_2\text{(aq)}}{\text{L}} \times \dfrac{2\,\text{mol } OH^-\text{(aq)}}{1\,\text{mol Sr(OH)}_2\text{(aq)}} = 0.760\,\dfrac{\text{mol}}{\text{L}}\,OH^-\text{(aq)}$

(c) $\dfrac{0.51\,\text{mol CsOH(aq)}}{\text{L}} \times \dfrac{1\,\text{mol } OH^-\text{(aq)}}{1\,\text{mol CsOH(aq)}} = 0.51\,\dfrac{\text{mol}}{\text{L}}\,\text{CsOH(aq)}$

Calculating Concentrations of Acids and Bases Answer Key (cont'd)

5. **(a)** $4.5\,\text{g HCl(g)} \times \frac{1\,\text{mol}}{36.46\,\text{g}} \times \frac{1}{3.0\,\text{L}} \times \frac{1\,\text{mol } H_3O^+(aq)}{1\,\text{mol HCl(g)}} = 0.041 \frac{\text{mol}}{\text{L}}\ H_3O^+(aq)$

(b) $3.6\,\text{g LiOH(s)} \times \frac{1\,\text{mol}}{23.95\,\text{g}} \times \frac{1}{3.00\,\text{L}} \times \frac{1\,\text{mol } OH^-(aq)}{1\,\text{mol LiOH(aq)}} = 0.050 \frac{\text{mol}}{\text{L}}\ OH^-(aq)$

(c) $2.93\,\text{g } Ba(OH)_2(s) \times \frac{1\,\text{mol}}{171.35\,\text{g}} \times \frac{1}{2.50\,\text{L}} \times \frac{2\,\text{mol } OH^-(aq)}{1\,\text{mol } Ba(OH)_2(aq)} = 0.0137 \frac{\text{mol}}{\text{L}}\ OH^-(aq)$

(d) $c_1V_1 = c_2V_2$

$\left(0.45 \frac{\text{mol}}{\text{L}}\right)(0.050\,\text{L}) = c_2\,(0.250\,\text{L})$

$c_2 = 0.090 \frac{\text{mol}}{\text{L}}\ Sr(OH)_2(aq)$

$\frac{0.090\,\text{mol } Sr(OH)_2(aq)}{\text{L}} \times \frac{2\,\text{mol } OH^-(aq)}{1\,\text{mol } Sr(OH)_2(aq)} = 0.18 \frac{\text{mol}}{\text{L}}\ OH^-(aq)$