

Chapter 9

13 $pK_{a1} = 6.351$
 $pK_{a2} = 10.329$

$$10.00 = 10.329 + \log \frac{[\text{base}]}{[\text{acid}]}$$

$$5.00 \text{ g NaHCO}_3 \left| \frac{\text{mol}}{84.01 \text{ g}} \right| = 0.0595 \text{ mol A}^-$$

$$10.00 = 10.329 + \log \frac{[\text{base}]}{0.0595 \text{ mol}}$$

$$-0.329 = \log \frac{\text{base}}{0.0595}$$

$$0.469 = \frac{\text{base}}{0.0595}$$

$$\text{base} = 0.0279 \text{ mol} \left| \frac{105.99 \text{ g}}{1 \text{ mol}} \right| = \boxed{2.96 \text{ g}}$$

14 $pK_{a1} = 2.972$
 $pK_{a2} = 13.7$

$$3.50 = 2.972 + \log \frac{[\text{base}]}{[\text{acid}]}$$

$$\frac{\text{base}}{\text{acid}} = 3.37$$

$$25.0 \text{ mL} \left| \frac{0.0233 \text{ mmol}}{1 \text{ mL}} \right| = 0.582 \text{ mmol} \Rightarrow \text{base} + \text{acid} = 0.582$$

$$\text{acid} = 0.582 - \text{base}$$

$$\frac{\text{base}}{(0.582 - \text{base})} = 3.37$$

$$\text{base} = 0.449 \text{ mmol} \left| \frac{\text{mL}}{0.202 \text{ mmol}} \right| = \boxed{2.22 \text{ mL}}$$

15 $pK_{a1} = 1.01$
 $pK_{a2} = 5.39$

$$5.50 = 5.39 + \log \frac{\text{base}}{\text{acid}}$$

$$\frac{\text{base}}{\text{acid}} = 1.288$$

$$10.0 \text{ mL} \left| \frac{0.100 \text{ mmol}}{1 \text{ mL}} \right| = 1.0 \text{ mmol}$$

$$\text{base} + \text{acid} = 10$$

$$\text{acid} = 10 - \text{base}$$

$$\frac{\text{base}}{10 - \text{base}} = 1.288$$

$$\text{base} = 5.63 \text{ mmol} \left| \frac{1 \text{ mL}}{1 \text{ mmol}} \right| = \boxed{5.63 \text{ mL OH}^-}$$

$$10 \text{ mmol} \left| \frac{123.11 \text{ mg}}{1 \text{ mmol}} \right| \left| \frac{1 \text{ g}}{1000 \text{ mg}} \right| = \boxed{1.23 \text{ g}}$$