

## pH and pOH Calculations

- 1) Determine the pH of a 0.0034 M HNO<sub>3</sub> solution.

$$\text{pH} = -\log [\text{H}^+] = -\log [0.0034] = 2.5$$

- 2) Determine the pOH of a 0.0034 M HNO<sub>3</sub> solution.

$$\text{pH} = -\log [\text{H}^+] = -\log [0.0034] = 2.5$$

$$\text{pOH} = 14 - \text{pH} = 14 - 2.5 = 11.5$$

- 3) Determine the pH of a 4.3 x 10<sup>-4</sup> M NaOH solution.

$$\text{pOH} = -\log [\text{OH}^-] = -\log (4.3 \times 10^{-4}) = 3.4$$

$$\text{pH} = 14 - 3.4 = 10.6$$

- 4) What is the pH and pOH of a 1.2 x 10<sup>-3</sup> HBr solution?

$$\text{pH} = -\log [\text{H}^+] = -\log [1.2 \times 10^{-3}] = 2.9$$

$$\text{pOH} = 14 - \text{pH} = 14 - 2.9 = 11.1$$

- 5) What is the pH and pOH of a 2.34 x 10<sup>-5</sup> NaOH solution?

$$\text{pOH} = -\log [\text{OH}^-] = -\log [2.34 \times 10^{-5}] = 4.63$$

$$\text{pH} = 14 - \text{pOH} = 14 - 4.63 = 9.37$$

- 6) What is the pH and pOH of a solution made by adding water to 15 grams of hydroiodic acid until the volume of the solution is 2500 mL?

$$\left( \frac{15 \text{ g HI}}{1} \right) \left( \frac{1 \text{ mole HI}}{127.9 \text{ g HI}} \right) \left( \frac{1}{2500 \text{ mL}} \right) \left( \frac{1000 \text{ mL}}{1 \text{ L}} \right) = 0.047 \text{ M HI}$$

$$\text{pH} = -\log [\text{H}^+] = -\log [0.047] = 1.3$$

$$\text{pOH} = 14 - \text{pH} = 14 - 1.3 = 12.7$$

- 7) What is the pH and pOH of a solution with a volume of 5.4 L that contains 15 grams of hydrochloric acid and 25 grams of nitric acid?

$$\left( \frac{15 \text{ g HCl}}{1} \right) \left( \frac{1 \text{ mole HCl}}{36.5 \text{ g HCl}} \right) \left( \frac{1}{5.4 \text{ L}} \right) = 0.076 \text{ M HCl}$$

$$\text{pH} = -\log [\text{H}^+] = -\log [0.076 + 0.073]$$

$$\left( \frac{25 \text{ g HNO}_3}{1} \right) \left( \frac{1 \text{ mole HNO}_3}{63.0 \text{ g HNO}_3} \right) \left( \frac{1}{5.4 \text{ L}} \right) = 0.073 \text{ M HNO}_3$$

$$\text{pH} = 0.82$$

$$\text{pOH} = 14 - 0.82$$

$$\text{pOH} = 13.18$$