

Name KEY Period \_\_\_\_\_ Date 2/2/2

**Acid and Bases – Calculations – 2a** Assume complete dissociation.

Please answer each of the following questions. Show all work to receive full credit.

1. A solution of  $1.56 \times 10^{-4}$  M nitric acid is made.  
 $\text{HNO}_3$   
 What is the concentration of hydronium?

$$[\text{H}_3\text{O}^+] = 1.56 \times 10^{-4} \text{ M}$$

What is the hydroxide concentration?

$$[\text{OH}^-] = \frac{1 \times 10^{-14}}{1.56 \times 10^{-4}} = 6.41 \times 10^{-11} \text{ M}$$

What is the pH?

$$-\log(1.56 \times 10^{-4}) = 3.81$$

What is the pOH?

$$14 - 3.81 = 10.19$$

2. A  $4.02 \times 10^{-1}$  M solution of sodium hydroxide is made.  
 $\text{NaOH}$   
 What is the concentration of hydronium?

$$[\text{H}_3\text{O}^+] = \frac{1 \times 10^{-14}}{4.02 \times 10^{-1}} = 2.49 \times 10^{-14} \text{ M}$$

What is the hydroxide concentration?

$$[\text{OH}^-] = 4.02 \times 10^{-1} \text{ M}$$

What is the pH?

$$14 - 3.96 = 13.6$$

What is the pOH?

$$-\log(4.02 \times 10^{-1}) = 3.96$$

3. A  $8.51 \times 10^{-7}$  M solution of phosphoric acid is made.  
 $\text{H}_3\text{PO}_4$   
 What is the concentration of hydronium?

$$[\text{H}_3\text{O}^+] = 3(8.51 \times 10^{-7}) = 2.55 \times 10^{-6} \text{ M}$$

What is the hydroxide concentration?

$$[\text{OH}^-] = \frac{1 \times 10^{-14}}{2.55 \times 10^{-6}} = 3.92 \times 10^{-9} \text{ M}$$

What is the pH?

$$-\log(2.55 \times 10^{-6}) = 5.59$$

What is the pOH?

$$14 - 5.59 = 8.41$$

4. A  $1.07 \times 10^{-5}$  M solution of magnesium hydroxide solution is made.  
 $\text{Mg(OH)}_2$   
 What is the concentration of hydronium?

$$[\text{H}_3\text{O}^+] = \frac{1 \times 10^{-14}}{2.14 \times 10^{-5}} = 4.67 \times 10^{-10} \text{ M}$$

What is the hydroxide concentration?

$$[\text{OH}^-] = 2(1.07 \times 10^{-5}) = 2.14 \times 10^{-5} \text{ M}$$

What is the pH?

$$14 - 4.67 = 9.33$$

What is the pOH?

$$-\log(2.14 \times 10^{-5}) = 4.67$$