

**General Chemistry**  
**Mr. MacGillivray**  
**Worksheet: Acids & Bases, Part I**

1. Answer these questions about acids. All solutions are aqueous solutions at 25°C.
  - a. What is the name for the  $\text{H}_3\text{O}^+$  ion?
  - b. What is always true about  $[\text{H}_3\text{O}^+]$  of acidic solutions? (Is it bigger or smaller than  $[\text{OH}^-]$ ?)
  - c. What is the numerical value of  $[\text{H}_3\text{O}^+]$  for an acid? (Give a range.)
  - d. What is the pH range of acids?
  - e. What is the pOH range of acids?
  - f. Explain what is meant by the logarithm of a number.
  - g. What is the formula for calculating pH from  $[\text{H}_3\text{O}^+]$ ?
2. Answer these questions about bases. All solutions are aqueous solutions at 25°C.
  - a. What is the name for the  $\text{OH}^-$  ion?
  - b. What is always true about  $[\text{H}_3\text{O}^+]$  of basic solutions? (Is it bigger or smaller than  $[\text{OH}^-]$ ?)
  - c. What is the numerical value of  $[\text{OH}^-]$  for a base? (Give a range.)
  - d. What is the pH range of bases?
  - e. What is the pOH range of bases?
  - f. What is the formula for calculating pOH from  $[\text{OH}^-]$ ?
3. State whether the following statements (about aqueous solutions) are TRUE or FALSE:
  - a. The product of  $[\text{OH}^-] \times [\text{H}_3\text{O}^+]$  is equal to  $1.00 \times 10^{-14}$  for a neutral solution.
  - b. The product of  $[\text{OH}^-] \times [\text{H}_3\text{O}^+]$  is equal to  $1.00 \times 10^{-14}$  for all solutions.
  - c.  $[\text{OH}^-] = [\text{H}_3\text{O}^+]$  for all solutions.
  - d.  $[\text{OH}^-] = 1.00 \times 10^{-7}$  for all solutions.
4. Acids are proton (a)\_\_\_\_\_ and electron pair (b)\_\_\_\_\_. Acids produce (c)\_\_\_\_\_ ions in solution.
5. Bases are proton (a)\_\_\_\_\_ and electron pair (b)\_\_\_\_\_. Bases produce (c)\_\_\_\_\_ ions in solution.
6. For the preceding problems you used the (a)\_\_\_\_\_, (b)\_\_\_\_\_, and (c)\_\_\_\_\_ definitions to define acids and bases.
7. Write the chemical reaction between HF acid and water below. Then, label the conjugate acid-base pairs.
8. Write the chemical reaction between the acetate ion ( $\text{CH}_3\text{CO}_2^-$ ), a base, and water below. Then, label the conjugate acid-base pairs.

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9. Fill in the missing values in each box.

Problem	Answer	Problem	Answer
$10^3 = ?$		$10^{-7} = ?$	
$10^2 = 1000$		$10^2 = 0.0001$	
$10^{-4} = ?$		$10^{-3} = ?$	
$10^2 = 0.1$		$10^2 = 0.0368$	

10. Solve for the missing values.

[OH]	[H <sub>3</sub> O <sup>+</sup> ]	Acidic, Basic, or Neutral Solution	pH	pOH
$1.0 \times 10^{-7} \text{ M}$				
	$1.0 \times 10^{-9} \text{ M}$			
$1.0 \times 10^{-5} \text{ M}$				
	$6.2 \times 10^{-13} \text{ M}$			
$9.3 \times 10^{-9} \text{ M}$				