

Ch. 19 & 20 Worksheet  
Acids & Bases

- What is the difference between an Arrhenius acid and a Bronsted acid? An Arrhenius base and a Bronsted base?
- Hydrogen ions react with water molecules to form what ion? *hydronium*  
What is the ion's formula?  $H_3O^+$
- What is produced when you put an active metal into an acid?  $H_2 + \text{salt}$
- Complete and balance the following:  $Al(s) + HNO_3(aq) \rightarrow ??$   $H_2 + Al(NO_3)_3$
- What is produced when you react an acid with a base?  $H_2O + \text{salt}$
- Complete and balance the following:  $HNO_3(aq) + Mg(OH)_2(s) \rightarrow ??$   $H_2O + Mg(NO_3)_2$
- What is produced when you react an acid with a carbonate?  $H_2O + CO_2 + \text{salt}$
- Complete and balance the following:  $HNO_3(aq) + MgCO_3(s) \rightarrow ??$   $H_2O + CO_2 + Mg(NO_3)_2$
- What effect does a base have on pink litmus paper?  
blue litmus paper? Would an acid have the same effects?
- How do acids taste? bases?
- What is the difference between a strong acid and a weak acid?  
List the 3 most common strong acids.  $HCl$ ,  $HNO_3$ ,  $H_2SO_4$
- For the following reactions, label each substance as a Bronsted acid or base. Indicate which substances are conjugate acid-base pairs.  

$$\begin{array}{ccccccc} & A & & B & & A & B & B & A \\ a) & NH_3 & + & H_2O & \leftrightarrow & NH_4^+ & + & OH^-; & \\ & & & & & & & & \\ c) & NO_2^- & + & H_3O^+ & \leftrightarrow & HNO_2 & + & H_2O; & \\ & & & & & & & & \\ d) & HNO_3 & + & HCO_3^- & \leftrightarrow & H_2CO_3 & + & NO_3^- \end{array}$$
- Water can act both as an acid and a base. What is this called? *amphoteric*
- For any aqueous solution,  $[H^+] \times [OH^-] = ?$   $1 \times 10^{-14}$
- For aqueous solutions:  
 a) if  $[H^+] = 2.5 \times 10^{-5} M$ , then  $[OH^-] = ?$  Is it acidic or basic?  $4 \times 10^{-10}$   
 b) if  $[OH^-] = 7.5 \times 10^{-10} M$ , then  $[H^+] = ?$  Is it acidic or basic?  $1.3 \times 10^{-5}$   
 c) if  $[OH^-] = 7.5 \times 10^{-4} M$ , then  $[H^+] = ?$  Is it acidic or basic?  $1.3 \times 10^{-11}$
- Calculate pH for the following and state whether the solution is acidic or basic:  
 A 4.6 a)  $[H^+] = 2.5 \times 10^{-5} M$ ; b)  $[OH^-] = 7.5 \times 10^{-10} M$ ; 4.9 A  
 B 8.7 c)  $[H^+] = 2.0 \times 10^{-9} M$ ; d)  $[OH^-] = 1.0 \times 10^{-7} M$  7 neutral
- Calculate  $[H^+]$  if pH = a) 1.5; b) 4.0; c) 7.5 a)  $1 \times 10^{-4}$  b)  $1 \times 10^{-4}$  c)  $3.2 \times 10^{-8}$
- If pH = 6.5, calculate: a) pOH; b)  $[OH^-]$  a) 7.5 b)  $3.2 \times 10^{-8}$
- If pOH = 8.2, calculate: a)  $[OH^-]$ ; b) pH; c)  $[H^+]$  a)  $6.3 \times 10^{-9}$  b) 5.8 c)  $1.5 \times 10^{-6}$
- What equation is used to solve titration problems?  $MV = MV$
- It takes 5.25 mL of 3.00 M NaOH(aq) to neutralize 50.0 mL of HCl(aq). What is the molarity of the HCl?  

$$M(50 \text{ mL}) = (3M)(5.25 \text{ mL})$$

$$M = 0.315 M$$
- 40.0 mL of NaOH(aq) is titrated with 6.00 M HNO<sub>3</sub>(aq).  
 It takes 5.00 mL of the acid to reach the end point.  
 What is the molarity of the NaOH?

$$(6M)(5 \text{ mL}) = M(40 \text{ mL})$$

$$0.75 M = M$$