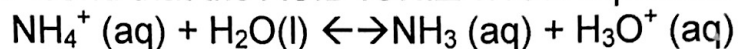


Name: \_\_\_\_\_

Blk: \_\_\_\_\_ Date: \_\_\_\_\_

Chemistry 12  
ACID BASE LESSON #9  
THE RELATIONSHIP BETWEEN  $K_a$  and  $K_b$  FOR A CONJUGATE PAIR

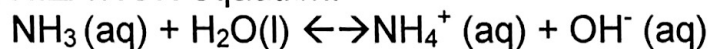
Experimentally it is found that the ACID IONIZATION equation:



Has the acid ionization constant of:

$$K_a =$$

While the BASE IONIZATION equation:



Has the BASE IONIZATION CONSTANT of:

$$K_b =$$

Since both equations involve both \_\_\_\_\_, the following relationship exists between the  $K_a$  and  $K_b$  for CONJUGATE PAIRS

$$K_a \times K_b =$$

Conclusion: for A CONJUGATE PAIR:

$$\boxed{K_a (\text{conjugate acid}) \times K_b (\text{conjugate base}) = K_w}$$

Recall that the table of Relative Strengths of Acids and Bases is set up with only  $K_a$  values. You can use the above equation to solve for the  $K_b$ .

$$K_b(\text{conjugate base}) =$$

**Example 1.** What is the  $K_b$  for  $\text{H}_2\text{PO}_4^-$  ?

**Example 2.** What is the  $K_b$  for  $\text{HS}^-$  ?

**Example 3.** Given that the  $K_b$  for  $\text{N}_4\text{H}_6$  is  $2.14 \times 10^{-12}$ , what is the  $K_a$  for  $\text{N}_4\text{H}_7^+$  ?