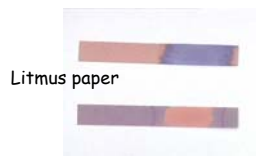


## Chemistry BC2001x: General Chemistry I



Lecture 13: Thursday October 22, 2009

Topics: Acids and Bases:  $K_a$ ,  $K_b$  and  $K_w$

Predicting when solutions are **acidic**, **basic**, or **neutral**

Hand in problem set 6

Pick up

1) problem set 7 (due 11/5; includes material from practice problem sets 7 and 8).

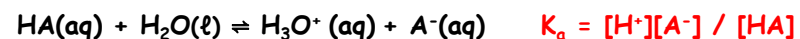
2) pH and Salts

3) Study guide for Exam 2 (Thursday, Oct. 29)

1

## Acidity and Basicity Constants ( $K_a$ and $K_b$ )

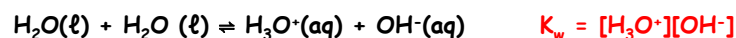
$K_a$  is the equilibrium constant for the hydrolysis (reaction with water) of an acid HA:



$K_b$  is the equilibrium constant for the hydrolysis (reaction with water) of an base B:



$K_w$  is the equilibrium constant for the hydrolysis of water!



By convention, the reaction must be balanced with a coefficient of 1 for the acid or base, and only one proton is transferred. Thus  $K_a$  and  $K_b$  values are typically tabulated according to the acid or base: the reaction to which they correspond is implied.

2

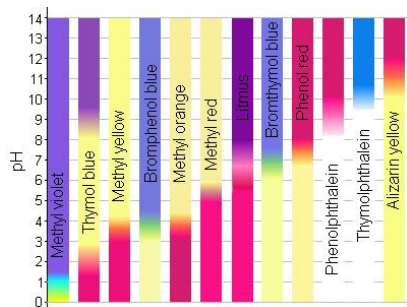
## Aqueous solutions

An aqueous solution is

neutral if  $[\text{H}^+] = [\text{OH}^-]$ , **acidic** if  $[\text{H}^+] > [\text{OH}^-]$ , **basic** if  $[\text{H}^+] < [\text{OH}^-]$ .

neutral if  $\text{pH} = \text{pOH}$ , **acidic** if  $\text{pH} < \text{pOH}$ , **basic** if  $\text{pH} > \text{pOH}$ .

How do we **measure**? **Indicators**, **litmus** or **pH paper**, or a **pH meter**.



3

## Aqueous solutions

An aqueous solution is

neutral if  $[\text{H}^+] = [\text{OH}^-]$ , **acidic** if  $[\text{H}^+] > [\text{OH}^-]$ , **basic** if  $[\text{H}^+] < [\text{OH}^-]$ .

neutral if  $\text{pH} = \text{pOH}$ , **acidic** if  $\text{pH} < \text{pOH}$ , **basic** if  $\text{pH} > \text{pOH}$ .

How do we **predict**? Look at properties of the **dissolved species**.

They may produce  $\text{H}^+$  or  $\text{OH}^-$  directly, or they may undergo hydrolysis reactions that result in the production of  $\text{H}^+$  or  $\text{OH}^-$ .

Solutions of acids (weak or strong) in water are **acidic**.

Solutions of bases (weak or strong) in water are **basic**.

Solutions of **salts**? ... more complicated: consider different cases.  
See handout

4