

REVIEW-- Honors
Unit 15: Acids and Bases

Name _____
Period _____

Topics:

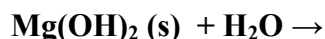
- *Properties of Acids & Bases*
- *Conductivity: solutions with ions are electrolytes (Demo!)*
- *Arrhenius and Brønsted definitions of Acids and Bases*
- *Writing acid/base reactions, acid/base conjugate pairs, equilibrium favors reactants or products*
- *Strengths of acids and bases (conductivity? bright vs. dim) (large or small K_a value?)*
- *K_a / K_b calculations (I, C, E calculations)*
- *pH calculations $K_w = 1 \times 10^{-14} = [H_3O^+][OH^-]$ and $pH = -\log [H_3O^+]$ and $pH + pOH = 14$*
- *Titration problems: concepts & stoichiometry (Titration Lab!)*

Practice Problems:

1) Why are all acids electrolytes? _____

a) Why are weak acids weak electrolytes? _____

2) Complete the following equation for $Mg(OH)_2$ (s) dissolving into water.

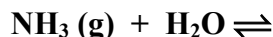


a) $Mg(OH)_2$ solid does not conduct electricity. Why not? _____

b) Why does $Mg(OH)_2$ (aq) conduct electricity? _____

c) Why is $Mg(OH)_2$ an Arrhenius base? _____

3) A solution of NH_3 in water has a pH of 10. Write the equation for NH_3 (g) dissolving into water.



4) How would you tell a strong acid from a weak acid by testing conductivities using a light bulb?

5) For the following acid & base titrations, write the neutralization reaction.

a) Sodium hydroxide and hydrofluoric acid

b) methylamine (CH_3NH_2 , a weak base) and nitric acid

6) 25.0 ml of a solution of oxalic acid, $H_2C_2O_4$, of unknown molarity is titrated to the equivalence point with 40.0 ml of 0.114 M KOH.

a) Write the balanced chemical equation.

b) What is the molarity of the oxalic acid solution?

- 7) 2.75 g of NaHSO_3 (s) is titrated with an NaOH solution of unknown molarity.
 This reaction occurs: NaHSO_3 (s) + NaOH (aq) \rightarrow Na_2SO_3 (aq) + H_2O (l)
 It takes 31.8 mL of the NaOH solution to exactly titrate to the equivalence point. What is the molarity of the NaOH solution?

- 8) The K_a values for these hypothetical acids are listed. Which is the stronger acid? _____

Acid A: $K_a = 2.3 \times 10^{-5}$

Acid B: $K_a = 2.6 \times 10^{-8}$

- 9) Which is a stronger base, NO_2^- or HS^- ? _____

Write the K_b expression for NO_2^- . (Write the needed chemical equation first.)

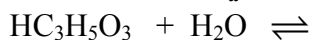
- 10) According to the Brønsted definition of an acid, an acid is a _____

According to the Brønsted definition of a base, a base is a _____

- 11) Complete these acid/base reactions. Show arrows showing transfer of H^+ , label conjugate acids/base pairs, label as "stronger acid or weaker acid" and determine if equilibrium lies mainly on the right or the left.



- 12) A 0.10 M aqueous solution of lactic acid, $\text{HC}_3\text{H}_5\text{O}_3$, has $\text{pH} = 2.43$. What is the $[\text{H}_3\text{O}^+]$ of this solution of lactic acid? What is the K_a for lactic acid?



Initial:

Change: _____

Equil:

- 13) A 0.30 M aqueous solution of hypothetical weak base, B, has $\text{pH} = 11.38$. What is the $[\text{OH}^-]$ of this solution? What is the K_b for this base?



Initial:

Change: _____

Equil:

14) If $[\text{OH}^-] = 0.000010 \text{ M}$, what is the $[\text{H}_3\text{O}^+]$? _____ What is the pH? _____

15) What is the hydronium ion concentration of a 0.0015 M solution of $\text{Mg}(\text{OH})_2$? What is its pH?

16) What is the pH of a 0.050 M HCl solution?

17) What is the hydroxide ion concentration in a solution with a pH equal to 10.54?

Answers: 6b) $[\text{H}_2\text{C}_2\text{O}_4] = 0.0912 \text{ M}$; 7) $[\text{NaOH}] = 0.831 \text{ M}$; 12) $[\text{H}_3\text{O}^+] = 3.7 \times 10^{-3} \text{ M}$; $K_a = 1.4 \times 10^{-4}$; 13) $[\text{OH}^-] = 2.4 \times 10^{-3} \text{ M}$; $K_b = 1.9 \times 10^{-5}$; 14) $[\text{H}_3\text{O}^+] = 1.0 \times 10^{-9} \text{ M}$; pH = 9.00; 15) $[\text{H}_3\text{O}^+] = 3.3 \times 10^{-12} \text{ M}$; pH = 11.48; 16) pH = 1.30; 17) $[\text{OH}^-] = 3.5 \times 10^{-4} \text{ M}$