

Topics: Weak Acid/Base Equilibria  
Common Ion Effect

Partial neutralization  
Buffers

1. Define acids and bases in terms of the Brønsted-Lowry theory.
2. Given a formula for a substance, determine whether (or not) it is an Arrhenius acid or an Arrhenius base.
3. Write the formula for the conjugate acid (or base) of a given molecule or ion.
4. For given equations, label the Brønsted-Lowry conjugate acid-base pairs and identify the stronger acid & base and the weaker acid & base.
5. For a given equilibrium reaction, write the equilibrium constant expression.
6. Given a series of equilibrium reactions with their respective equilibrium constants, arrange them in the order of their increasing tendency to proceed toward completion. (Does equilibrium favor reactants or products?)
7. Given equations for equilibrium systems, determine the direction in which the equilibrium would be shifted upon application of a stress such as change in concentration of a reactant or product or change in temperature, and the effect of that stress on the equilibrium constant.
8. Write the reaction for autoionization of water and give the ion product constant for water.
9. Calculate any one of the following from any of the other three: pH, pOH,  $[H_3O^+]$ ,  $[OH^-]$ .
10. Define neutral, acidic or basic solutions in terms of relative concentrations of  $H_3O^+$  and  $OH^-$ .
13. For a given weak acid or weak base, write the ionization reaction and the equilibrium constant expression.
14. Given the pH and initial concentration of a weak acid or weak base, calculate the equilibrium constant ( $K_a$  or  $K_b$ ).
15. Given the percent ionization and initial concentration of a weak acid or weak base, calculate the equilibrium constant ( $K_a$  or  $K_b$ ).
16. Given the equilibrium constant and initial concentration of weak acid or weak base, calculate the equilibrium concentrations of all species and the pH of the solution.
17. Discuss the effect of addition of a salt of a common ion to a solution of a weak acid or a weak base.
18. Given the equilibrium constant and initial concentration of a weak acid or weak base and the quantity of compound containing a common ion that is added to the weak acid or weak base solution, calculate  $[H_3O^+]$ , pH,  $[OH^-]$  or pOH at equilibrium.
19. Given the equilibrium constant and initial concentration of a weak acid or weak base, calculate the concentration or quantity of a compound containing a common ion that must be present to give a solution of specified pH, pOH,  $[H_3O^+]$  or  $[OH^-]$ .
20. Given the equilibrium constant and initial concentration of a weak acid or weak base and the quantity of a strong base or acid that reacts with the weak acid or weak base, calculate the pH, pOH,  $[H_3O^+]$  or  $[OH^-]$  at equilibrium.
21. From a list of compounds or pairs of compounds select those which could act as buffers.
22. Given a buffer solution of specified concentrations, calculate the pH, pOH,  $[H_3O^+]$  or  $[OH^-]$  after a specified volume of either a strong acid or strong base solution of known concentration is added to a specified volume of the buffer solution.
23. Be able to solve any of the assigned problems in your textbook.
24. Define or discuss the following:

neutralization	acid-base indicator
pH, pOH	common ion effect
conjugate acid or base	percent ionization
buffer solution	amphiprotic
weak acid or base	amphoteric