1. A sample of milk has pH = 6.45. Calculate $[H^+]$, $[OH^-]$, and pOH for this sample.

2. A solution of hypochlorous acid, HOCl, is used to disinfect a shower stall. If the solution is 0.680 M HOCl, and has a pH = 3.84, what is its K_a value? Calculate the % error of your answer from the value found in Table 14.2 (p. 659).

3. Calculate the degree of ionization for the hypochlorous acid in Question #8.

4. Calculate the pH of a 0.520 M solution of hydrogen sulfate ion (HSO_4^-), which has an acid dissociation constant, K_a, equal to 0.014 at a particular temperature. Set up the ICE table and apply the 5 % rule.

5. Set up an ICE table and calculate the pH of a 0.80 M solution of ethylamine ($K_b = 5.6 \times 10^{-4}$). Use an equation similar to Eqn 14.6 on p. 678.

6. How many drops of 0.050 M hydrochloric acid would you have to add to neutralize all of the hydroxide in 10.0 mL of the ethylamine solution in Question 11? 20 drops = 1.0 mL. Assume that no more hydroxide is produced other than what is produced in the equilibrium in Question #11.

7. A solution of 1.40 M benzoic acid was mixed with 250.0 mL of a 0.550 M sodium hydroxide solution and the resulting solution had pOH = 0.534. How many milliliters of the benzoic acid solution were initially added? Assume benzoic acid and hydroxide react on a one-to-one basis.

8. The pH of a 0.0242 M solution of ammonia at a particular temperature is 10.80. Calculate K_b. Use an equation similar to Eqn 14.6 on p. 678.

9.. Tractor tires are partly filled with water to give them added weight. Calcium chloride, $CaCl_2$, is added to keep the water from freezing. If a tire solution is 3.57 m $CaCl_2$, what is the mole fraction of calcium chloride in the solution and what is the molarity of the solution? Assume the density of the solution is 1.27 g/mL.

$CaCl_2$ = _____ Molarity = _____

10. Ether boils at 34.7 deg C and freezes at −116 deg C. Enough eugenol, which produces the flavor and smell of cloves, was dissolved in 200.0 grams of ether to make a 0.566 molal solution. If the freezing point depression and boiling point elevation constants of ether are 1.79 deg C kg/mol and 2.02 deg C kg/mol, respectively, what are the freezing point and boiling point of the solution?

fp = _____ bp = _____

11. If the molecular formula of eugenol is $C_{10}H_{12}O_2$, what was the mass of the eugenol used in Question #2?

Mass = _____

12. The vapor pressure of benzene is 40.4 torr at 7.57 deg C. If ¥ÄH_{vap} for benzene is 30.8 kJ/mol, at what Celsius temperature does it have a vapor pressure of 404 torr?

$$\ln \frac{P_1}{P_2} = \frac{\Delta H_{vap}}{R}\left[\frac{1}{T_2} - \frac{1}{T_1}\right]$$, where R = 8.314 J/mol K

T = _____

13. At a high temperature nitric oxide and hydrogen react according to the following equation: $2H_2$ (g) + 2N¡ÕO (g) ¡æ $2H_2O$ (g) + N_2 (g)

An initial rate experiment was run and the following data was collected:

Trial	[H2]	[NO]	Rate
1	0.0100	0.0250	2.40×10^{-6}
2	0.0050	0.0250	1.20×10^{-6}
3	0.0100	0.0125	0.60×10^{-6}

Determine the rate law for the reaction, and determine the value of the rate constant, k, for all three trials. What is the value of k? Be sure to include units of k.

Rate = _____ k = _____

14. Iodine-131 decays to xenon-131 in a first order process with a half-life of 8.1 days. If a technician starts with 60.0 grams of iodine-131, how much time must pass before he has only 5.00 grams left?

t = _____

15. Autoionization of Water and the pH Scale. (Question 14.42)

At 40 ¨¬C, the value of K_w is 2.92 ¡¿ 10^{-14}.

a. Calculate the $[H^+]$ and $[OH^-]$ in pure water at 40 ¨¬C.
(Type your answer using the format 8.050e-3 for 8.050 ¡¿ 10^{-3}.)

$[H^+]$ = _____ *M*, and $[OH^-]$ = _____ *M*

b. What is the pH of pure water at 40 ¨¬C?

pH = _____

c. If the hydroxide ion concentration in a solution is 0.37 *M*, what is the pH at 40 ¨¬C?

pH = _____

16. A solution is prepared by mixing 83.0 mL of 5.00 *M* HCl and 30.0 mL of 8.00 *M* HNO_3. Water is then added until the final volume is 1.00 L. Calculate $[H^+]$, $[OH^-]$, and the pH for this solution. (Where needed, type your answer using the format 8.050e-3 for 8.050 ¡¿ 10^{-3}.)

$[H^+]$ = _____*M*
$[OH^-]$ = _____*M*
pH = _____

17. Solutions of Acids. (Question 14.58)

Calculate the pH of a 0.39 *M* solution of iodic acid (HIO_3, K_a = 0.17).

pH = _____

18. Solutions of Acids. (Question 14.62)

Calculate the pH of a solution that contains 1.7 *M* HF and 1.7 *M* HOC_6H_5. Also calculate the concentration of $OC_6H_5^-$ in this solution at equilibrium.
(Where needed, type your answer using the format 8.050e-3 for 8.050 ¡¿ 10^{-3}.)

pH = _____
$[OC_6H_5^-]$ = _____ *M*

19. Solutions of Acids. (Question 14.70)

One mole of a weak acid was dissolved in 2.0 L of water. After the system had come to equilibrium, the concentration of HA was found to be 0.49 *M*. Calculate K_a for HA. (Type your answer using the format 8.050e-3 for 8.050 ¡¿ 10^{-3}.)

K_a = _____

20. Solutions of Bases. (Question 14.84)

For the reaction of hydrazine (N_2H_4) in water,

$H_2NNH_2(aq) + H_2O(l) \rightleftharpoons H_2NNH_3^+(aq) + OH^-(aq)$

K_b is 3.0 ¡¿ 10^{-6}. Calculate the concentrations of all species and the pH of a 3.0 *M* solution of hydrazine in water.

$[H_2NNH_2]$ = _____*M*
$[H_2NNH_3^+]$ = _____*M*
$[OH^-]$ = _____*M*
pH = _____