Your Name: _____

CEE 370 *Fall 2019*

Homework #1

1. A solution of sodium bicarbonate is prepared by adding 45.00 g of sodium bicarbonate to a 1.00 L volumetric flask and adding distilled water until it reaches the 1.00 L mark. What is the concentration of sodium bicarbonate in units of (a) milligrams per liter, (b) molarity, (c) normality, and (d) milligrams per liter as $CaCO_3$? Show your work on attached pages.

2. Balance the following 5 chemical equations (i.e., determine the value of the stoichiometric coeffcients, x, y and z in each case:
   a. $CaCl_2 + xNa_2CO_3 = yCaCO_3 + zNaCl$
   b. $C_6H_{12}O_6 + xO_2 = yCO_2 + zH_2O$
   c. $3NO_2 + xH_2O = yHNO_3 + zNO$
   d. $2C_4H_{10} + xO_2 = yCO_2 + zH_2O$
   e. $Al(OH)_3 = yAl^{3+} + zOH^-$

3. You've just prepared a solution by dissolving 20 mg sodium sulfide (Na_2S), and 30 mg potassium sulfate dihydrate ($K_2SO_4 \bullet 2H_2O$) in 1 Liter of distilled water.
   a) What is the molar concentration of sodium sulfide in this solution?
   b) What is the equivalent concentration of sodium sulfide in this solution?
   c) What is the molar concentration of potassium in this solution?
   d) What is the concentration of total sulfur in this solution in mg/L?
   e) What is the concentration of reduced sulfur (i.e., S(-II)) in this solution in mg/L?
   f) What is the theoretical TDS of this solution in mg/L?

4. If 200 mg of HCl is added to water to achieve a final volume of 1.00 L, what is the final pH?

5. What amount (mass, in mg) of NaOH (a strong base), would be required to neutralize the acid in Problem 4?

6. The concentration of a chemical degrades in water according to first-order kinetics. The degradation constant is 0.2 day^{-1}. If the initial concentration is 100.0 mg/L, (a) how many days are required for the concentration to reach 0.14 mg/L? Also (b) calculate the half-life ($t_{1/2}$) for this decay reaction.

7. Each mole of $CaF_2(s)$ dissolved yields 1 mole of Ca^{2+} and 2 moles of F^- (fluoride). The solubility product of calcium fluoride (CaF_2) is $3x10^{-11}$ at 25C. Could a fluoride concentration of 1.0 mg/L be obtained in water that contains 200 mg/L of calcium? Yes or no? Show your work.

Assigned: 9 Sept 19
Due: 20 Sept 19

Your Name: _____

Answer Page

Fill in the boxes with the correct answer.

You will only get credit for a problem if you: (1) fill in the box with the correct answer in the units indicated, (2) your answer is legible, and (3) you attach page(s) with calculations backing up your answer.

Problem #

1	a		mg/L
	b		M
	c		N
	d		mg/L as $CaCO_3$

2	a	1	$CaCl_2$		Na_2CO_3	=		$CaCO_3$		NaCl
	b	1	$C_6H_{12}O_6$		O_2	=		CO_2		H_2O
	c	3	NO_2		H_2O	=		HNO_3		NO
	d	2	C_4H_{10}		O_2	=		CO_2		H_2O
	e	1	$Al(OH)_3$			=		Al^{3+}		OH^-

3	a		mM
	b		meq/L
	c		mM
	d		mg/L
	e		mg/L
	f		mg/L

4		pH units

5		mg

6	a		days
	b		days

7	