Homework #1

Due: March 29, 2016 (Tue), in class

1. Select one from the environmental or public health outbreaks related to water quality that occurred recently (2000-present) in your own country. Briefly (in less than 3 paragraphs) describe the contaminants of concern, causes, effects, and solutions adopted if there were any. (20 points)

2. Suggest at least four different roles that dissolved organic matter plays in the biochemistry and transport of contaminants in natural waters. (20 points)

3. Determine the molarity and mole fraction of 43% ethanol in water (volume/volume basis). Assume that when ethanol is mixed with water, the total volume remains unchanged (for example, if 1.0 L ethanol and 1.0 L water is mixed, the total volume is 2.0 L). Use the following values:

   density of ethanol = 0.78 kg/L

   density of water = 1.00 kg/L

(10 points)

4. Determine the TS, TVS, TFS, TSS, TDS, VSS, FSS, VDS, and FDS of a water sample using the following data. All analyses are made using 50 mL of the water sample. (10 points)

Mass of residue in evaporating dish after evaporation at 105℃ = 36.0 mg

Mass of residue in evaporating dish after ignition at 500℃ = 34.0 mg

Mass of residue on filter paper after evaporation at 105℃ = 12.0 mg

Mass of residue on filter paper after ignition at 500℃ = 11.0 mg

5. Using the following data for water sample analysis, i) determine the acceptance of the analysis for sample 1 and ii) predict SO_4^{2-} concentration in sample 2 as mg/L based on electroneutrality.

(unit: mg/L)

Ions	Sample 1	Sample 2
Ca^{2+}	76.0	120.0
Mg^{2+}	26.8	75.0
Na^+	23.0	1.86
K^+	19.6	15.6
Cl^-	37.2	42.7
SO_4^{2-}	192.0	?
CO_3^{2-}	10.4	0.00
HCO_3^-	126.5	156.9

(15 points)

6. Determine the alkalinity, total hardness, and carbonate hardness (in mg/L as $CaCO_3$) for the two water samples. (15 points)

7. Estimate the pH of sample 1. Use pK_{a2} = 10.3 for carbonic acid. (10 points)