Problem 1

Strontium, Sr^{2+}, is a toxic heavy metal that may cause concern when present in water.

a) Determine whether Sr^{2+} will precipitate as $SrSO_4(s)$ if 10^{-4} mole/liter of Sr^{2+} and 10^{-4} mole/liter of SO_4^{2-} are originally present and that $pK_{sp} = 7.8$ for $SrSO_4(s)$.

b) How much Sr^{2+} will precipitate (moles/liter) if 1×10^{-3} *mole* H_2SO_4 is added per liter of solution?

c) How much SO_4^{2-} and Sr^{2+} remain after precipitation?

d) How much Na_2SO_4 would need to be added to the original water to ensure a strontium concentration below 1 mg/L?

Problem 2

For the water with the analysis given below:

$CO_2 = 8.8$ mg/l Alkalinity (HCO_3^-) = 135 mg/l, as $CaCO_3$

$Ca^{2+} = 40$ mg/l $SO_4^{2-} = 29.0$ mg/l

$Mg^{2+} = 14.7$ mg/l $Cl^- = 17.8$ mg/l

$Na^+ = 13.7$ mg/l

a) Draw the meq bar graph of the raw water

b) Determine the chemicals need in meq/l for excess lime-soda ash softening

Problem 3

Determine the amount of natural alkalinity needed for the treatment of a surface water with alum at a dosage of 30 mg/l. If the flowrate is 4000 m^3/d, estimate the amount of sludge produced assuming a specific gravity of 1.02 and a solids content of 4% for the wet sludge.