

Example question: Water Constituents

Following water quality was obtained for a drinking water sample. Answer the following.

Chemical species	Results
Chloride, Cl^-	8 mg/L
Sulfate, SO_4^{2-}	16 mg/L
Total Dissolved Solids (TDS)	110 mg/L
Bicarbonate, HCO_3^-	73 mg/L
Calcium, Ca^{2+}	15 mg/L
Magnesium, Mg^{2+}	5 mg/L
pH	9
Potassium, K^+	0.7 mg/L
Silica, SiO_2	7 mg/L
Sodium, Na^+	13 mg/L

- 1) Calculate the concentrations in mg/L of H^+ and OH^- in the water. How significant are these values compared to the values for the ions given above?
- 2) Calculate the concentrations of the ions listed in the table in milliequivalents per liter, and summarize the results in a table. Do the cations and anions appear to be in charge balance? Would including the H^+ and OH^- concentrations in the charge balance affect the results?
- 3) Calculate the ionic strength of the water. Is it safe to assume that the drinking water is a dilute solution? Determine based on an acceptable error of 5% for molarity = activity.
- 4) In the common method for measuring the total dissolved solids of a sample, drying of the sample by heating converts bicarbonate to carbon dioxide, water, and carbonate. Write a balanced equation for this reaction and employ the result to compute the TDS for the water sample. What could be the reasons for the difference between the calculated/measured TDS?