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Chem 205 Report
Impurities in Natural Water

Name: _

Date: 12-04-2013

Partner: _

• **Distillation**

1. Distillation of a solution containing a dissolved solid (CoCl₂)

Is CoCl₂ impurity present in the distillate? No pink color its not present
Explain from your observations.

2. Distillation of a solution containing a dissolved gas (NH₃)

Is NH₃ impurity present in the distillate? same odor NH₃ is present
Explain from your observations. a drop of phenolphthalein turns solution pink

• **Minerals in tap water (or other potable water supply)**

3. Calcium and magnesium hardness

Table 1. Titration of Tap Water with EDTA

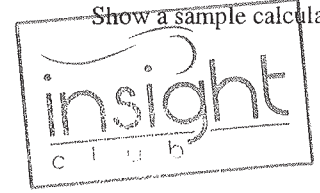
Trial	Upper buret reading (mL)	Lower buret reading (mL)	Volume of EDTA used (mL)
1	0,00 mL	32,00 mL	32,00 mL
2	0,00 mL	29,50 mL	29,5 mL
3	0,00 mL	31,9 mL	31,9 mL

$V_{\text{tap water aliquot}} = 100,00 \text{ mL}$

$V_{\text{EDTA average}} = 31,13 \text{ mL}$

Hardness of tap water (moles/L) = $\frac{31,13 \times 0,01}{100} = 3,11 \times 10^{-3} \text{ mol/L}$

Show a sample calculation at the back of this page.



Handwritten notes:
DTC-ker
vs
tpo
0.965
-ker

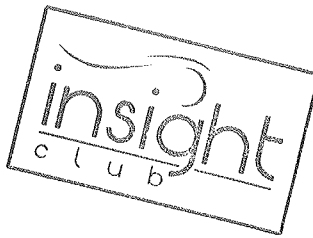


Table 2. Titration of Sea Water with EDTA

Trial	Upper buret reading (mL)	Lower buret reading (mL)	Volume of EDTA used (mL)
1	0,00 ml	31,20 ml	31,20 ml
2	0,00 ml	32,00 ml	32,00 ml
3	0,00 ml	32,00 ml	32,00 ml

$V_{\text{sea water aliquot}} = 5,00 \text{ ml}$

$V_{\text{EDTA average}} = 31,73 \text{ ml}$

Hardness of sea water (moles/L) = $\frac{31,73 \times 0,01}{5} = 6,34 \times 10^{-2} \text{ mol/L}$

4. Chloride ion test

Evaporated water cloudiness present Tap water turbidity presence of Cl^-

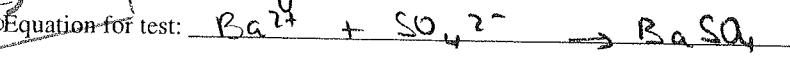
Distillate A1 no change Distillate A2 slight turbidity few amount of Cl^-



5. Sulfate ion test

Evaporated water cloudiness SO_4^{2-} present Tap water no change no SO_4^{2-}

Distillate A1 no change Distillate A2 cloudiness presence of SO_4^{2-}



6. Phosphate ion test

Does tap water produce a blue color? yes

Does sea water produce a blue color? yes

How does each compare to the 5.0 mg/L standard? darker blue than tap water

7. Indication of carbonate

Is the CO_3^{2-} ion present in the residue? yes

How do you know? because bubbles formed upon the rxn of HCl with residue.

Write a balanced equation for the reaction of HCl with any MgCO_3 that may have been present.



• Water softening using ion-exchange resins

8. Household type

Initial buret reading 0 ml

Final buret reading 3,5 ml

Volume of EDTA used 3,5 ml \sim 0,00 ml $\left(\frac{1}{2}\right)$ It's softened
no hardness

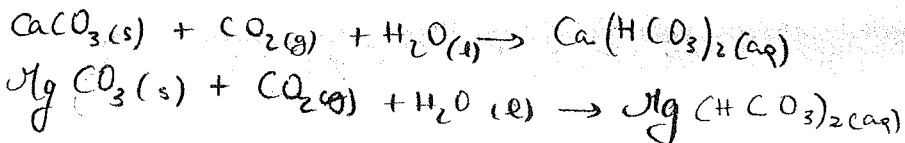
Hardness of softened water $C_1V_1 = C_2V_2 \Rightarrow \frac{0,01 \times 3,5}{5} = 7 \times 10^{-3}$ mol/L

Is chloride ion present? yes Is sulfate ion present? yes

Is phosphate ion present? yes

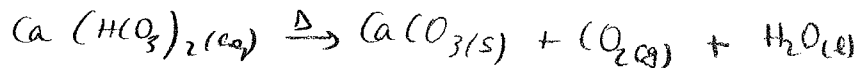
Questions

1. What reaction between soil, water and limestone rock accounts for the relatively large amounts of $\text{Ca}(\text{HCO}_3)_2$ and $\text{Mg}(\text{HCO}_3)_2$ found in ground water. Where does the necessary CO_2 come from? CO_2



CO_2 came from the dissolved gas in the atmosphere.

2. "Boiler scale" forms in kettles, consisting mainly of calcium carbonate. Write a chemical equation for the corresponding reaction. Explain why the scale forms much more heavily at high temperature (like the boiling point of water)



At very high temperature, solubility of CO_2 gas decreases in the product solution shifting the equilibrium towards the product side, thus more CaCO_3 solid is going to be formed so the scale forms much more heavily