V SEMESTER

PRACTICAL MANUAL FOR THIRD B.Sc. CHEMISTRY

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PRACTICAL – 6 (ENVIRONMENTAL CHEMISTRY)

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DETERMINATION OF SODIUM CARBONATE AND SODIUM BI CARBONATE IN A WATER SAMPLES BY DOUBLE TITRATION METHOD

AIM

Estimate the amount of sodium carbonate and sodium bi carbonate in a given 100 ml problem solution.

PRINCIPLE:

$$Na_2CO_3 + HCl \longrightarrow NaHCO_3 + NaCl$$

$$NaHCO_3 + HCl \longrightarrow NaCl + H_2O + CO_2\uparrow$$

PROCEDURE

The burette is filled with the given HCl. The given problem solution is diluted with distilled water and made up to the mark and shake well thoroughly.

Take 20 ml of problem solution into a conical flask and add 100 ml ice cold water and one or two drops of phenolphthalein indicator. The solution in the conical flask changes into pale pink colour. The acid is rundown carefully from the burette into the conical flask with constant shaking. The titration is continued till the solution in the conical flask changes to colourless. This is the first end point. Burette reading is noted. Then two drops of methyl orange indicator is added to the colourless solution. A light yellow colour solution is formed. Titration is continued till the light yellow colour solution in the conical flask changes to pale pink colour. This is the end point. The experiment is repeated until two consecutive readings are obtained.

REPORT

The amount of sodium carbonate present in the given problem solution= g

The amount of sodium bi carbonate present in the given problem solution= g

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CALCULATIONS

S.NO	VOLUME OF MIXTURE SOLUTION	BURETTE READINGS			2X	Y – 2X
		I	X	Y		
1	20 mL	0				
2	20 mL	0				

Volume of HCl required for the half neutralisation of Na_2CO_3 = X mL

Volume of HCl required for the complete neutralisation of Na_2CO_3 = 2X mL

Volume of HCl required for complete neutralisation of mixture solution =Y mL

Volume of HCl required for the neutralisation of $NaHCO_3$ present in the given problem solution =Y – 2X mL

VALUES OF $NaHCO_3$	VALUES OF Na_2CO_3
Values of HCl values of $NaHCO_3$	Values of HCl values of Na_2CO_3
M_2 = M_3=	M_2 = M_4 =
V_2 = V_3 =	V_2 = V_4 =
n_2 = n_3 =	n_2= n_4=
Molarity of $NaHCO_3$ in mixture $M_3= \frac{M_2V_2n_3}{V_3n_2}$ m/L	Molarity of Na_2CO_3 in mixture $M_4= \frac{M_2V_2n_4}{V_4n_2}$ m/L
Amount of $NaHCO_3$ in 100 mL solution $= \frac{M_3 \times GMWt \times 100}{1000}$ grams	Amount of Na_2CO_3 in 100 mL solution $= \frac{M_4 \times GMWt \times 100}{1000}$ grams

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DETERMINATION OF HARDNESS OF WATER USING EDTA

TOTAL HARDNESS

Reagents: EDTA solution, EBT indicator, Ammonia buffer

Procedure for total hardness

Burette is rinsed with the given EDTA solution and filled with the same. 100 mL of the water sample is taken into a conical flask. To this 1 mL ammonia buffer solution and 5 or 6 drops of Erio chrome Black T (EBT)indicator is added. The solution in the conical flask changes to wine red colour. This solution is titrated with EDTA solution from the burette. The titration is continued till the solution in the conical flask changes into wine red to blue colour. This is the end point. The experiment is repeated until two consecutive readings are obtained.

Procedure for permanent hardness

Burette is rinsed with the given EDTA solution and filled with the same. 100 mL of the water sample is taken into a conical flask and pit it on a water bath for about 15 minutes. After 15 minutes of the time the sample is cool. During the boiling of water some volume is lost so add same amount of distilled water is added to the cooled sample. To this 1 mL ammonia buffer solution and 5 or 6 drops of Erio chrome Black T (EBT)indicator is added. The solution in the conical flask changes to wine red colour. This solution is titrated with EDTA solution from the burette. The titration is continued till the solution in the conical flask changes into wine red to blue colour. This is the end point. The experiment is repeated until two consecutive readings are obtained.

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CALCULATIONS

Tabular form of total hardness

S.No	Volume of water sample	Burette readings		Volume of EDTA
		Initial	Final	
1	100 mL			
2	100 mL			

Total hardness = $\frac{\text{mL of EDTA used (unboiled)}}{\text{mL of water sample is used}}$ x 10^3

= $\frac{\text{mL of EDTA used (unboiled)}}{\text{mL of water sample is used}}$ x 1000 mg/L

= ------ mg/L

Tabular form of permanent hardness

S.No	Volume of water sample	Burette readings		Volume of EDTA
		Initial	Final	
1	100 mL			
2	100 mL			

Permanent hardness = $\frac{\text{mL of EDTA used (boiled)}}{\text{mL of water sample is used}}$ x 1000 mg/L

= ----- mg/L

Temporary hardness = Total hardness – Permanent hardness

= ----- mg/L

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- Determination of Chlorides in water samples by Mohr's method.
- Determination of pH, turbidity and totalsolids in water sample.
- Determination of Ca^{+2} and Mg^{+2} in soil sample by flame photometry.
- Determination of PH in soil samples using pH metry.

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