$$N1*V1 = N2*V2$$
$$(NaOH) \quad (H_2SO_4)$$

$$\text{Capacity} = \frac{V\ of\ \text{effluent}\ (ml) * N\ (H2SO4)}{weight\ of\ resin\ in\ (g)}$$

That means it is possible to calculate the number of mg $CaCO_3$ from the known solution of NaOH used in titration assume the volume of 0.02×NaOH that equal the first 50ml =10ml

Then the number of mmol. NaOH the equivalent to the H_2CO_3 = 10 X 0.02 = 0.2 And due to the Number of moles or mmol. of H_2CO_3 = 1/2 mmol. or mmol. of NaOH. The number of mmoles H_2CO_3 =0.2/2=0.1

And because the number of mmol. $CaCO_3$= number of mmol. H_2CO_3 = 0.1 That means 50ml from tap water cation 0.1 mmol $CaCO_3$.

Weight $CaCO_3$ = number of mmol of $CaCO_3$ multiplied by its molecular weight =0.1×100=10mg, in 50ml.

or $\frac{1000\ X\ 10}{50}$ = 200 mg/L $CaCO_3$

Repeat titration with second one and make the same calculation and make compares

Exp. (4): Determination the capacity of a cation exchange resin:

The total ion-exchange capacity of a resin is dependent upon the total number of ion active group per unit weight of material, and the greater, the number of ions, the greater will be the capacity. The total ion-exchange capacity is usually expressed as ***milliequivalents per gram of exchanger*** (meq. per g.), and represents the efficiency of resin.

The exchange capacity of a cation in the resin may be measured in the laboratory by determining the number of milli gram equivalent of sodium ion which are absorbed by 1g of the dry resin in the hydrogen form.

Procedure & Materials:

1- Weight out accurately about 2.5g of the air dried resin dry hydrogen form by placing it an evaporating dish cover with watch glass and leave in warm place (25- 35C°) for (2-3 days).
2- Fill a small column 15cm×1cm with D.W.
3- Transfer the resin through a dry funnel into the column.
4- Fill a 25ml separatory funnel with 0.25N Na_2SO_4.
5- Allow the solution 0.25N Na_2SO_4 to drip into the column at a rate of about 2ml per minute.
6- Collect all the effluent in a 500ml conical flask.
7- Titrate the effluent solution with 0.1N NaOH by using PhPh. Indicator.

$$2R^-H^+_{(s)} + Na_2SO_{4(l)} \longrightarrow 2R^-Na^+_{(s)} + H_2SO_{4(l)}$$

Calculation:

The capacity of the resin in milli-equivalents per gram is given by a v/w. where N1 is the normality of the NaOH solution V1 is the volume in the ml and w is the weight(g) of the resin.