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Expt: 7

ACID STRENGTH IN A CITRIC ACID

Aim: To determine the acid strength in a citric acid solution by using pH meter.

Citrus fruits contain fairly amount of citric acid. It is often a good source of Vitamin C (Ascorbic acid) too. A simple acid-base titration with a strong base can be performed to determine its acid strength. However, some citrus fruits are coloured and in such a case conventional titration using indicator – dyes are not possible. Various instruments based like conductivity meter, pH meter, or spectrophotometer methods then become essential.

The present experiment is aimed, at introducing pH instrument for carrying out acid-base titrations.

This experiment involves the use of pH meter for titration of an acid with a strong base of known strength. A pH meter is a potentiometer, which uses a glass electrode sensitive to H^+ ion concentration. If a strong acid is titrated against a strong base (in the burette), the pH of the solution varies as a sigmoidal curve with a very sharp increase of pH at the endpoint.

Materials Required:

Glassware & Instruments

1. 100mL Beaker – 2No.

2. 50mL Burette – 1No.

3. Glass rod – 1No.

4. 100mL Standard Flask – 2No.

5. pH meter

Chemicals:

1. Buffer Solution pH – 4/7/9.2/10 (dissolve the pH tablet in 100 ml dist. water)

2. Citric acid solution (Equivalent weight of citric acid (monohydrate) is 70.05, for 0.1N take 0.7 gm citric acid (monohydrate) into 100 ml dist. water)

3. 0.1 N NaOH (0.4 gm of NaOH into 100 ml dist. water)

Procedure:

Determination of strength of the citric acid solution:

Switch on the pH meter and allow it to stabilize for 10 minutes. Standardise the pH meter with a buffer solution pH 7. The calibration of the electrode by different buffer solutions are required, otherwise the instrument may not show the proper reading. Wash the glass electrode by distilled water and immerse it into unknown acid solution and note the pH. Add small aliquots of 0.1 N sodium hydroxide solution from a burette, stir the solution well, and note the pH and the burette reading. Continue further till there is almost no change in pH.

Plot 'pH' vs. 'volume of base'. The end point of the sigmoid curve, which is expected at pH 7, is the end point. Calculate the strength of the Citric Acid solution.

Experimental Readings:

Strength of NaOH solution = 0.1 N

Volume of Citric Acid solution taken = 20 ml

S.No.	Volume of NaOH(ml)	pH	S.No.	Volume of NaOH(ml)	pH
1.	0.0		22.	21.0	
2.	1.0		23.	22.0	
3.	2.0		24.	23.0	
4.	3.0		25.	24.0	
5.	4.0		26.	25.0	
6.	5.0		27.	26.0	
7.	6.0		28.	27.0	
8.	7.0		29.	28.0	
9.	8.0		30.	29.0	
10.	9.0		31.	30.0	

11.	10.0		32.	31.0	
12.	11.0		33.	32.0	
13.	12.0		34.	33.0	
14.	13.0		35.	34.0	
15.	14.0		36.	35.0	
16.	15.0		37.	36.0	
17.	16.0		38.	37.0	
18.	17.0		39.	38.0	
19.	18.0		40.	39.0	
20.	19.0		41.	40.0	
21.	20.0				

Continue titration until pH of the solution does not show much change (i.e. about 10 readings after the end point). Plot pH V_S Volume of base added.

End point = ……. ml of NaOH added.

$N_1V_1 = N_2V_2$

Strength of Citric Acid Solution = ……. N