class - B.Sc. Part II (subsidiary)
Subject - chemistry
Paper - gr. c
Topic - citric acid
Name - Dr. Rashmi Sinha
Deptt. of chemistry
H. D. Jain college.

citric acid (2-Hydroxy propane-1,2,3-tricarboxylic acid)

occurance :— It occurs mainly in unripe fruits of citrus group (limes, galgals and oranges). Lemon juice contains 7%- 10% citric acid.

Preparation :-

(1) **From lemon juice :—** The juice is extracted from the fruit and boiled to coagulate proteins and albuminous matter. The resulting clear solution is neutralized with calcium carbonate. citric acid ppt out as calcium citrate, which is filtered off and then decomposed with calculated amount of H_2SO_4. calcium sulphate so formed, is filtered out and the filtrate is concentrated. citric acid crystallises out as monohydrate.

Lemon juice $\xrightarrow[\text{coagulate protein}]{\text{Boiled to}}$ filtrate (sol^n) $\xrightarrow[\Delta]{CaCO_3}$

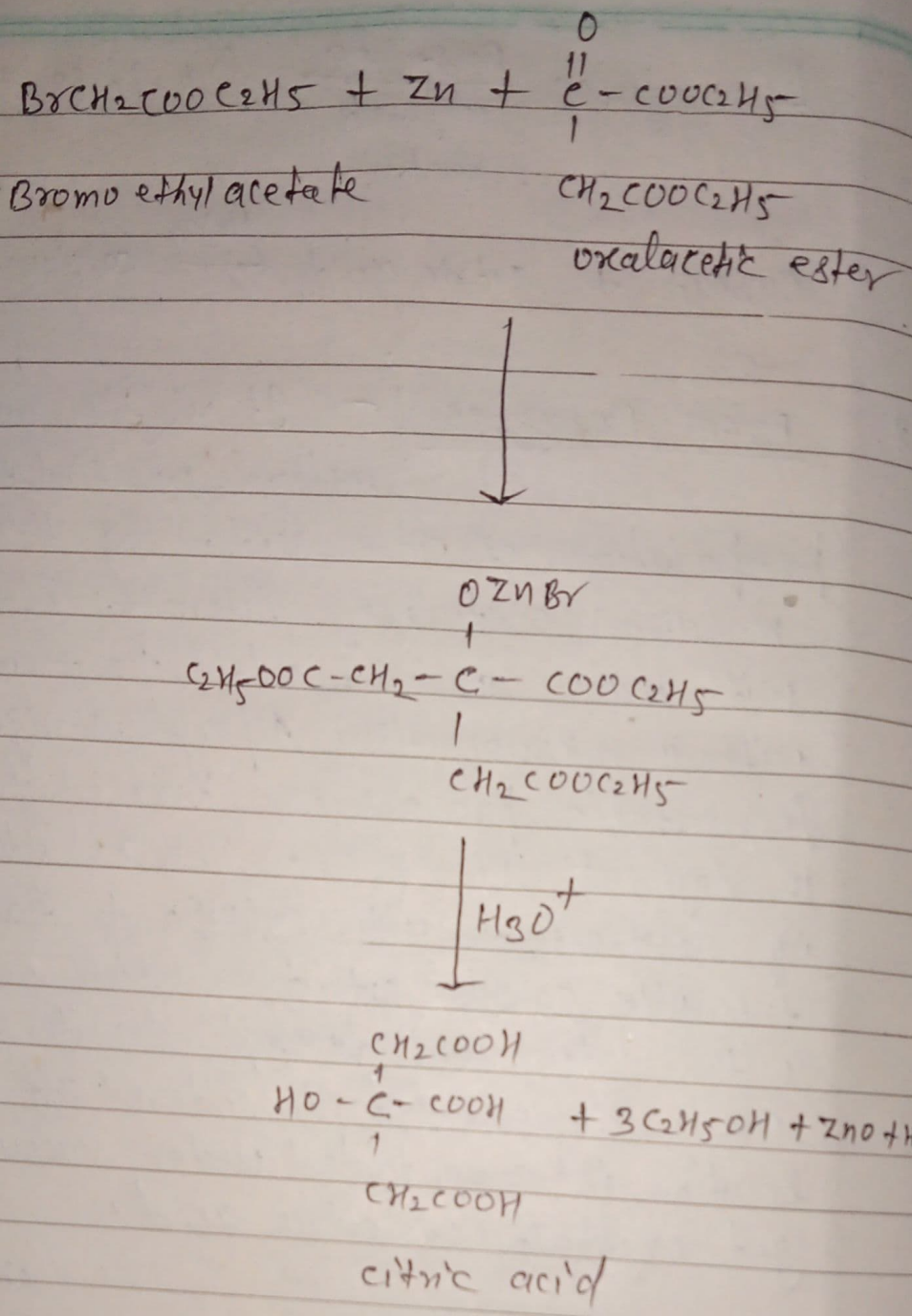
$CaSO_4$ + citric acid $\xleftarrow{H_2SO_4}$ calcium citrate

(2) <u>From Molasses</u> :- It is the most recent method of industrial preparation of citric acid. In this method molasses containing sucrose is diluted with water and subjected to fermentation with a microorganism Aspergillus niger. The fermentation process is carried for 7 to 10 days at 26-28°C. The resulting sol^n is neutralized with $Ca(OH)_2$ to form insoluble calcium citrate. which is washed with water and decomposed with dil. H_2SO_4. The calcium sulfate is filtered off and the solution is concentrated under vaccum to get crystals of citric acid.

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow[\text{A. niger (Fermentation)}]{\text{air}} HO-C(CH_2COOH)_2-COOH$$

citric acid

(3) <u>synthetic method</u> :- Lawrence (in 1897) prepared citric acid using Reformatsky reaction with bromomethyl acetate and oxalacetic ester.



(4) <u>From Petroleum</u> :- Recently it has been shown that certain strains of candida (a yeast) can produce citric acid from n-alkanes derived from petroleum. This method when developed will revolutionize the citric acid industry.