class - B.Sc. Part II (Subsidiary)
Subject - chemistry
Paper - gr. c
Topic - constitution of lactic - acid

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## constitution of lactic acid :-

(1) From analytical data and molecular weight determination the molecular formula of lactic acid has been found to be $C_3H_6O_3$

(2) It contains one -OH gr. because it forms
a. mono acetyl derivative with acetyl chloride

$$C_3H_6O_3 + CH_3COCl \longrightarrow C_3H_5O_2(O\text{-}CO\text{-}CH_3) + HCl$$

b. when reduced with hot and conc. HI it forms propionic acid

$$C_3H_6O_3 + 2HI \longrightarrow C_3H_6O_2 + I_2 + H_2O$$

Thus, it may be represented as $C_3H_5O_2(OH)$

(3) It contains one -COOH gr. because it forms
a. one type of salt with NaOH or KOH

$$C_3H_5O_2(OH) + NaOH \longrightarrow C_3H_4O_2(OH)Na + H_2O$$

b. one type of ester with alcohol.

$$C_3H_5O_2(OH) + R-OH \longrightarrow C_3H_4O(OH)OR + H_2O$$

Thus it may be represented as $C_2H_4(COOH)(OH)$.

(iv) It is an α-hydroxy acid because it forms carbon monooxide which burn with blue flame, when treated with conc. $H_2SO_4$.

$$C_2H_4(COOH)(OH) \xrightarrow{H_2SO_4} CH_3CHO + CO\uparrow + H_2O$$

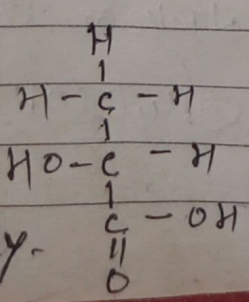
The presence of -OH and -COOH gr. is also confermed by its reaction with $PCl_5$ or $SOCl_2$ in which chloro lactyl chloride is obtained

$$C_2H_4(COOH)(OH) \xrightarrow{PCl_5 \text{ or } SOCl_2} C_2H_4(COCl)(Cl)$$

(v) It is a straight chain compound of three carbon atoms, because on reduction with conc. HI, it forms propionic acid which is a straight chain compⁿ of three carbon atoms.

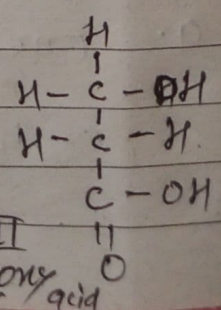
$$\text{Lactic acid} \xrightarrow{HI} H_3C-CH_2-COOH$$

(vi) Keeping in view the tetra valency of carbon atoms, the possible structure of lactic acid is



I

α-hydroxy-acid



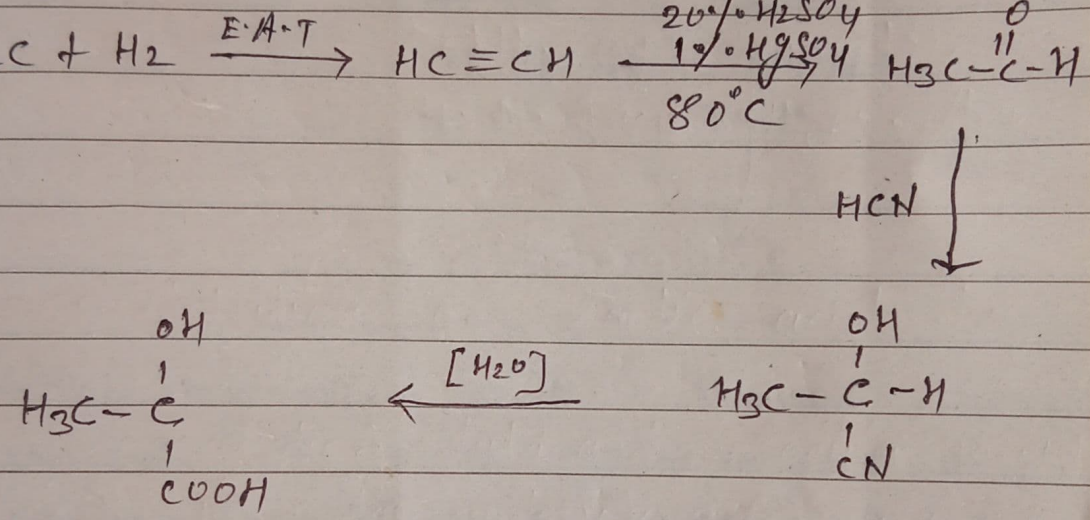
II

β-hydroxy acid

(vii) Structure I is confermed as the stru. of lactic acid because

a. It forms carbon mono oxide when treated with conc. $H_2SO_4$

b. Its synthesis from carbon and hydrogen




Identical with lactic acid.