Hydrolysis of Acetyl Salicylic Acid Solution in Sorenson Phosphate Buffer at pH 8

LAB 4

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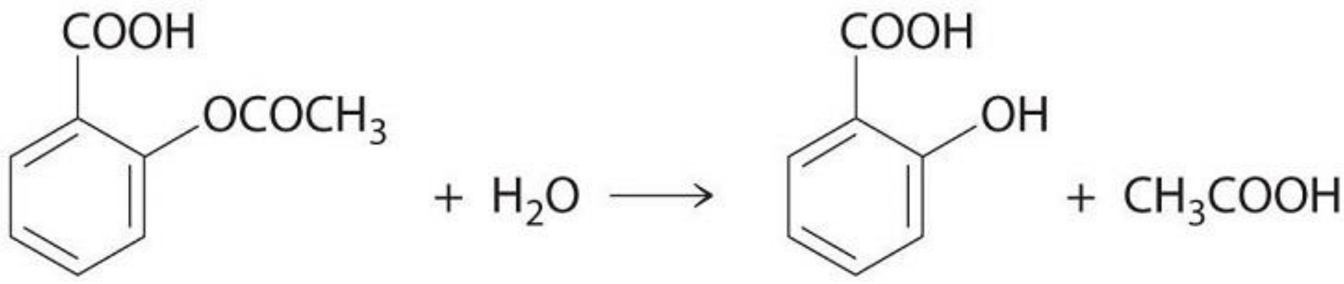
Introduction

Aspirin is a weak acid .it is soluble at 20 C°in 300 parts of water .

~~It is unstable in aqueous solutions degrading to salicylic acid and acetic acid~~



acetylsalicylic acid + H_2O → salicylic acid + CH_3COOH acetic acid

Aspirin also degrades in solid dosage forms when exposed to moisture and therefore , should be stored in tightly closed containers and kept in a dry environment .

Aim of Experiment

To study the effect of temperature on the hydrolysis of aspirin (S.P.B), and to calculate the shelf life of aspirin .

Shelf life of any drug :it is the time required for the drug to lose 10% of its effectiveness

Procedure :

1. Dissolve 0.695 g of aspirin in 250 ml of phosphate buffer (use a volumetric flask)

2. place 200 ml of this solution in an erlenmeyer flask , then keep the flask in a water bath for (30 min) at required temperature. the temperature that will be used are(40, 60, 80 °C)

Withdraw (1 ml) sample at the end of 30 mins , then continue withdrawing (1 ml) sample at 15 min interval for 90 min.

Add to each sample , 5 ml color developing reagent and read the absorbance at 530 nm

Tabulate your data.

Notes:

1- absorbance should increase with time

2- concentration of S.A at zero time is zero because aspirin not hydrolyzed yet , while the concentration of aspirin at zero time $C0=$ initial concentration of aspirin 2.78 mg /ml

$C0=0.695/250 \times 1000= 2.78$ mg/ml

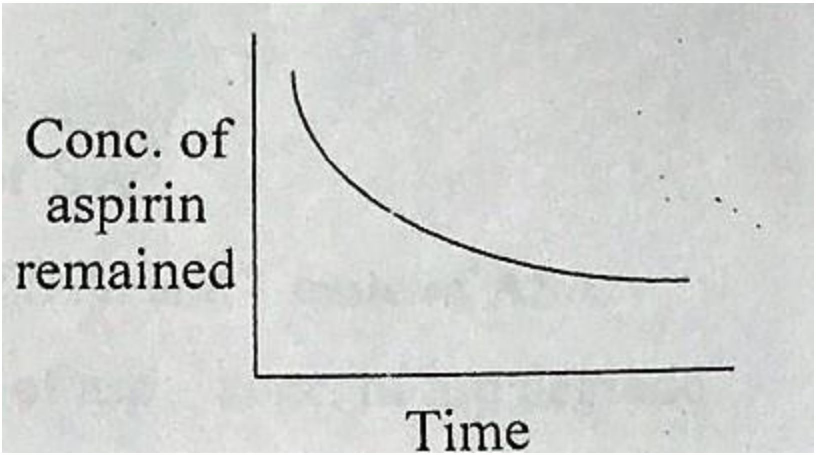
3- S .A give violet color with color developing reagent

4- rate of aspirin hydrolysis follows **first order reaction**

$\frac{dc}{dt} \propto C$

$-\frac{dc}{dt} \propto C$ (since conc. Of aspirin decrease with time as hydrolyzed)

$-\frac{dc}{dt} = KC$



$$\int_{c0}^{ct}\frac{dc}{c} = -k\int_{0}^{t} dt$$

-(ln Ct- ln Co) =kt(t-0)

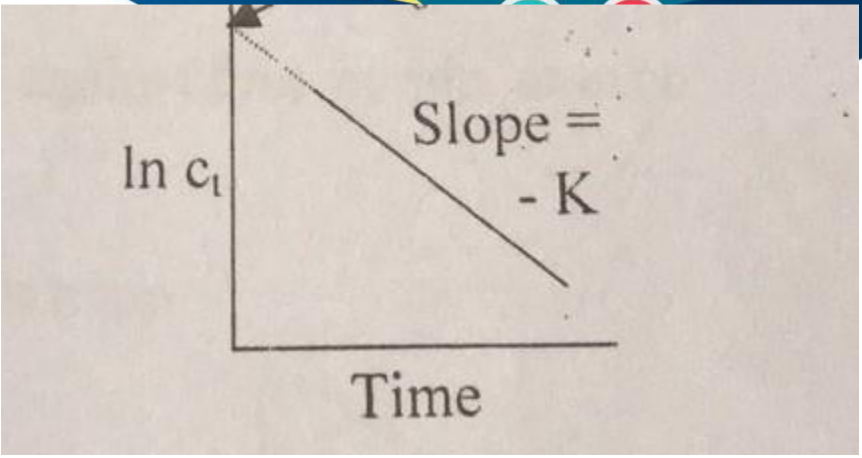
Ln Ct –ln Co = - kt

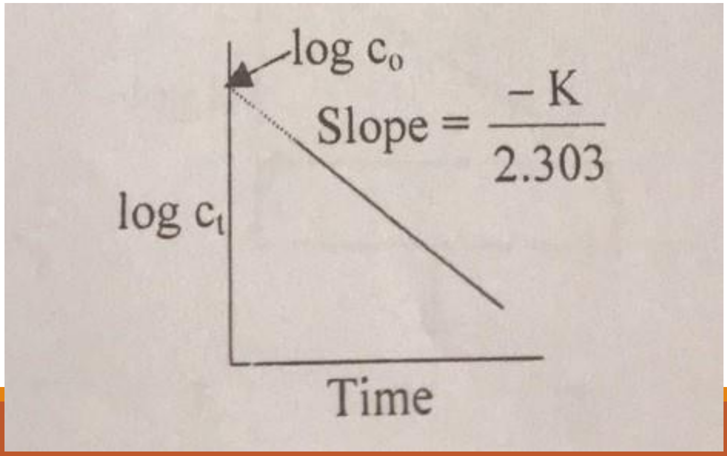
Ln Ct = ln Co –kt

Since ln = log × 2.303

Log Ct *2.303=log Co* 2.303-kt

Log Ct = log Co –kt/2.303





5- Sorenson phosphate buffer (pH 8)

Consist of two solutions

A-1/15 M Monopotasium phosphate KH_2PO_4

B- 1/15 M Disodium phosphate $Na_2HPO_4.2H_2O$

Time	Absorbance	Conc. Of S.A	Conc. Of aspirin hydrolyzed	Conc.of aspirin remained
0		Y= c+bx	*180/138	2.7- C_h
30				
45				
60				

7- use the calibration curve of S .A (exp. 1) to find the conc. Of S .A

Y= C+ bx

Ab= intercept + slope × conc.

e.g. 0.65= 0.016+1.83× conc.   Conc.= 0.35 mg /ml of S.A

Conc. Of ASP. Degrade = 0.35 ×180M. Wt of Asp/138 M.Wt of S.A

Since each mole of aspirin give 1 mole of S.A and 1 mole of A.A.

Conc. Of remaining aspirin = Initial conc. Of ASP – conc. of ASP degrade

2.78- 0.46 = 2.32 mg /ml

Take the log or ln conc. Remaining and plot against time in min. at each temp.

8- from the plots find the slops then K at each temp.

9- take log K and plot $1/T$

(draw Arrhenius plot) to find K at 25 °C.

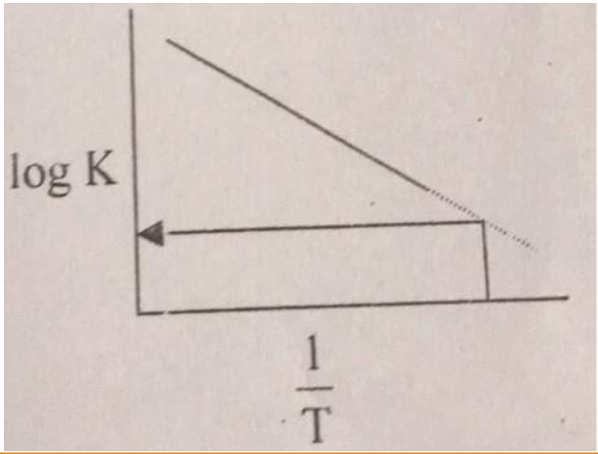
Arrhenious equation :

Log K= log A - $(Ea)/(2.303\ R)$ *$1/T$

Where A= frequency factor ,Ea = energy of activation ,T= absolute temp.

R= gas constant .

t10%= 0.105/ $K_{25°C}$



THANK YOU