

2020

## CHEMISTRY — HONOURS — PRACTICAL

Paper : CC-5P

(Physical Chemistry)

Full Marks : 30

*The figures in the margin indicate full marks.**All calculations can be done using calculator.*

1. Determine the rate constant of saponification of Methyl Acetate conductometrically

(a) Write down the theory using the following points :

(i) Conductance, the principle of measurement of the conductance of a solution.

(ii) Saponification reaction, its order, rate constant and its unit.

(iii) Derivation of the working formula :

 $(C_0 - C_t)/(C_t - C_\infty) = akt$  where terms have their usual meaning.

(iv) The Kinetic Run was carried out by mixing 25 ml of (M/60) Methyl Acetate and 25 ml of (M/60) NaOH

- Give the method of preparation of exact 100 ml of (M/60) NaOH solution.

- Give the method of preparation (including all calculations) of exact 100 ml of (M/60) Methyl Acetate solution starting from adding 1 ml Methyl Acetate of density  $0.932 - (t-20) \times 1.25 \times 10^{-4}$  gm/ml. (Assume  $t = 30^\circ\text{C}$  and  $\text{MW} = 74$ ) into a 100 ml volumetric flask and makeup the volume up to the mark.

- Explain the variation of conductance of the reaction mixture with time.

(1+3)+(1+1+1)+3+(1+2+2)

(b) Determine the rate constant of the reaction using the following Conductance vs Time data (The reaction mixture is prepared by adding 25 ml (M/60) Methyl Acetate and 25 ml of (M/60) NaOH.)

Given :  $C_0 = 1.90$  mS,  $C_\infty = 0.81$  mS

Time (min)	1	2	3	4	5	6	7	8	9
Conductance (mS)	1.84	1.76	1.69	1.62	1.55	1.48	1.42	1.37	1.33

Using the following least square equation for slope calculate the rate constant of the reaction :

$$\text{Slope (m)} = \left( \sum_i (x_i - x_{\text{avg}}) * (y_i - y_{\text{avg}}) \right) / \left( \sum_i (x_i - x_{\text{avg}})^2 \right)$$

(Consider 10 data points including (0, 0) point to calculate the slope.)

 $x_{\text{avg}}$  is the average of 10  $x$ -values (time) $y_{\text{avg}}$  is the average of 10  $y$ -values ( $(C_0 - C_t)/(C_t - C_\infty)$ )