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, it's order, rate constant and it's 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) *1.25* 10^{-4} gm/ml). (Assume t = 30°C and 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 :

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

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

x_{avg} is the average of 10 x-values (time)

y_{avg} is the average of 10 y-values $((C_0 - C_t)/(C_t - C_\infty))$ 15
