

4. a) Show that the pH of an aqueous solution of a salt of weak acid and weak base is independent of its concentration.
- b) What is the effect of addition of 0.25 gm mole of  $\text{NH}_4\text{Cl}$  to a litre of 0.1 (M)  $\text{NH}_3(\text{aq})$  solution on the degree of dissociation of the base.

$$K_{\text{NH}_3(\text{aq.})} = 1.8 \times 10^{-5}$$

- c) Find out the pH of a 0.02 (N) solution of phenylacetic acid at  $25^\circ\text{C}$ . ( $K_a = 4.8 \times 10^{-5}$ ). 4+2+2

## FIRST B. SC. EXAMINATION, 2017

( 2nd Semester )

CHEMISTRY ( SUBSIDIARY )

PAPER - IVS

Time : Two hours

Full Marks : 50

Use a separate answerscript for each group.

### GROUP - A

1. a) The reaction,  $A \rightarrow \text{products}$ , is “1/2” order with respect to A. Deduce the integrated rate law and find the expression of half-life period. Will such reaction go to completion ? 3+1+1
- b) On the top of a certain mountain the atmospheric pressure is 0.8 atm and pure water boils at 368 K. A climber finds that it takes 4 hours to boil an egg against 4 minutes at 373 K at sea level. Find the activation energy for the reaction that occurs when egg is boiled. Assume the frequency factor to be independent of temperature. 3
- c) Rate constant of a reaction becomes double when pH is changed from 5 to 4.7. Show that it is an example of specific hydrogen ion catalysis. 2
- d) Write down Michaelis Menten equation for enzyme catalysis. How one can obtain the Michaelis constant ( $K_M$ ) from a plot of  $r$  vs  $[S]$  ? The terms have their usual significance. 1+3

[ Turn over

[ 2 ]

- e) Draw (i) rate of reaction and (ii) concentration of reactant as a function of time for a zero order reaction. 3

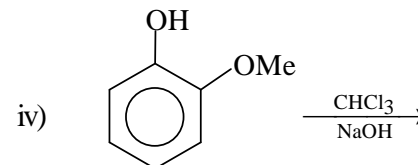
or

Describe any one method for the determination of order of a reaction.

**GROUP - B**

2. a) Discuss how ethyl alcohol responds to iodoform test. Give mechanism of the salient steps. 3
- b) Mention the reagent(s) involved for the following reactions : 3
- i) 
$$\text{CH}_3 - \underset{\text{O}}{\parallel} \text{C} - \text{CH}_2\text{CO}_2\text{Et} \rightarrow \text{CH}_3\underset{\text{OH}}{\text{CH}}\text{CH}_2\text{CO}_2\text{Et}$$
- ii)  $\text{PhCOCH}_3 \rightarrow \text{PhCOCHO}$
- iii)  $\text{PhCN} \rightarrow \text{PhCHO}$
- c) Predict the product(s) of the following reactions : 4
- i) 
$$\text{PhCHO} \xrightarrow[\text{aq. EtOH}]{\text{KCN}}$$
- ii) 
$$\text{PhCHO} + \text{PhCOCH}_3 \xrightarrow[\text{aqEtOH}]{\text{NaOH}}$$
- iii) 
$$\text{CH}_3\text{CH}_2\text{OH} \xrightarrow[\text{ii) CS}_2, \Delta; \text{ (iii) CH}_3\text{I}]{\text{i) NaOH}}$$

[ 3 ]



- d) Carry out the following transformations : 2×2
- i) 
$$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH} \rightarrow \text{CH}_3\underset{\text{OH}}{\text{CH}}\text{CH}_3$$
- ii) 
$$\text{PhCOCH}_3 \rightarrow \text{Ph}\underset{\text{OH}}{\text{CH}}\text{CO}_2\text{H}$$
- e) Write short notes on : 1½×2
- i) Rosenmund's reduction ;
- ii) Perkin reaction

**GROUP - C**

3. What is meant by buffer solution ? Discuss the mechanism of buffer action. Define buffer capacity. Prove that mixture of a weak acid and its corresponding salt in equal concentration has the maximum buffer capacity. 1+3+1+3

[ Turn over