

## **Daily Tutorial Sheet 2**

## **JEE Advanced (Archive)**

16. The given set of reactions can be represented as below:

Aq. NaOH – 
$$\xrightarrow{\text{Gas B}}$$
 Sod. salt of acid A  $\xrightarrow{\text{(i) NaOH(heat)}}$  Dibasic acid, C pressure

Calculation of molecular formula of C

% of 
$$H = \frac{2}{18} \times \frac{0.08}{0.40} \times 100 = 2.22\%$$
; % of  $C = \frac{12}{44} \times \frac{0.39}{0.40} \times 100 = 27.30\%$ 

By usual method, empirical formula of acid  $C = CHO_{c}$ 

Eq. wt. of acid 
$$C = \left(\frac{1.0}{0.71} \times 108\right) - 107 = 45$$

Mol wt. of acid  $C = 45 \times 2 = 90$ 

$$\therefore$$
 Mol. formula of  $C = C_2H_2O_4$ 

Since it is dicarboxylic acid, it must have two -COOH groups.

COOH

Hence C is

COOH

Oxalic acid

Going back, compound C must be produced from sodium oxalate which in turn is produced from sodium formate. Hence A is formic acid and B is CO. Thus the complete series of reactions can be written as below.

$$2 \text{NaOH (aq.)} \xrightarrow{2 \text{CO(B)}} + \xrightarrow{\text{NaOH}} | \begin{array}{c} \text{COONa} & \text{COOH} \\ \hline \text{NaOH} & \text{heat} \\ \text{HCOONa} & \text{COONa} \\ \end{array} \xrightarrow{\text{H}_2 \text{SO}_4} | \\ \text{COOH}$$

**18.(F)** Carboxylic acid exist in dimeric form due to hydrogen bonding.

$$R-C$$
 $O$ 
 $H$ 
 $C-R$ 

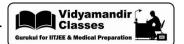
19. Electron withdrawing inductive effect increases acid strength while electron donating inductive effect

$$\begin{array}{c|c} H_3C-CH-COOH < CH_3CH_2COOH < CH_3COOH < CH_2-CH_2COOH < CH_2-COOH \\ & | & | & | \\ CH_3 & Cl & Cl \\ \end{array}$$

$$\begin{array}{ccc} \textbf{20.} & & C_6H_5COOH \xrightarrow{PCl_5} & C_6H_5COCl \xrightarrow{NH_3} & C_6H_5CONH_2 \xrightarrow{P_2O_5} & C_6H_5CN \xrightarrow{H_2/Ni} & C_6H_5CH_2NH_2 \\ & & & & & & & & & & & & & & & & \\ & & & & & & & & & & & & & \\ & & & & & & & & & & & & \\ & & & & & & & & & & & & \\ & & & & & & & & & & & & \\ & & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & \\ & & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & &$$

**21.(D)**  $CH_3CH_2COOH + NaHCO_3 \longrightarrow CH_3CH_2COONa + H_2CO_3$ 

$$H_2CO_3 \longrightarrow H_2O + CO_2 \uparrow$$



22. (i) 
$$\frac{\text{fuming}}{\text{H}_2\text{SO}_4}$$
 SO<sub>3</sub>H OH SO<sub>3</sub>H OH

(ii) 
$$P_2O_5$$
  $H^+$ 

23. 
$$C_6H_5CHO + CH_3 - C - OC_2H_5 \xrightarrow{C_2H_5ONa} C_6H_5 - CH = CH - C - OC_2H_5$$

24. 
$$CH_3CH_2COOH \xrightarrow{red - P} CH_3 - CH - COOH \xrightarrow{(i) alc. KOH} CH_2 = CH - COOH \xrightarrow{Br_2} A \xrightarrow{Br} (HVZ reaction)$$

**25**. A  $\beta$ -keto acid undergo very fast decarboxylation

A 
$$\beta$$
-keto acid undergo very fast decarboxylation 
$$\begin{array}{c|c} OH & O\\ \hline \\ C_6H_5 - C = CH_2 & \longrightarrow \\ C_6H_5 - C - CH_3 \\ \hline \\ enol & \\ \end{array}$$

B is  $C_3H_5COOH$  and A is  $C_3H_5 - C = C - C_3H_5$ **26**.

> Also A on ozonolysis gives B indicates that there is no olefinic bond in  $C_3H_5$  unit of A and it is cyclopropyl group.

$$\Rightarrow$$
 A = C = C  $\Rightarrow$  COOH and C = B

$$\Rightarrow A = \bigcirc C \equiv C \longrightarrow ; B = \bigcirc COOH \text{ and } C = \bigcirc Br$$

$$CH_3 \longrightarrow CH_3 \longrightarrow CH_2 \longrightarrow COOEt$$

$$NO_2 \longrightarrow NO_2 \longrightarrow NO_2$$

$$NO_2 \longrightarrow NO_2$$

(ii) A stable carbanion HO 
$$COOH$$
  $CH_2$   $H^+$   $COOH$   $CH_2$   $HO$   $CH_2$   $H^ CH_2$   $HO$   $B$ 



(iii) 
$$C_6H_5$$
  $C_6H_5$   $C_6H$ 

**28.(C)** Methylketone and alcohol having structure similar to CH<sub>3</sub> – CH(OH)R can undergo haloform reaction. Acetic acid has alpha hydrogen atom.

29. 
$$\begin{array}{c|c} O \\ C - OC_2H_5 \\ C - OC_2H_5 \\ O \end{array} \xrightarrow[NaOEt]{NaOEt} \begin{array}{c} C - OC_2H_5 \\ C - OC_2H_5 \\ O \end{array} \xrightarrow[NaOEt]{NaOEt} \begin{array}{c} C - OC_2H_5 \\ C - OC_2H_5 \\ O \end{array} \xrightarrow[NaOEt]{NaOEt} \begin{array}{c} C - OC_2H_5 \\ C - OC_2H_5 \\ O \end{array} \xrightarrow[NaOEt]{NaOEt} \begin{array}{c} C - OC_2H_5 \\ C - OC_2H_5 \\ O \end{array} \xrightarrow[NaOEt]{NaOEt} \begin{array}{c} C - OC_2H_5 \\ C - OC_2H_5 \\ O \end{array} \xrightarrow[NaOEt]{NaOEt} \begin{array}{c} C - OC_2H_5 \\ C - OC_2H_5 \\ O \end{array} \xrightarrow[NaOEt]{NaOEt} \begin{array}{c} C - OC_2H_5 \\ C - OC_2H_5 \\ O \end{array} \xrightarrow[NaOEt]{NaOEt} \begin{array}{c} C - OC_2H_5 \\ O \end{array} \xrightarrow[NaOEt]{NaOEt} \xrightarrow[NaOEt]{NaOEt} \begin{array}{c} C - OC_2H_5 \\ O \end{array} \xrightarrow[NaOEt]{NaOEt} \xrightarrow[NaOEt]{NaOEt} \begin{array}{c} C - OC_2H_5 \\ O \end{array} \xrightarrow[NaOEt]{NaOEt} \xrightarrow[NaOEt]{NaOEt}$$

**30.**  $CH_3 - C - OC_2H_5 \xrightarrow{H_3O^+} CH_3 - C - OH + C_2H_5 - OH$ 

Hydrolysis of ester follows acyl-O-cleavage reaction mechanism.