

1. Explain the following terms :

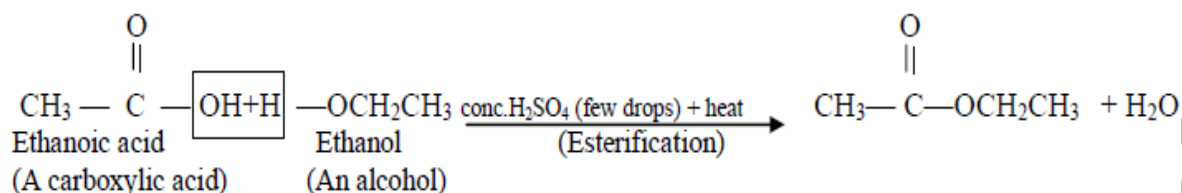
a) Etherification

b) Saponification

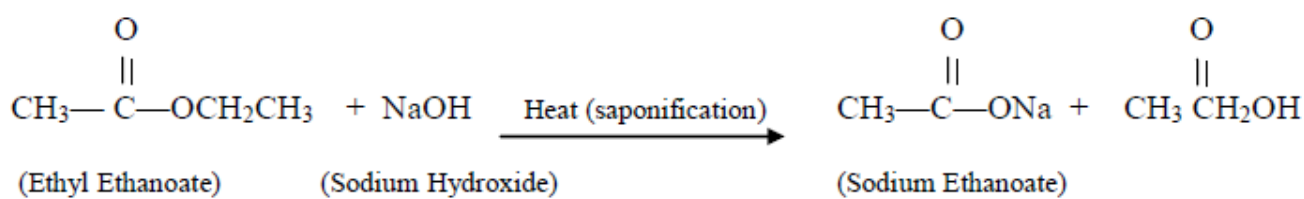
c) Dehydration

ANS

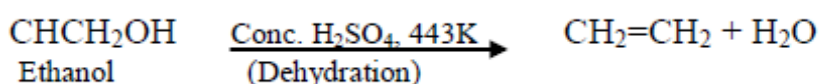
[a] the reaction between a carboxylic acid and an alcohol in presence of a few drops of conc.  $H_2SO_4$  to form an ester is called etherification.



ANS [b] Saponification – Alkaline hydrolysis of an ester to give the salt of the corresponding acid and the alcohol is called saponification. It is reverse of Esterification. For example, O O O



ANS [c] Dehydration means removal of a molecule of water. When ethanol is heated with conc.  $H_2SO_4$  at 443K, it undergoes dehydration to form ethene.



2. An organic compound A having molecular formula  $C_2H_4O_2$  reacts with Sodium metal Na evolves a gas B which readily catches fire. A also reacts with Ethanol in the presence of concentrated Sulphuric acid to form a sweet smelling substance C in making perfumes.

a) Identify the compounds A, B and C.

b) Write balanced chemical equation to represent the conversion of

i. Compound A to compound B.

ii. Compound A to compound C.

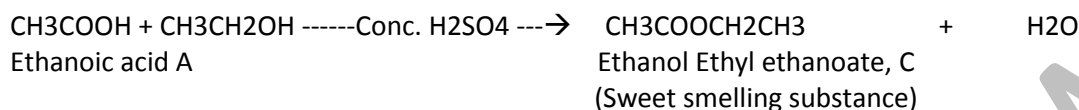
ANS

[2-i] Since the Organic compound A with molecular formula  $C_2H_4O_2$  reacts with sodium metal to form a gas B which catches fire, therefore, gas B must be  $H_2$  and compound A must be ethanoic acid.



Ethanoic acid, A (Sodium ethanoate) hydrogen, B [Catches fire]

**ANS [2-ii]** We know that esters are sweet smelling substances which are used in perfumes. These are formed when a carboxylic acid reacts with an alcohol in presence of conc.  $\text{H}_2\text{SO}_4$ . Since new compound A (i.e., Ethanoic acid) reacts with ethanol (an alcohol) in presence of conc.  $\text{H}_2\text{SO}_4$  to form a sweet smelling substance which is used in perfumes, therefore; C must be an Ester, i.e., ethyl ethanoate.



**3. Give the name of the following :** a) An Aldehyde derived from Ethane. b) Ketone derived from Butane. c) The compound obtained by the Oxidation of Ethanol by Chromic anhydride.

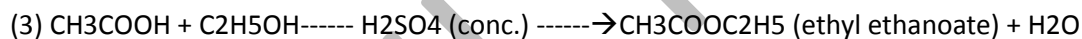
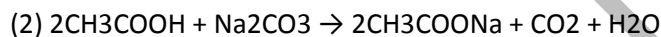
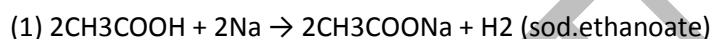
**ANS [3]**

i. Ethanal [ $\text{CH}_3\text{CHO}$ ]      ii. Butanone [ $\text{CH}_3\text{COCH}_2\text{CH}_3$ ]      iii. Ethanal [ $\text{CH}_3\text{CHO}$ ]

**4. Write chemical equations of the reactions of Ethanoic acid with :**

a) Sodium      b) Sodium Carbonate      c) Ethanol in the presence of conc.  $\text{H}_2\text{SO}_4$ .

**ANS [4]**



**5. Give a test to distinguish between:**

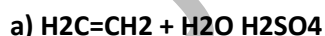
a) Ethane and Ethene      b) Ethanol with Ethanoic acid.      c) Soaps and detergents'

i. Ethene decolorizes the Reddish brown colour of Bromine water while ethane does not.

ii. Ethanoic acid gives a brisk effervescence with sodium hydrogen carbonate while ethanol does not.

iii. Soaps form curdy white precipitate or scum with hard water while detergents do not form any precipitate.

**6. Complete the following reactions:**

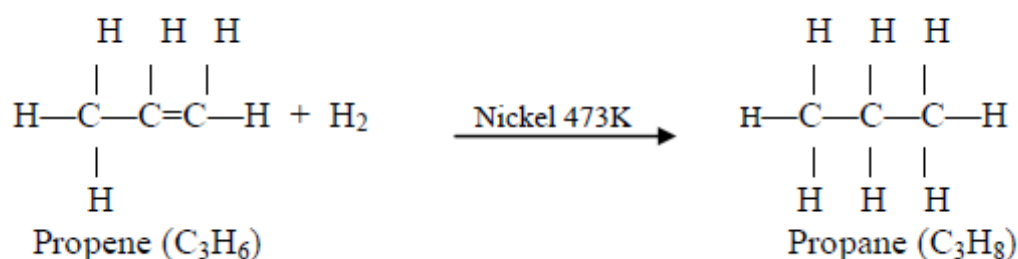


[Ans]

- a)  $\text{H}_2\text{C}=\text{CH}_2 + \text{H}_2\text{O} \xrightarrow{\text{H}_2\text{SO}_4} \text{CH}_3-\text{CH}_2-\text{OH}$
- b)  $\text{HC}\equiv\text{CH} + 2\text{Br} \longrightarrow \begin{array}{c} \text{Br} \quad \text{Br} \\ | \quad | \\ 2 \text{H}-\text{C}-\text{C}-\text{H} \\ | \quad | \\ \text{Br} \quad \text{Br} \end{array}$
- c)  $2\text{C}_2\text{H}_5\text{OH} + 2\text{Na} \longrightarrow 2\text{C}_2\text{H}_5\text{ONa} + \text{H}_2$
- d)  $\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \xrightarrow{\text{H}_2\text{SO}_4} \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$

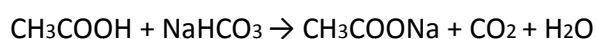
7. Two carbon compounds A and B have the molecular formula  $\text{C}_3\text{H}_8$  and  $\text{C}_3\text{H}_6$  respectively. Which one of the two each most likely to show addition reaction? Justify your answer. Explain with the help of a chemical equation, how an addition is useful in vegetable Ghee industry.

[Ans]  $\text{C}_3\text{H}_8$  corresponds to the general formula  $\text{C}_n\text{H}_{2n+2}$  ( $n=3$ ), therefore it is an alkane which is a saturated compound. The molecular formula,  $\text{C}_3\text{H}_6$  corresponds to the general formula  $\text{C}_n\text{H}_{2n}$  ( $n=3$ ) therefore it is an alkene, which is an unsaturated compound. Since alkenes contain a double bond, therefore  $\text{C}_3\text{H}_6$  is more reactive than  $\text{C}_3\text{H}_8$ .  $\text{H}_2$  is added in presence of a catalyst to form saturated hydrocarbons for example,



This addition reaction is useful in industry for converting vegetable ghee. Vegetable oils contain a number of unsaturated carbon chains having double bonds between carbon atoms. When  $\text{H}_2$  gas is bubbled through vegetable oils in presence of Nickel as catalyst at 473K, some of these double bonds add  $\text{H}_2$  to form saturated carbon chains. As a result of this partial hydrogenation, vegetable ghee is formed.

8. What substance should be oxidised to prepare acetic acid ( $\text{CH}_3\text{COOH}$ )? How can ethanol and Ethanoic acid be differentiated? [Ans 8] Ethanol on oxidation with alkaline  $\text{KMnO}_4$  gives acetic acid. Ethanol and Ethanoic acid be differentiated by: Action with sodium hydrogen carbonate - On adding a small amount of sodium hydrogen carbonate to Ethanoic acid, carbon dioxide gas is evolved with brisk effervescence. However, no such reaction is noticed in case of ethanol.



9. Write down the difference between soap and detergents.

Soaps	Detergents
(i) Soaps are sodium or potassium salts of higher fatty acids i.e. carboxylic acids obtained from oil and	(i) Detergents are mostly sulphonates of long chain hydrocarbons.

fats	
(ii) Soaps cannot work effectively in hard water	(ii) Detergents can work equally well in hard and soft water
(iii) Soaps cannot be used in neutral or acidic sol.	(iii) Detergents can be used in acidic , alkaline or neutural sol.
iv) Soaps are prepared from vegetable Oils animals fats which are scarce.	(iv) Detergents are manufactured from hydrocarbons obtained from coal or petroleum

10. An organic compound A is widely used as a preservative in pickles and has a molecular formula  $C_2H_4O_2$ . This compound reacts with ethanol to form a sweet smelling compound B.

i) Identify the compound A.

ii) Write the chemical equation for its reaction with Ethanol to form compound B.

iii) How can we get compound A back from B?

iv) Name the process and write corresponding chemical equation.

v) Which gas is produced when compound A reacts with washing soda? Write the chemical equation

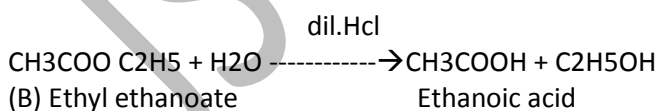
Ans: 10.

(i) The compound 'A' with molecular formula  $C_2H_4O_2$  is ethanoic acid also called acetic acid. Its structural formula is  $CH_3COOH$ . A dilute sol. of acetic acid called vinegar is used as preservative of pickles.

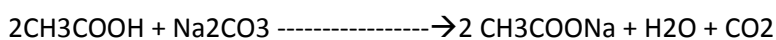
(ii) Compound A reacts with ethanol to form compound 'B' which is an ester and has pleasant smell. The reaction is called esterification reaction .



(iii) The compound 'A' can be obtained from ethyl ethanoate by reacting with water in presence of dilute hydrochloric acid acting as catalyst.



(iv) This process is known as ester hydrolysis (v) Carbon dioxide gas is evolved with effervescence when the compound A reacts with washing soda which is chemically  $Na_2CO_3$ .



The gas can be identified by passing through lime water which turns milky.