

EVI

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Course (CoS): CHM102

Department / Aeronautical & Astronautical Engineering

Matric No: 19/ENR109/019

Course title: General Chemistry II

Assignment: Assignment on ether.

Question

1) Give the IUPAC names of the following organic compounds; CH_3OCH_3 , $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$, $(\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2)_2\text{O}$, $\text{CH}_3\text{CH}_2\text{OCH}_2$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_3$.

Solution

(i) $\text{CH}_3\text{OCH}_3 \rightarrow$ Methoxymethane.

(ii) $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3 \rightarrow$ Ethoxyethane.

(iii) $(\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2)_2\text{O} \rightarrow$ Butoxymethane.

(iv) $\text{CH}_3\text{CH}_2\text{OCH}_3 \rightarrow$ Methoxyethane.

(v) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_3 \rightarrow$ Ethoxypropane.

2) Discuss the properties of ethers.

Solution

1) Physical states: At room temperature, ethers are colourless, neutral liquids with pleasant odour. The lower aliphatic ethers are highly flammable gases or volatile liquids.

2) Solubility: Ethers are less soluble in water than the corresponding alcohols. Lower molecular weight ethers such as methoxymethane and methoxyethane are fairly soluble in water. Since the molecules are able to form hydrogen bonds with the water molecules but as the hydrogen content of the molecules increases, there is a rapid decrease in solubility. They are miscible with most organic solvents.

3) Density: Most of the simple ethers are less dense than water, although the density increases with increasing relative molecular mass and some of the aromatic ethers are in fact denser than water.

4) Boiling point:- lower molecular mass ethers have a lower boiling point than the corresponding alcohols but those ethers containing alkyl radicals larger than four carbon atoms, the reverse is true. The boiling point of ethers tend to approximate those of hydrocarbons of same relative molecular mass from which it can be concluded that the molecules are not associated in the liquid phase as there are no suitably available hydrogen for association through hydrogen bonds.

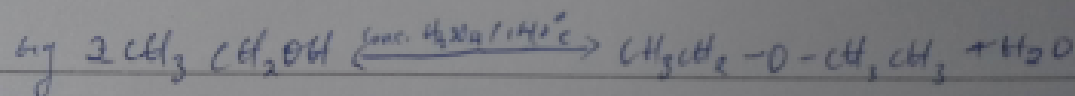
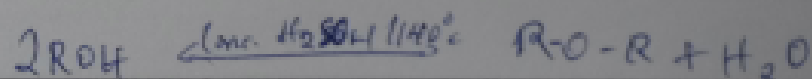
5) Reactivity:- ethers are inert at moderate temperature their inertness at moderate temperature leads to their wide use as reaction media.

3) Discuss explicitly two methods of preparing ethers as show equations of reaction.

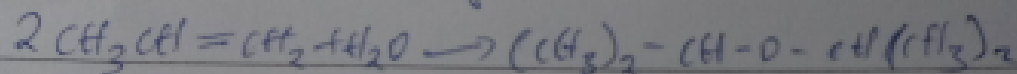
Solution

1. Partial dehydration of alcohol

Simple ether are manufactured from alcohol by catalytic dehydration. The alcohol is excess and concentrated tetraoxo sulphate (vi) acid is heated at a carefully maintained temperature of 140°C . This process is known as continuous etherification. If excess alcohol is not used the temperature is as high as $170-180^{\circ}\text{C}$, further dehydration to yield alkene occurs.



2. Controlled catalytic hydration of ethene



2-isopropoxypropane

4) State three uses of Ethylene oxide
solutions

(1) Ethylene oxide is used as an intermediate in the hydrolytic manufacture of Ethylene glycol.

(2) Ethylene oxide is used in the preparation of non-toxic emulsifying agents, plastics, and several synthetic textiles.

(3) Ethylene oxide is used as a gaseous sterilizing agent.