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Course code: CHM102 (Assignment 2)

Question 1: Give the IUPAC name of the following organic compounds

- 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. $(\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_3)_2\text{O} \rightarrow$ 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

Question 2: Discuss the properties of ethers
solution

- ① Physical states: At room temperature, ethers are colourless, neutral liquids with pleasant odors. The lower aliphatic ethers are highly inflammable gases or volatile liquids.
- ② Solubility: Ethers are less soluble in water than the corresponding alcohols. Lower molecular weight ethers such as 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 rapid decline in solubility. They are miscible with most organic solvents.
- ③ Density: Most of the simple ethers have a lower boiling point and are less dense in water, although the density increases with increasing relative molecular mass and some of the aromatic ethers are in fact denser than water.

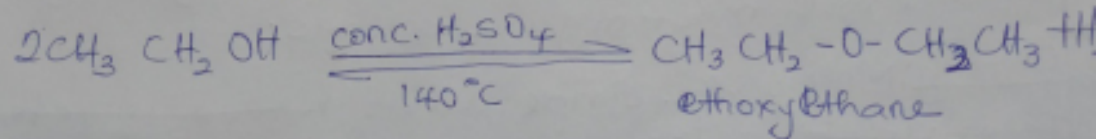
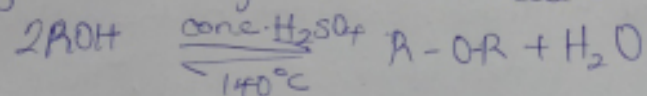
(4) Boiling point: Low molecular mass ethers have a lower boiling point than the corresponding alcohols but those ethers containing alkyl radicals larger than four carbon atoms, the reverse is true. Boiling point of ethers tend to approximate those of hydrocarbons of same relative molecular mass from 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. This leads to their wide use as reaction media.

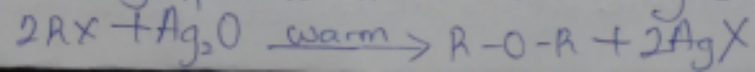
Simple ethers are not found commonly in nature but the ether linkage is present in such natural products as sugars, starches and cellulose.

Question 3: Discuss explicitly two methods of preparing ethers and show equations of reaction.

(1) Partial dehydration of alcohols: Simple ethers are manufactured from alcohols by catalytic dehydration. The alcohol in excess and concentrated H_2SO_4 is heated at a carefully maintained temperature of $140^\circ C$, this process is known as continuous etherification. If excess alcohol is not used, the temperature is as high as $170-180^\circ C$, further dehydration to yield alkene occurs.



(2) From haloalkanes and dry silver(I) oxide: This includes the heating of haloalkanes with dry silver(I) oxide.



Question 4: State three uses of ethylene oxide.

Answer

- ① Ethylene oxide is used as intermediate in the hydrolytic manufacture of ethylene glycol
- ② It is used in the preparation of nonionic emulsifying agents, plastics, and several textiles
- ③ Ethylene oxide is also used as a gaseous sterilizing agent