

NAME: AGHATISE OSAYAMEN STEPHANIE
DEPARTMENT: MEDICINE AND SURGERY
COLLEGE: MEDICAL AND HEALTH SCIENCE
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Assignment

1. Give the IUPAC names of the following organic compounds.

- CH_3OCH_3 - Methoxymethane
- $\text{[CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3\text{]}$ - Ethoxymethane
- $\text{[CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{]}_2\text{O}$ - Butoxymethane
- $\text{CH}_3\text{CH}_2\text{OCH}_3$ - Methoxyethane
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_3$ - Ethoxypropane

2. Discuss the properties of Ethers

- Physical properties/states: At room temperature, ethers are colourless, neutral liquids with pleasant odours. The lower aliphatic ethers are highly flammable gases or volatile liquids.
- 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 hydrocarbon content of the molecules increases, there is a rapid decline in solubility. They are miscible with most organic solvents.
- Density: Most of the simple ethers are less dense than water, although the density increases with increasing relative molecular mass of some of the aromatic ethers are in fact denser than water.
- 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. The boiling point of ethers tend to approximate those of hydrocarbons of some 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.

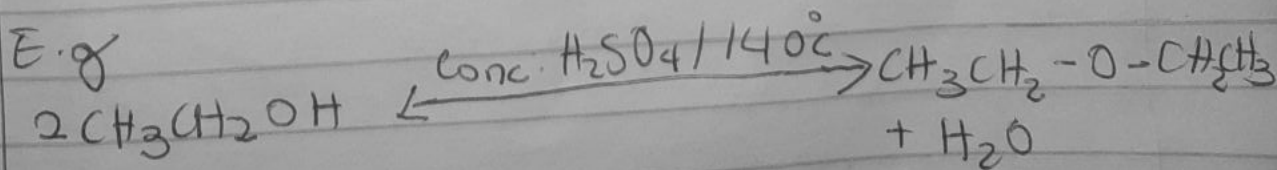
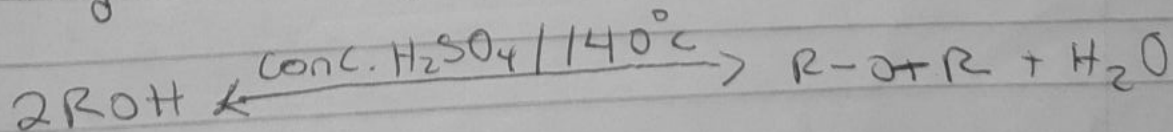
e) Reactivity. Ethers are inert at moderate temperature. Their inertness at moderate temperatures leads to their wide use as reaction media.

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

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

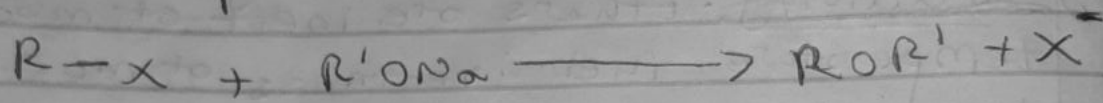
a) Method 1: Partial dehydration of alcohols

Simple ethers are manufactured from alcohols by catalytic dehydration. The alcohol in excess and concentrated tetraoxosulphate (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.

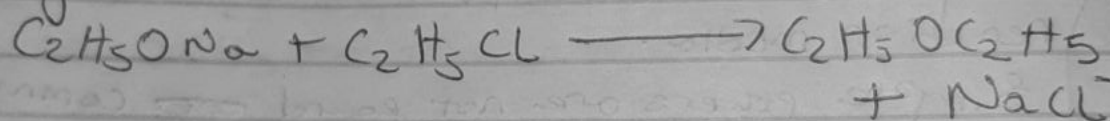


b) Method 2: Preparation of Ethers by Williamson Synthesis

Williamson synthesis is an important method for the preparation of symmetrical and asymmetrical ethers in laboratories. Here, alkyl halides (primary and secondary) react with sodium alkoxide ($R'ONa$) or potassium alkoxide ($R'OK$) to produce ethers.



E.g



Tertiary alkyl halides are not used in Williamson synthesis because tertiary alkyl halides prefer to undergo elimination instead of substitution. Hence, if we are to prepare Butyl methyl ether, we will use $(C_4H_9)_2ONa$ and CH_3Br and not $(C_4H_9)_3Br$ and CH_3OH .

4. State three uses of ethylene oxide

- Ethylene oxide is used as an intermediate in the hydrolytic manufacture of ethylene glycol
- Ethylene oxide is used in the preparation of nonionic emulsifying agents, plastics, plasticizers and several synthetic textiles.
- Ethylene oxide is used as a gaseous sterilizing agent.