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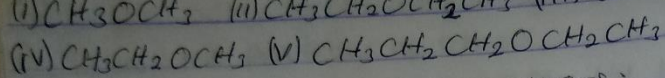
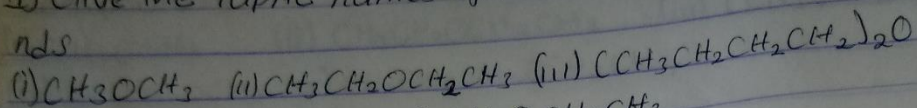
19/MHS01/414

CHEMISTRY 102

ETHERS

MEDICINE AND SURGERY

1) Give the IUPAC names of the following organic compounds



2) Discuss the properties of ethers.

3) Discuss explicitly two methods of preparing ethers and show equation of reaction

4) State three uses of ethylene oxide.

SOLUTION

1) (i) CH_3OCH_3 - Methoxymethane

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

(iii) $(\text{C}_4\text{H}_9\text{O})_2\text{O}$ - Butoxyethane

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

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

2) Properties of ethers.

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

b) Solubility: Ethers are less soluble in water than are the corresponding alcohol. 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 hydrocarbon content of the molecule increases, there is a rapid decline in solubility. They are miscible with most organic solvents.

c) Density: most of the simple ethers are less dense than water although the density increase with increasing relative molecular mass and some of the aromatic ethers are in fact denser than water.

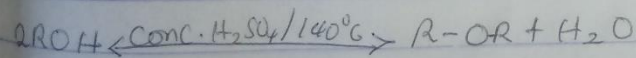
d) Boiling point: Low molecular mass ethers have a lower boiling points than the corresponding alcohols but those ethers containing alkyl radicals larger than four carbon atoms, the reverse is true. The boiling point of ethers tend to approximate those of hydrocarbons of same relative molecular mass 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.

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

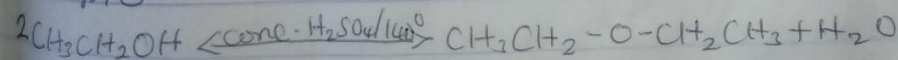
3) 2 methods of preparing ethers.

1. Partial dehydration of alcohols.

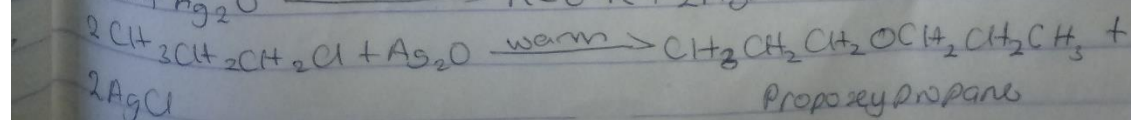
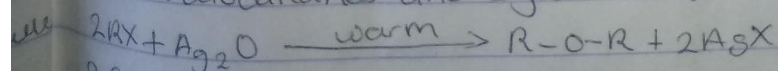
Simple ethers are manufactured from alcohols by catalytic dehydration. The alcohol in excess and concentrated tetraoxosulphate(VI) acid is heated at a carefully maintained temperature of 140°C . This process is known as continuous etherification. If excess alcohol is not used, the temperature is as high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

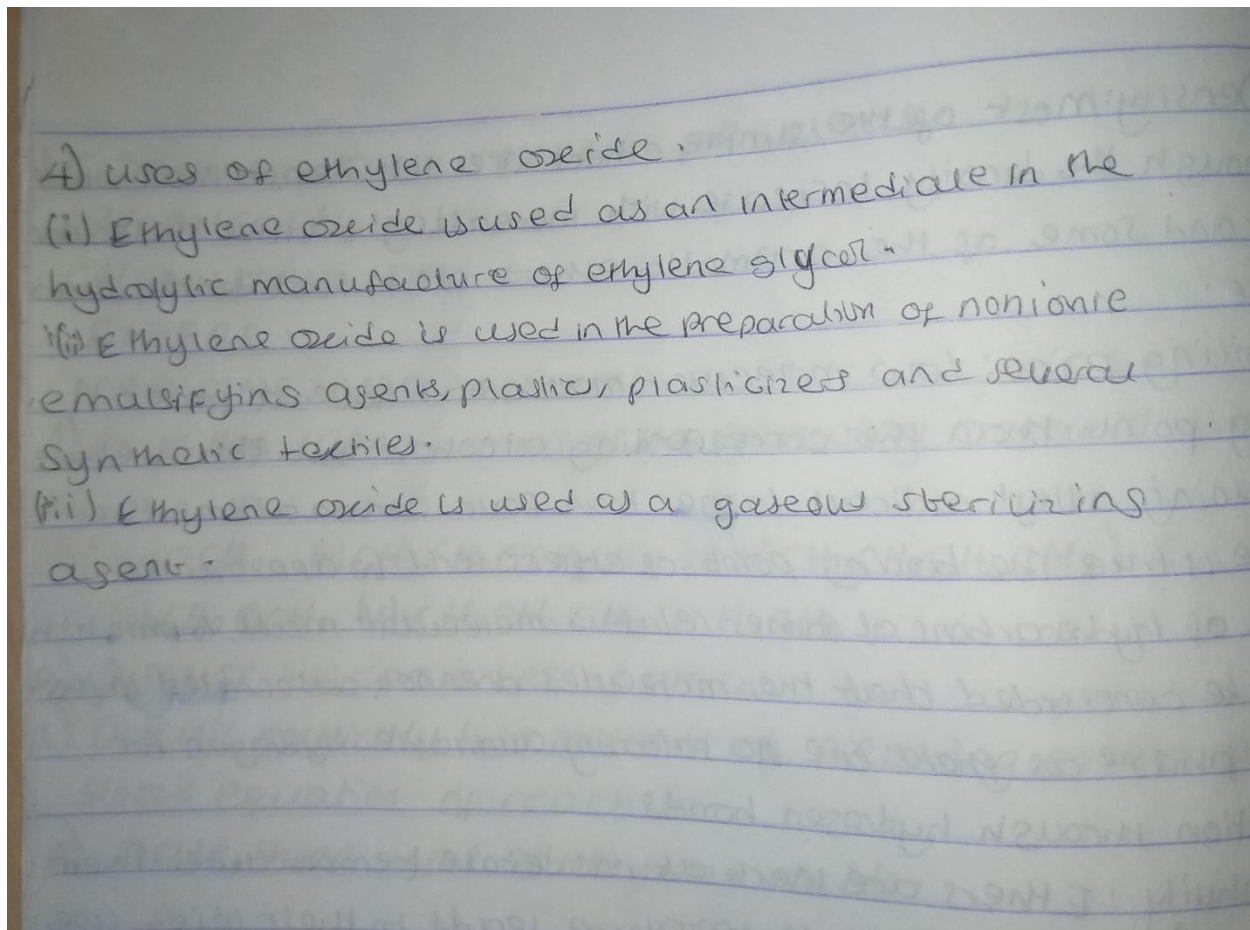


example



2. from Halocarbones and dry silver (I) oxide.





4) uses of ethylene oxide.

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

(ii) Ethylene oxide is used in the preparation of nonionic emulsifying agents, plastic, plasticizers and several synthetic textiles.

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

NAME: UGOCHUKWU CHIZITEREM PRECIOUS. MATRIC NUMBER: 19/MHS01/414. DEPARTMENT: MBBS.