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Dept: Medicine and surgery

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### Assignment

1) Give the IUPAC names of the following Organic Compounds

$\text{CH}_3\text{OCH}_3$  - methoxymethane

$\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$  - Ethoxyethane

$(\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2)_2\text{O}$  - Butoxymethane

$\text{CH}_3\text{CH}_2\text{OCH}_3$  - methoxyethane

$\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_3$  - ethoxy propane

2) Discuss the properties of ethers.

\* At room temperature, ethers are colorless neutral liquids with pleasant odours. The lower aliphatic ethers are highly flammable, gaseous or volatile liquids.

\* Ethers are less soluble in water ~~that~~ than 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 the hydrocarbon content of the molecule increases, there is a rapid decline in solubility.

\* Ethers are inert at moderate temperature. Their inertness at moderate temperature leads to their wide use as reaction media.

\* Most ethers are less dense than water, although the density increases with increasing relative molecular mass and some of the aromatic ethers are denser than water.

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

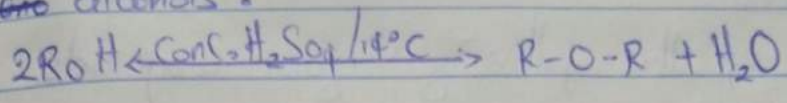
#### Method 1

Preparation of ethers by dehydration of alcohols

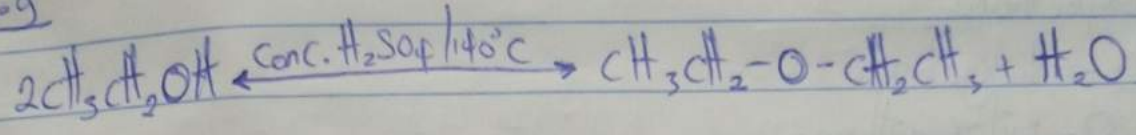
In the presence of protic acids (sulphuric acid), alcohols undergo catalytic dehydration to produce alkenes and ethers under different conditions. The process of continuous etherification occurs here e.g. In the



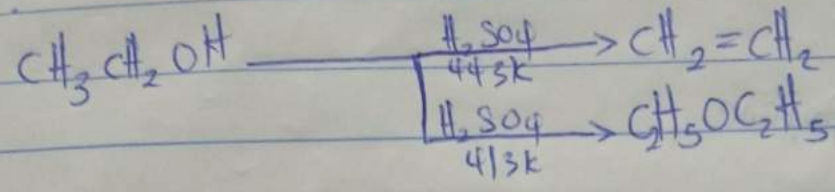
presence of sulphuric acid, dehydration of ethanol at 443K (or between 170°C - 180°C) yields ethene whereas it yields ethoxyethane at 413K (140°C). This is an ideal method of preparation through primary ~~alkano~~ alcohols.



e.g.



or:

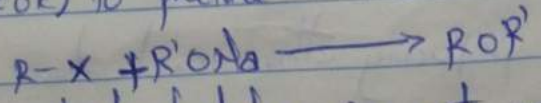


The preparation of ethers by dehydration of alcohol is a ~~reversible~~ nucleophilic substitution reaction. The two molecules of the alcohol act as a substrate and a nucleophile each. It can follow either an S<sub>N</sub>1 or S<sub>N</sub>2 mechanism. The choice of the mechanism depends on whether the protonated alcohol loses water before or simultaneously upon the attack of a second alcohol molecule. Generally, the secondary and tertiary alcohols follow the S<sub>N</sub>1 mechanism while the primary alcohol follows the S<sub>N</sub>2 mechanism.

### 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



Tertiary alkyl halides are not used in Williamson's synthesis because tertiary alkyl halides prefer to undergo elimination instead of substitution. Hence, if we are to prepare t-butyl methyl ether, we will use (CH<sub>3</sub>)<sub>3</sub>ONa and CH<sub>3</sub>Br; and not (CH<sub>3</sub>)<sub>3</sub>Br and CH<sub>3</sub>OH



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4. State three uses of ethylene oxide

- i) Ethylene oxide is used as an intermediate in the hydrolytic manufacture of ethylene glycol (paracetamol).
- ii) Ethylene oxide is used as a gaseous sterilizing agent.
- iii) Ethylene oxide is used in the preparation of non-ionic emulsifying agents, plastics, plasticizers and several synthetic textiles.