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Course: CHEMISTRY 102.

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ANSWERS.

- 1)a. CH_3OCH_3 : Methoxymethane
- b. $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$: Ethoxyethane
- c. $(\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2)_2\text{O}$: Pentanamide
- d. $\text{CH}_3\text{CH}_2\text{OCH}_3$: Methoxyehane

2) **Physical Properties:**

****** The boiling point of ethers is comparable to the alkanes but much lower than that of alcohols of comparable molecular mass despite the polarity of the C-O bond. The miscibility of ethers with water resembles those of alcohols.

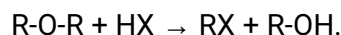
****** Ether molecules are miscible in water. This is attributed to the fact that like alcohol, the oxygen atom of ether can also form hydrogen bonds with a water molecule.

****** Most of the simple esters 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.

Chemical Properties:

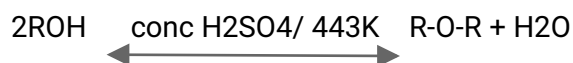
****** Cleavage of C-O bond

Ethers are generally very unreactive in nature. When an excess of hydrogen halide is added to the ether, cleavage of C-O bond takes place leading to the formation of alkyl halides. The order of reactivity is given as $\text{HI} > \text{HBr} > \text{HCl}$

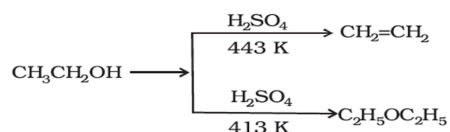


3)a) Preparation of Ethers by Dehydration of Alcohols

In the presence of protic acids (sulphuric acid), alcohols undergo dehydration to produce alkenes and ethers under different conditions. For example: in the presence of sulphuric acid, dehydration of ethanol at 443 K yields ethene whereas it yields ethoxyethane at 413 K. This is an ideal method of preparation through primary alcohols.



For Example:



The preparation of ethers by dehydration of alcohol is a nucleophilic substitution reaction. The alcohol involved in reaction plays two roles: one alcohol molecule acts as a substrate while the other acts as a nucleophile. It can follow either an SN1 or SN2 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 SN1 mechanism while the primary alcohols follow the SN2 mechanism.

2) From Haloalkanes and dry Silver (1) Oxide



4) a) Ethylene oxide (EtO) is produced in large volumes and is primarily used as an intermediate in the production of several industrial chemicals, the most notable of which is ethylene glycol.

b) It is also used as a fumigant in certain agricultural products and as a sterilant for medical equipment and supplies.

c) Most ethylene oxide is used as an intermediate in the production of other chemicals used to manufacture products, such as fabrics for clothes, upholstery, carpet and pillows.

