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**Assignment Title:** Assignment on Ether  
**Course Title:** General Chemistry II  
**Course Code:** CHM 102

**Question**  
Assignment

1. Give the IUPAC names of the following organic compounds

CH3OCH3           CH3CH2OCH2CH3

(CH3CH2CH2CH2)2O           CH3CH2 OCH3

CH3CH2CH2OCH2CH3

2. Discuss the properties of ethers

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

4. State three uses of ethylene oxide

Answer

* CH3OCH3 –Methoxymethane
* CH3CH2OCH2CH3 – Ethoxyethane
* (CH3CH2CH2CH2)2O-
* CH3CH2 OCH3 –Methoxyethane
* CH3CH2CH2OCH2CH3  -Ethoxypropane

1. Physical properties of ethers

* An ether molecule has a net dipole moment due to the polarity of C-O bonds.
* 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.

Chemical properties of ethers

Ethers generally undergo chemical reactions in two ways:

1. 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 HI>HBr>HCl

1. Electrophilic Substitution

The alkoxy group in ether activates the aromatic ring at Ortho and Para positions for electrophilic substitution.

1. Halogenation of Ethers

Aromatic ethers undergo halogenations, for example bromination, upon the addition halogen in the presence or absence of a catalyst.

1. Friedel Craft’s Reaction of Ethers

Aromatic ethers undergo Friedel Craft’s reaction for example addition of alkyl or acyl halide in the presence of a Lewis acid as catalyst.

1. Preparation of Ethers

Method 1: 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 443k yields ethane whereas it yields ethoxyethane at 413k. This is an ideal method of preparation through primary alcohols.

H2So4 CH2=CH2

443k

H2So4

CH3 CH2OH 413k C2H5OC2H5

Method 2: preparation of ethers by Williamson synthesis.

Williamson synthesis is an important method for the preparation of symmetrical and asymmetrical ethers in laboratories. In this method, an alky halide is reacted with sodium alkoxide which leads to the formation of ether.

R-X+R’-ONa+ R-O-R’+Nax

1. Uses of Ethylene Oxide
2. 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.
3. Ethylene oxide is used to sanitize medical and pharmaceutical products that cannot support conventional, high-temperature steam sterilization procedures.
4. Ethylene oxide derivatives are used as ingredients in industrial cleaners, heat transfer, liquids, polyurethanes and plasticizers.