Baridoma Moses Bachem
191/ENG05/018
Mechatronics Engineering
CHEM 102

1 Give the IUPAC names of the following organic compounds
CH_3OCH_3 → Methoxymethane
$CH_3CH_2OCH_2CH_3$ → Diethyl ether
$(CH_3CH_2CH_2CH_2)_2O$ →
$CH_3CH_2OCH_3$ → Methoxyethane
$CH_3CH_2CH_2OCH_2CH_3$ → Ethoxyethane

2 Discuss the properties of Ethers
1 PHYSICAL PROPERTIES
a) An ether molecule has a net dipole movement - we can attribute this to the polarity of C-O bonds.
b) The boiling point of ether is comparable to the alkanes. However it is much lower compared to that of alcohols of comparable molecular mass. This is despite the fact of the polarity of the C-O bond.
c) The miscibility of ether with water resembles those of alcohols

2) CHEMICAL PROPERTIES
a) Cleavage of C-O bond - Ethers are generally very unreactive in nature when we add an excess of hydrogen halide to the ether - cleavage of C-O bond takes place. This leads to the formation of alkyl halides

b) Electrophilic substitution - The alkoxy group in ether activates the aromatic ring at ortho and para positions for electrophilic substitution reactions are halogenation, Friedel Crafts reaction e.t.c

c) Halogenation reation of Ethers - Aromatic Ethers undergo halogenation for example, bromination, when we add a halogen in the presence or absense of a catalyst

10) Friedel Crafts reaction of ethers - Aromatic Ethers undergo Friedels Crafts reaction for example addition of alkyl or alcyl group when we introduce it to an alkyl or acyl halide in the presence of a lewis acid as catalyst.

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

a) Preparation of Ethers by dehydration of Alcohols
In the presence of sulphuric acid, alcohol undergoes dehydration to produce alkenes and ethers under different condition. The preparation of ethers by dehydration of Alcohol is a nucleophilic substitution reaction. The alcohol involved acts as a substrate and a nucleophile.

$$CH_3CH_2OH \xrightarrow[443K]{H_2SO_4} CH_2 = CH_2$$

$$CH_3CH_2OH \xrightarrow[413K]{H_2SO_4} C_2H_5OC_2H_5$$

b) Preparation of Ethers by Williamson synthesis - In this method, an alkyl halide is reacted with sodium alkoxide which leads to the formation of ether and it follows the S_N2 mechanism for primary alcohol.

$$R-X + R'-\ddot{O}\,Na^+ \longrightarrow R-\ddot{O}-R' + Na\,X$$

4) State 3 uses of ethylene oxide.
a) It is used to manufacture ethylene glycol (Antifreeze)
b) It is also used to make textiles, detergent, Polyurethane foam
c) It is used as a fumigant for pests, sterilizer for food spices