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CHM102 ASSIGNMENT

1) CH_3OCH_3 ⇒ methoxymethane
$CH_3CH_2OCH_2CH_3$ ⇒ ethoxyethane
$CCH_3CH_2CH_2CH_2)_2O$ ⇒ butoxybutane
$CH_3CH_2OCH_3$ ⇒ methoxyethane
$CH_3CH_2CH_2OCH_2CH_3$ ⇒ ethoxypropane

2) (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 alcohols, lower molecular weight ethers such as methoxymethane and methoxymethane 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 molecules 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 increases with increasing relative molecules mass and some of the aromatic ethers are in fact denser than water

d) Boiling point: Low molecular mass ethers have a lower boiling point than the corresponding alcohols but those ethers containing alkyl groups larger than four carbon atoms, the reverse is true. The boiling

Boil of ethers tend to approximate those of hydrocarbons of some 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 temperatures leads to their wide use as reaction media. Simple ethers are not found commonly in nature but the ether linkage

3) (a) Partial dehydration of alcohols

Simple ethers are manufactured from alcohols by catalytic dehydration. The alcohol in excess are concentrated hetero-xosulphate(VI) and 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°C, further dehydration to yield alkene occur

$$2ROH \xrightarrow{Conc\ H_2SO_4/140^\circ C} R-O-R + H_2O$$

Example $2CH_3CH_2OH \xrightarrow{Conc.\ H_2SO_4/140^\circ C} CH_3CH_2-O-CH_2CH_3 + H_2O$

ethanol ethoxyethane water

b) From Haloalkanes and dry silver (I) oxide

In this case, a halo alkane or an alkyl halide is reacted with dry Silver a) oxide which displaces the halogen in the halo alkane and eventually forms an ether and silver halide.

$$2RX + Ag_2O \xrightarrow{100^\circ C} R-O-R + 2AgX$$

Example: $2CH_3CH_2CH_2Cl + Ag_2O \xrightarrow{100^\circ C} CH_3CH_2CH_2OCH_2CH_2CH_3 + 2AgCl$

Propyl chloride Silver(I) oxide Dipropoxypropane Silver chloride

4) a) Ethylene oxide is used as an intermediate in the hydrolytic manufacture of ethylene glycol

b) Ethylene oxide is used in the preparation of nonionic emulsifying agents, plastics, plasticizers and several synthetic textiles.

c) Ethylene oxide is used as a gaseous sterilizing agent