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1) Give the IUPAC names of the following organic compounds
CH_3OCH_3 → Methoxymethane
$CH_3CH_2OCH_2CH_3$ → Ethoxyethane
$(CH_3CH_2CH_2CH_2)_2O$ → Butoxybutane.
$CH_3CH_2OCH_3$ → methoxyethane.
$CH_3CH_2CH_2OCH_2CH_3$ → Ethoxypropane.

2) Discuss the properties of ethers.

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 they corresponding alcohols. Lower molecular weight ethers such as methoxymethane are fairly soluble in water.

c) Density:
Some of the simple ethers are less dense than water, although the density increases with increasing relative molecular mass and some of the aromatic ethers are infact denser than water.

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

e) Reactivity: Ethers are inert at moderate temperature. Their inertness at moderate temperatures leads to their wide use as reaction media.

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

a) William ether synthesis: Ethers can be made in synthesis using a method disavered by Alexander Williamson which is apply named the William ether synthesis. In this process, an alkoxide ion can alcohol with the hydrogen removed) reacts with an alkyl halide (a hydrogen attached to hydrocarbon). This is also called substitution reaction because the alkoxide ion replaces the halogen.

$$H_3C - Br + Na^+ - O\!\!\checkmark CH_3 \rightarrow H_3C - O\!\!\checkmark CH_3 + NaBr$$

b) preparation of ethers by dehydration of Alcohols.
When alcohols are heated with conc. H_2SO_4 at 413 K, ether $(ROR)^1$ are formed.

$$2\,CH_3 - CH_2 - OH \xrightarrow[413\,K]{Conc\ H_2SO_4} CH_3CH_2 - O - CH_2 - CH_3 + H_2O$$

Uses of ethylene oxide

a) It is used as a fumigant for foods and textile.
b) It is also used as a Sterilant for medical equipment.
c) It is used as a raw material for industrial manufacture of ethylene glycol.