

4 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. The boiling point of ethers tend to approximate those of hydrocarbons of same 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 hydrogens for association through hydrogen bonds.

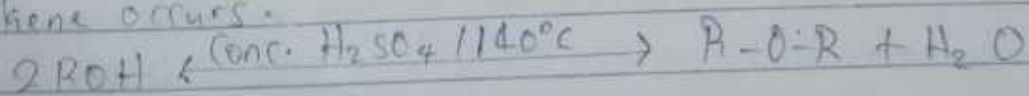
5 Reactivity: Ethers are inert at moderate temperatures. Their inertness at moderate temperatures leads to their wide use as reaction media.

### QUESTION 3

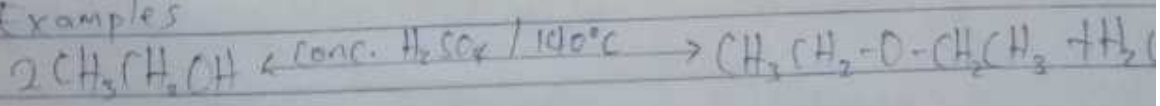
Two methods of preparing ethers are:

1. Partial dehydration of alcohols

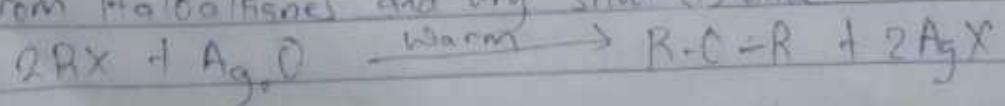
Simple ethers are manufactured from alcohols by catalytic dehydration. The alcohol in excess and concentrated tetraoxo sulphate (VI) acid is heated at a carefully maintained temperature of  $140^{\circ}\text{C}$ . This process is known as continuous etherification. If excess alcohol is not used, the temperature is as high as  $170-180^{\circ}\text{C}$ , further dehydration to yield alkene occurs.



Examples



2 From Haloalkanes and dry silver (I) oxide



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### QUESTION 1

ORGANIC COMPOUND	IUPAC NAME
$\text{CH}_3\text{OCH}_3$	Methoxymethane
$\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$	Ethoxyethane
$(\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2)_2\text{O}$	Butoxymethane
$\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$	Methoxyethane
$\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_3$	Ethoxypropane

### QUESTION 2

Properties of ethers are;

- Physical states:** At room temperature, ethers are colourless, neutral liquids with pleasant odours. The lower aliphatic ethers are highly flammable gases or volatile liquids.
- Solubility:** Ethers are less soluble in water than are the corresponding alcohols. Lower molecular weight ethers such as methoxymethane and methoxyethane 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.
- Density:** Most 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 in fact denser than water.

## QUESTION 4

Three uses of ethylene oxide are:

1. Ethylene oxide is used as a gaseous sterilizing agent.
2. Ethylene oxide is used in the preparation of nonionic emulsifying agents, plastics, plasticizers and several synthetic ~~or~~ textiles.
3. Ethylene oxide is used as an intermediate in the hydrolytic manufacture of ethylene glycol.