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- 1a.  $\text{CH}_3\text{OCH}_3$  - Methoxymethane
- b.  $(\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2)_2\text{O}$  - Butoxymethane
- c.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_3$  - Ethoxypropane
- d.  $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$  - Ethoxyethane
- e.  $\text{CH}_3\text{CH}_2\text{OCH}_3$  - Methoxyethane

2. Properties of ethers include:

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.

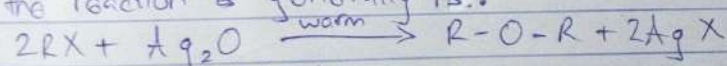
b. Density:

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.

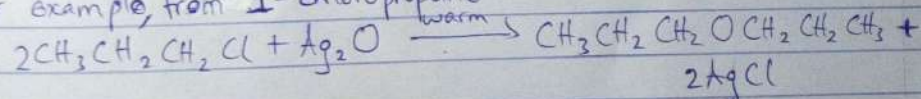
3. Methods of preparing ethers include:

a. From Haloalkanes and Dry Silver (I) oxide:

Ethers can be prepared by heating haloalkanes, such as  $\text{CH}_3\text{F}$  (methyl fluoride),  $\text{CH}_3\text{Cl}$  (methyl chloride),  $\text{CH}_3\text{Br}$  (methyl bromide), etc, with dry silver (I) oxide ( $\text{Ag}_2\text{O}$ ). The equation of the reaction is generally is:



For example, from 1-chloropropane

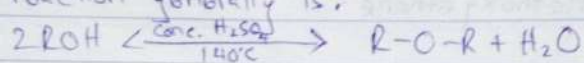


which resulted in propoxypropane.

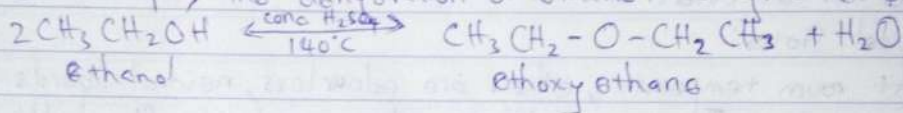


#### b) Partial Dehydration of Alcohols:

Simple ethers are manufactured from alcohols by catalytic dehydration. The alcohol (in excess) and concentrated tetraoxosulphate (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. The equation of the reaction generally is:



For example, the dehydration of ethanol to give ethoxyethane



#### 4. Uses of ethylene oxide include:

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