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DEPARTMENT: MEDICINE AND SURGERY

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CHM 102 ASSIGNMENT

1. Give the IUPAC names of the following organic compounds.

Answer

- $\text{CH}_3\text{OCH}_3 \rightarrow$  Methoxymethane
- $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3 \rightarrow$  Ethoxyethane
- $(\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2)_2\text{O} \rightarrow$  Butoxybutane.
- $\text{CH}_3\text{CH}_2\text{OCH}_3 \rightarrow$  Methoxyethane.
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_3 \rightarrow$  Ethoxypropane.

2. Discuss the properties of ethers.

Answer.

- i) Physical states: Ethers are colourless, neutral liquids with pleasant odours at room temperature. The lower aliphatic ethers are highly flammable gases or volatile liquids.
- ii) Solubility: Ethers are less soluble in water than 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 bond with the water molecules. There is a rapid decline in solubility as the hydrocarbon content of the molecules increases. They are miscible with most organic solvents.
- iii) Boiling point: Low molecular mass ethers have a boiling point lower than the corresponding alcohols but for 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 suitable available hydrogen for association through hydrogen bonds.

(iv) Density: Most of the simple ethers are less dense than water, although the density increases with increasing molecular mass and some of the aromatic ethers are in fact denser than water.

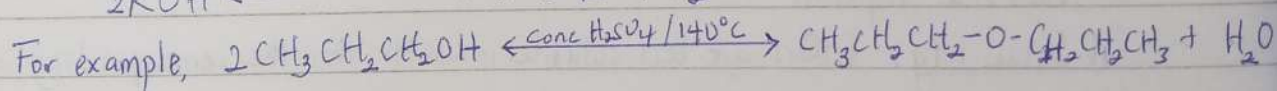
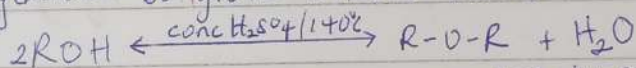
(v) Reactivity: Ethers are inert at moderate temperature. Their inertness at moderate temperatures leads to their wide use as reaction media.

Note: Simple ethers are not found commonly in nature but the ether linkage is present in such natural products as sugars, starches and cellulose.

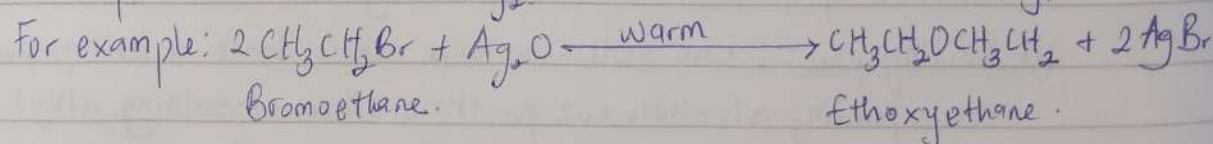
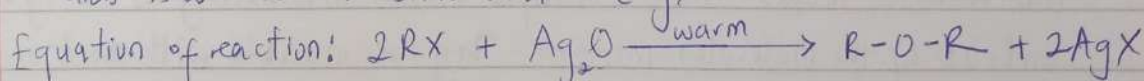
3. Discuss explicitly two methods of preparing ethers and show equations of reaction.

Answer

(i) 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 should be as high as  $170^{\circ}\text{C} - 180^{\circ}\text{C}$ , further dehydration to yield alkene occurs



(ii) From Haloalkanes and dry silver (I) oxide: Ethers ~~are~~ <sup>is</sup> produced when haloalkanes is warmed with silver (I) oxide (dry).



4. State three uses of ethylene oxide

Answer

(i) Ethylene oxide is used as an intermediate in the hydrolytic manufacture of ethylene glycol

(ii) It is used in the preparation of nonionic emulsifying agents, plastics and synthetic fibres

(iii) Ethylene oxide is used as a gaseous sterilizing agent