

NAME: AMADI SARIMA MILDRED

DEPARTMENT: MEDICINE AND SURGERY

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COURSE: CHM 102 (General Chemistry II)

1. Give the IUPAC names of the following organic compounds

(i) CH_3OCH_3 - methoxymethane

(ii) $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$ - Ethoxyethane

(iii) $(\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2)_2\text{O}$ - Dibutyl ether

(iv) $\text{CH}_3\text{CH}_2\text{OCH}_3$ - Ethyl methyl ether

(v) $\text{CH}_3\text{CH}_2\text{OCH}_3$ - Ethyl methyl ether

(vi) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_3$ - Ethyl propyl ether

2a. Physical Properties

An ether molecule has a net dipole moment due to the polarity of C-O bonds. The boiling point of ethers is comparable to the alkanes but much lower than that of alcohols of comparable molecular mass despite the polarity of the C-O bond. The miscibility of ethers with water resembles those of alcohols. Ether molecules are miscible in water. This is attributed to the fact that like alcohol, of comparable molecular mass despite the polarity of the C-O bond, the oxygen atom of ether can also form hydrogen bonds with a water molecule.

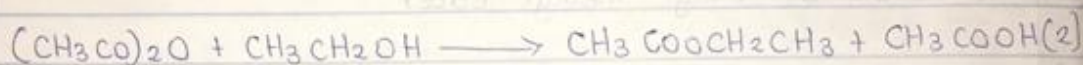
b. Chemical Property

Doesn't react with bases, active metals, oxidizing agents and reducing agents. Strong acid will cleave esters at elevated temperatures. When stored in presence of oxygen, esters will form explosive peroxides such as diethyl ether peroxide.

3a. Making ~~the~~ esters with acid anhydrides

This reaction can again be used to make esters from both alcohols and Phenols. The reactions are slower than the corresponding reactions with acyl chlorides, and you usually need to warm the mixture. In the case of Phenol, you can react the phenol with Sodium hydroxide solution first, producing the more reactive phenoxide ion.

Taking ethanol reacting with ethanoic anhydride as a typical reaction involving an alcohol: There is a slow reaction at room temperature (or faster on warming). There is no visible change in the colorless liquids, but a mixture of ethyl ethanoate and ethanoic acid is formed



The reaction with Phenol is similar, but will be slower.

Phenyl ethanoate is formed together with ethanoic acid.

If the Phenol is first converted into Sodium Phenoxide by adding Sodium hydroxide solution, the reaction is faster.

Phenyl ethanoate is again formed, but this time the other product is Sodium ethanoate rather than ethanoic acid.

3b. Making esters from Carboxylic acids

This method can be used for converting alcohols into esters, but it doesn't work with Phenols compounds

where the -OH group is attached directly to the benzene ring. Phenols react with carboxylic acids so slowly that the reaction is unusable for Preparation purposes.

Esters are produced when carboxylic acids are heated with alcohols in the presence of an acid catalyst. The catalyst is usually concentrated Sulphuric acid. Dry hydrogen chloride gas is used in some cases, but these tend to involve aromatic esters (ones where the carboxylic acid contains a

benzene ring). The esterification reaction is both slow and reversible

* Uses of ethylene oxide:

1) It is used for the sterilization of medical equipment, including the sterilization of personal protective equipment used by doctors and hospitals across the country.

2) Ethylene oxide is used as an intermediate in the production of other chemicals used to manufacture products, such as fabrics for clothes, upholstery, carpet and pillows

3) Ethylene glycol, which is derived from ethylene oxide, is used to manufacture fiberglass used in products ranging from jet skis to bathtubs to bowling balls, as well as polyethylene terephthalate (PET) plastic resin to make beverage containers and packaging film