

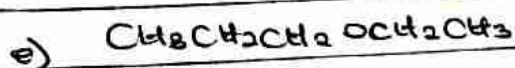
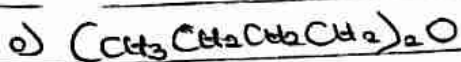
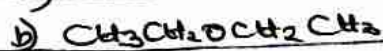
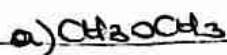
CHM 102

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MORS

19/MCHS01/372

1) Give the IUPAC names of the following organic compounds

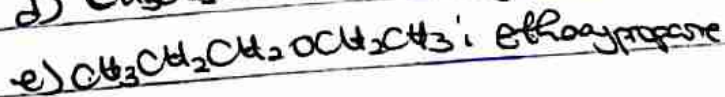
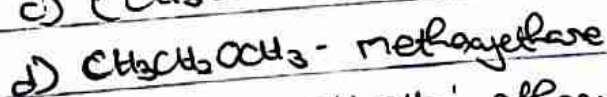
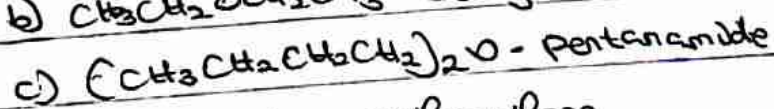
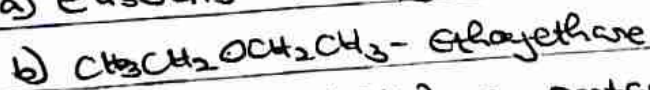
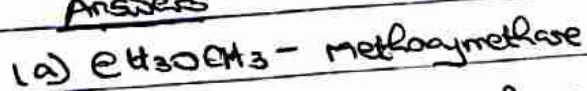


2) Discuss the properties of ethers

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

4) State three uses of ethylene oxide

Answers



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, the oxygen atom of ether can also form hydrogen bonds with a water molecule.

b) Chemical properties

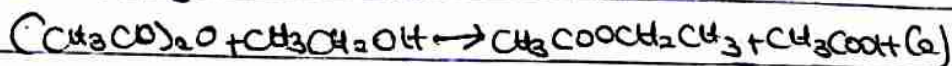
Doesn't react with bases, active metals, oxidizing agents and reducing agents

Strong acids will cleave ethers at elevated temperatures. When stored in presence of oxygen, ethers will form explosive peroxides such as diethyl ether peroxide.

3a) Making 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 a 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.

b) 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 a 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.

10) A small but important use of ethylene oxide is the

sterilization of medical equipment, including the sterilization

of personal protective equipment and by doctors and

hospitals across the country.

11) Most 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.

12) Ethylene glycol, which is derived from ethylene oxide, is used

to manufacture fiberglass used in products ranging from

jet axes to bathtubs to bowling balls, as well as

polyethylene terephthalate (PET) plastic resin to

make beverage containers and packaging film.