

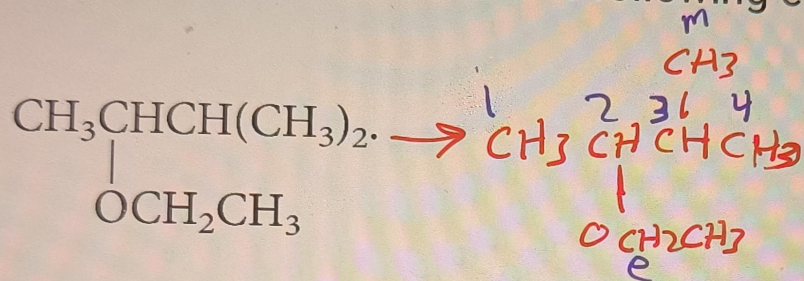
Physical Properties of Ethers

*hydrogen bonds > dipoles > London forces

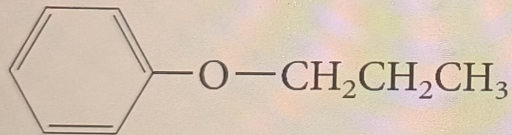
Table 8.1 Properties of Alcohols, Ethers, and Hydrocarbons of Similar Molecular Weight

Compound	Formula	bp	mol wt	Water solubility (g/100 mL, 20°C)
1-butanol	CH ₃ CH ₂ CH ₂ CH ₂ OH	118°C	74	7.9
diethyl ether	CH ₃ CH ₂ —O—CH ₂ CH ₃	35°C	74	7.5
pentane	CH ₃ CH ₂ —CH ₂ —CH ₂ CH ₃	36°C	72	0.03

What are the correct names for the following ethers?



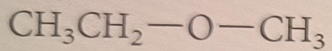
2-ethoxy-3-methylbutane



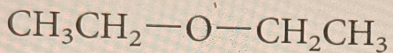
propoxy benzene

Nomenclature of Ethers

مقدمة *

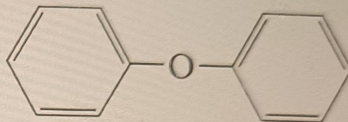


ethyl methyl ether



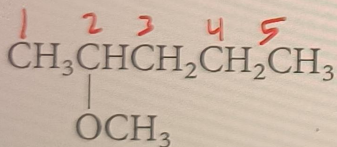
ethyl ether ✓

✓ diethyl ether (the prefix di- is sometimes omitted)



diphenyl ether ✓

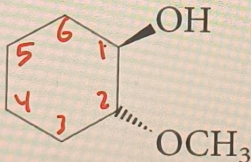
phenyl ether ✓



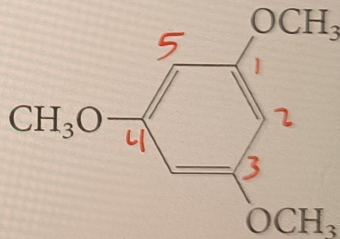
2-methoxypentane

OR: alkoxy

* أو لوية ر هـ أكثر صه OR



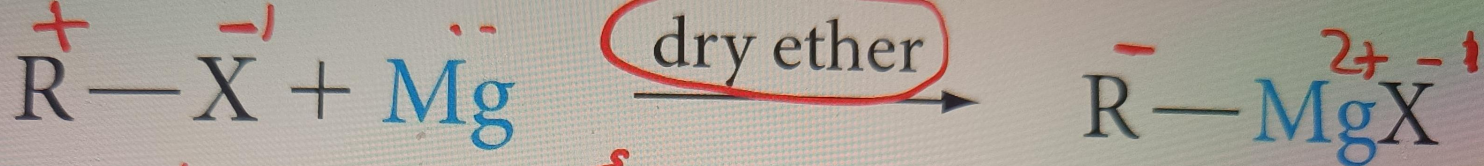
trans-2-methoxycyclohexanol



1,3,5-trimethoxybenzene

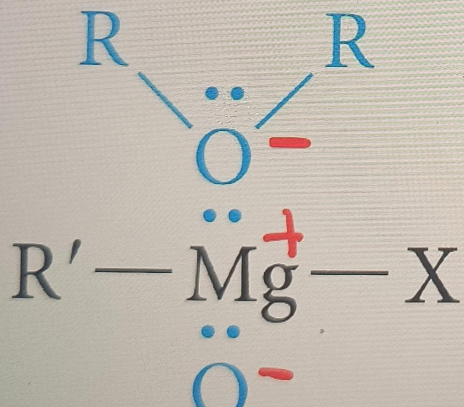
h ethers cannot form hydrogen bonds with one
n bonds with alcohols. This explains why ethe
r soluble.

water



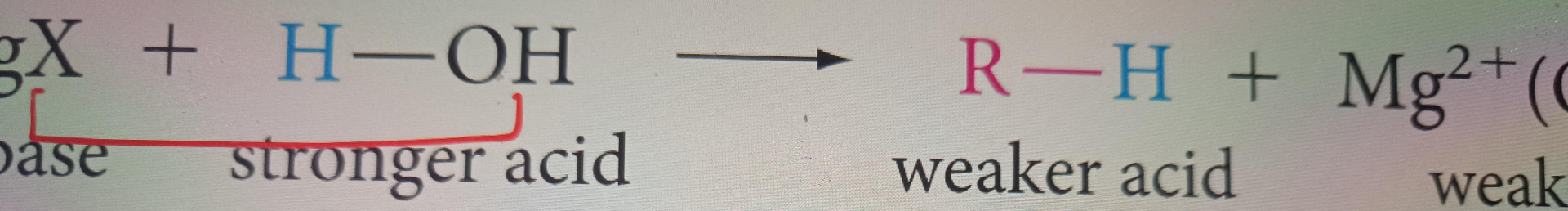
تفاعل تآكسد و اختزال

a Grignard reagent

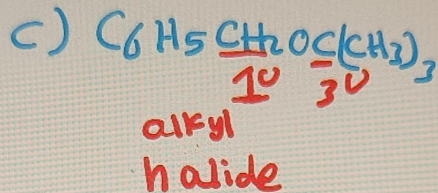
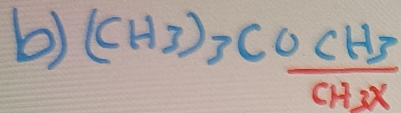


e^- donor

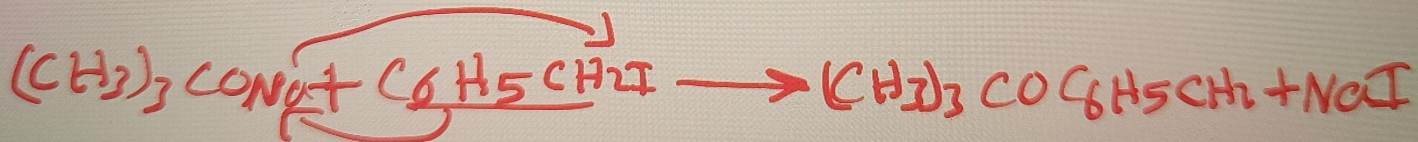
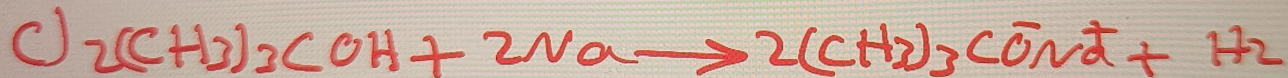
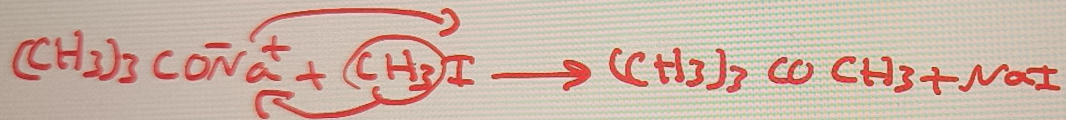
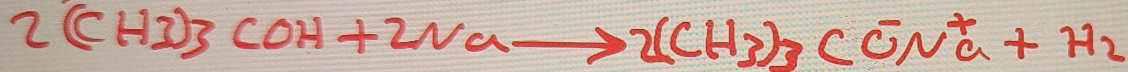
Acting as a Lewis base, ether
stabilizes a Grignard reagent.



*acid base reaction alkane



b)

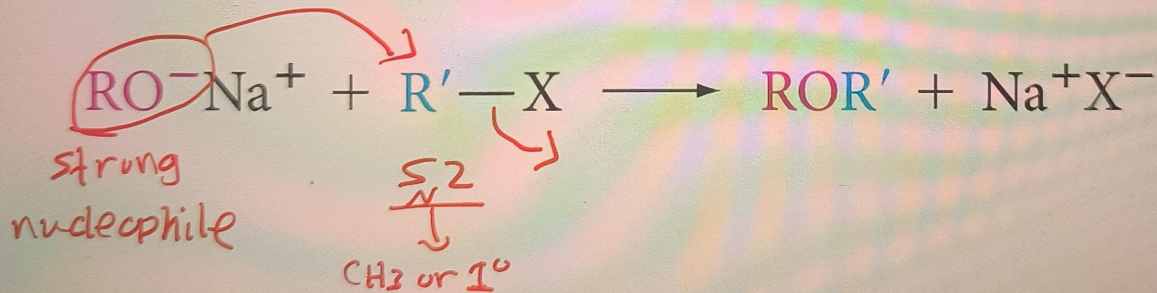


Williamson Synthesis For symmetrical and unsymmetrical ether

① first step, an alcohol is converted to its alkoxide by treatment with a reactive metal (Na or K) or metal hydride

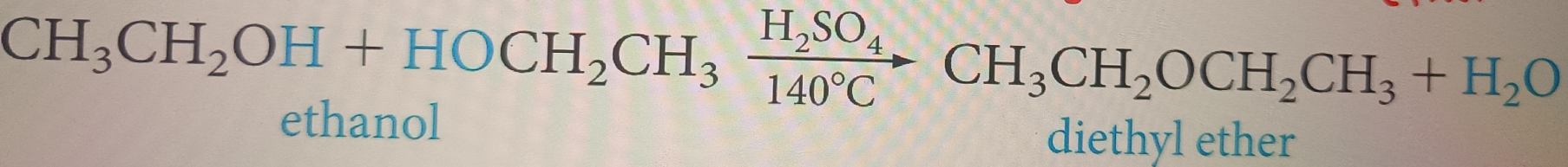


② In the second step, an $\text{S}_{\text{N}}2$ displacement is carried out between the alkoxide and an alkyl halide

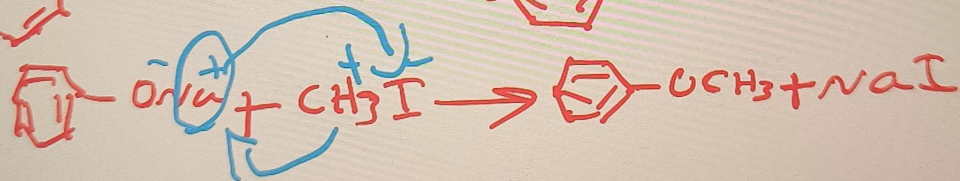
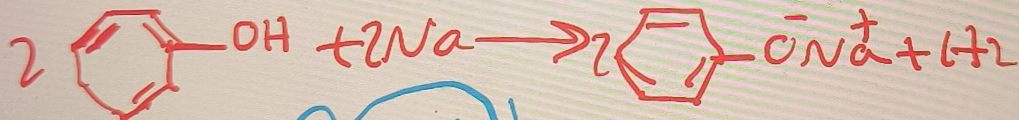
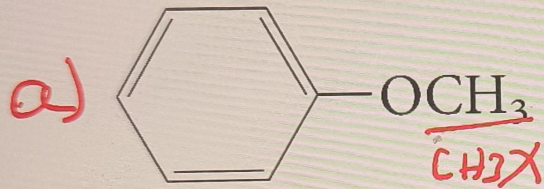


Preparation of Ethers

* Condensation reaction



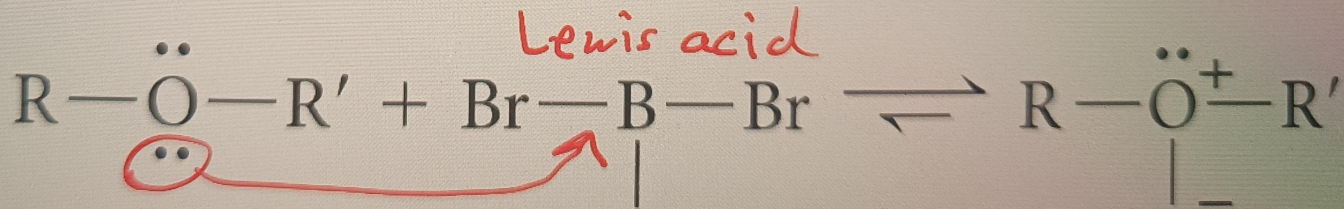
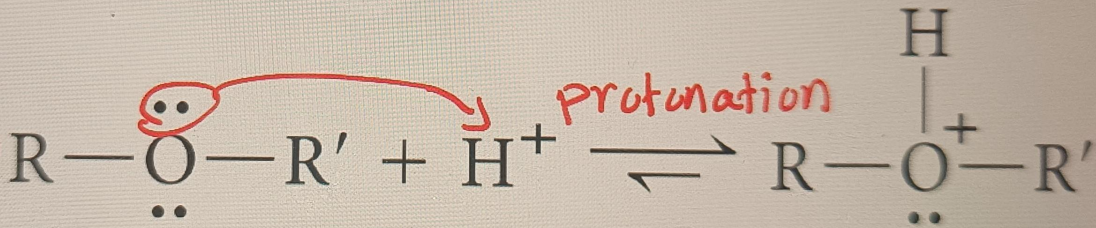
Show how this compound could be made

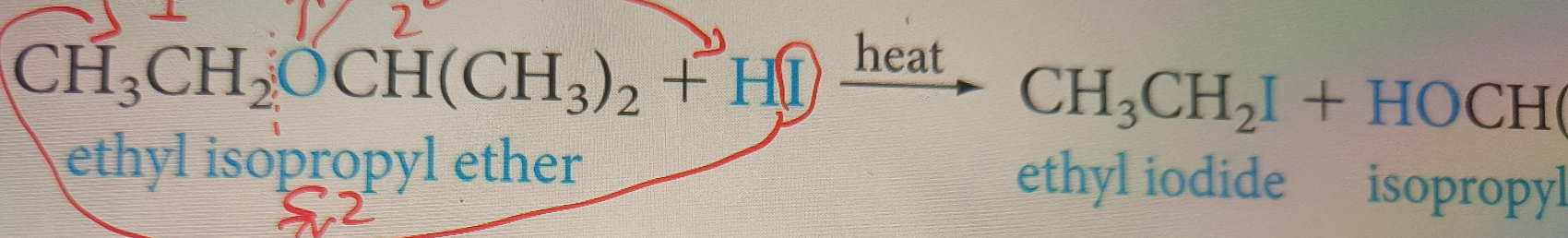


Ethers have unshared e^- pairs on the oxygen atom and are therefore Lewis bases. They react with strong proton acids and with Lewis acid such as the boron halides.

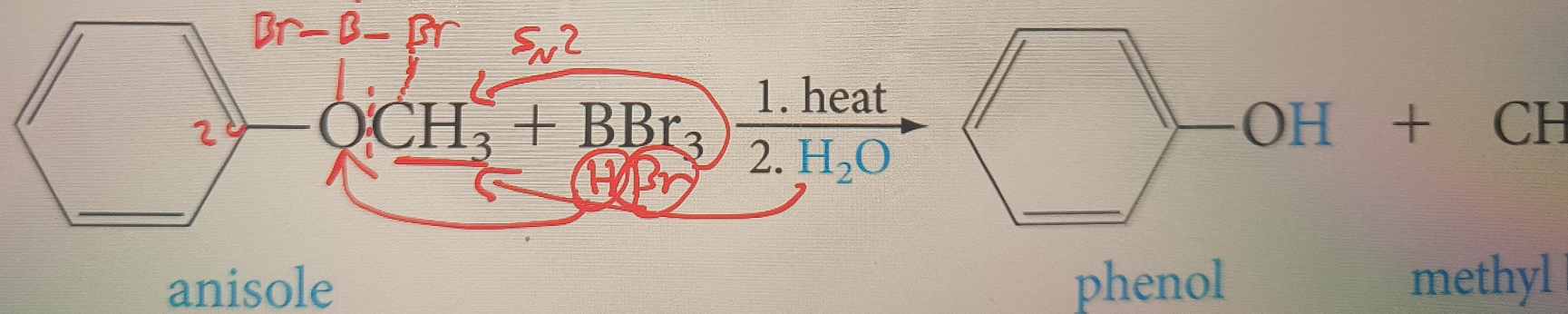
*OR, OH

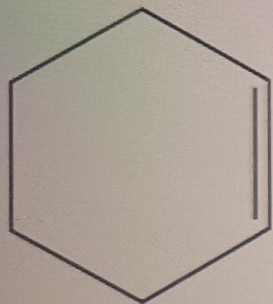
bad leaving groups



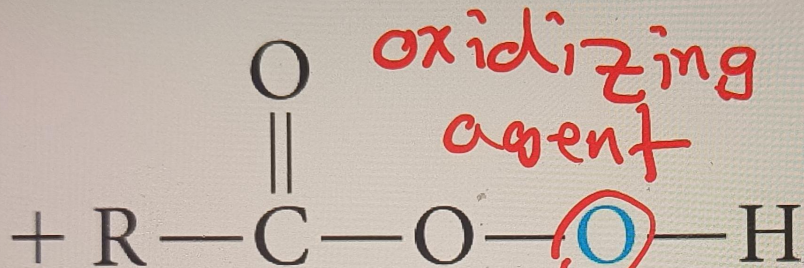


I attacks the least crowded carbon which is the primary carbon.



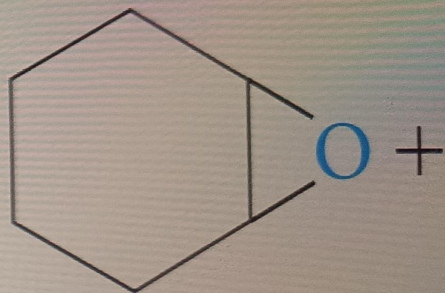


cyclohexene



organic peroxy acid

peracid



cyclohexene oxide

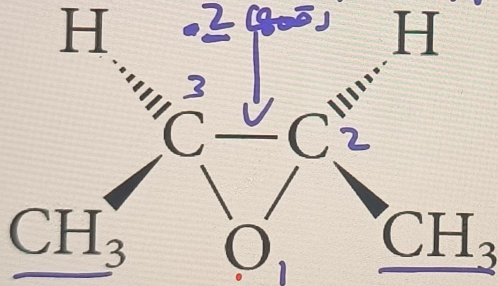
Common names

Epoxides (Oxiranes)

are cyclic ethers with a three-membered ring containing one oxygen atom

* the least stable, the most reactive three-membered ring

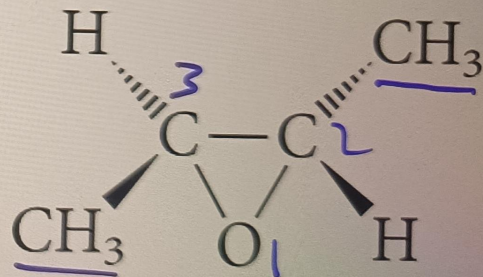
double bond / قوسين يتكونان *



cis-2-butene oxide

(*cis*-2,3-dimethyloxirane)

bp 60°C

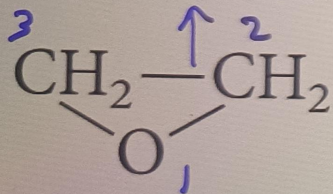


trans-2-butene oxide

(*trans*-2,3-dimethyloxirane)

bp 54°C

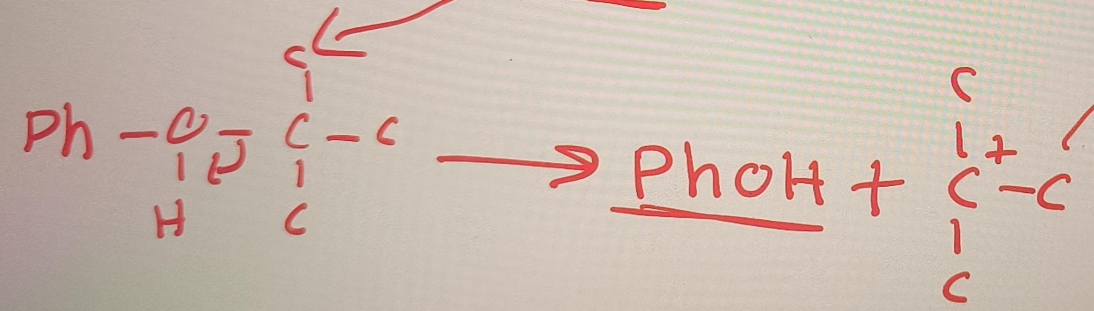
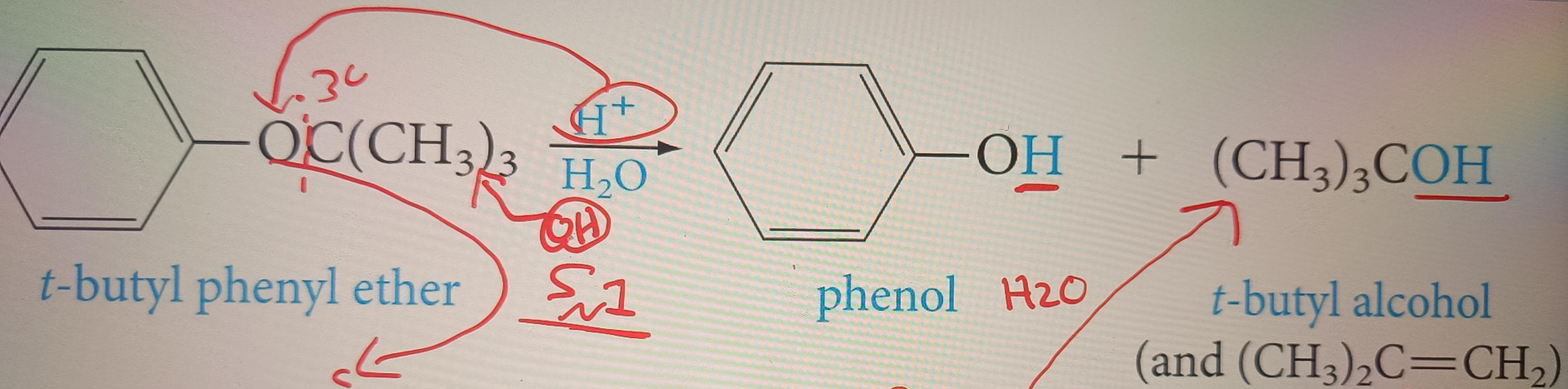
alkene / قوسين *



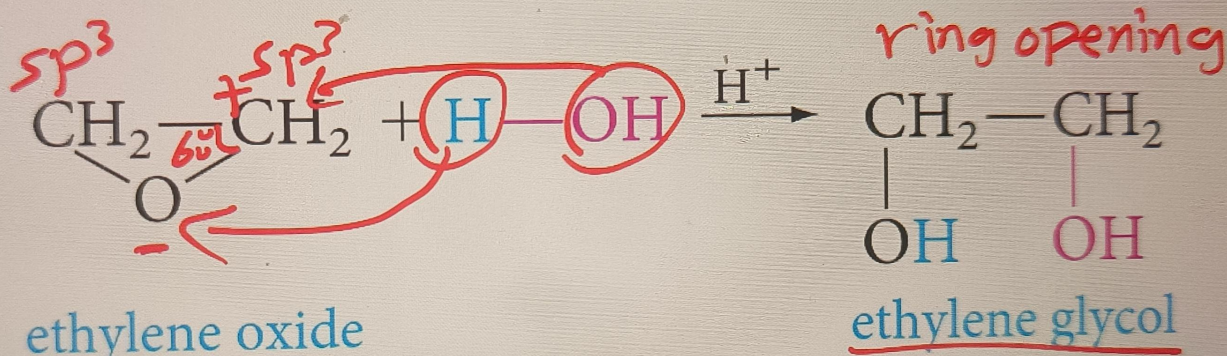
ethylene oxide

(oxirane)

bp 13.5°C



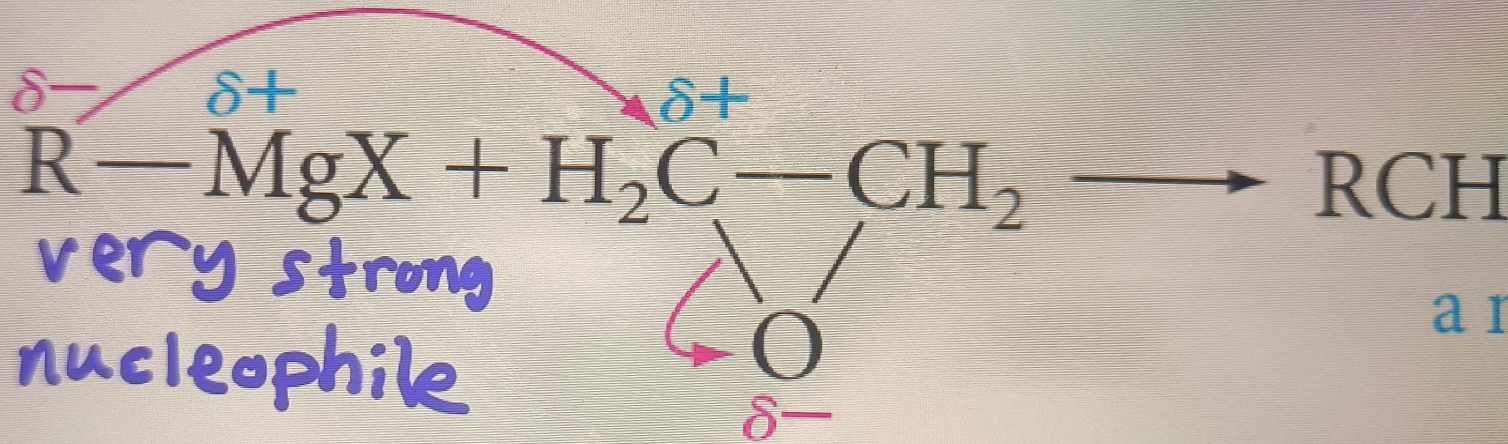
Reactions of Epoxides



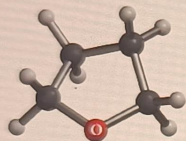
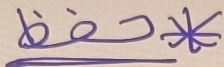
ethylene oxide

ethylene glycol

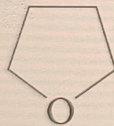
* كلما اقتربت الروابط من بعضها
 كلما كان المركب اقل استقراره.



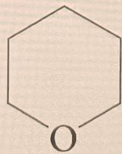
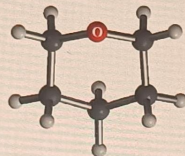
Cyclic Ethers



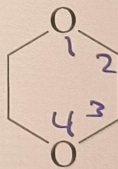
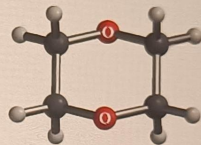
THF



tetrahydrofuran
(oxolane)
bp 67°C



tetrahydropyran
(oxane)
bp 88°C



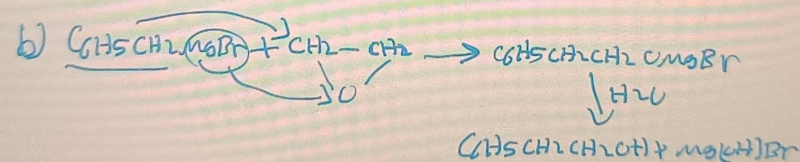
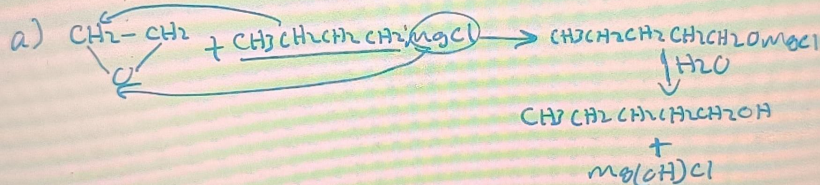
1,4-dioxane
bp 101°C

* nonactin selects K^+ rather than Na^+ because the capacity in this molecule is suitable for the K^+ .

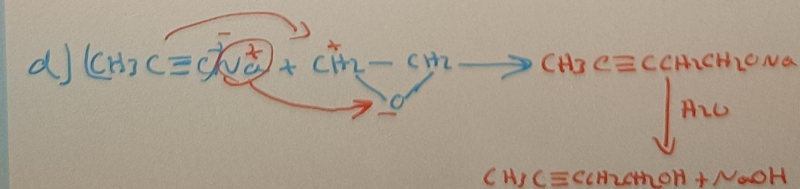
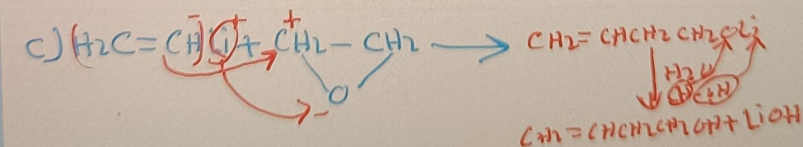
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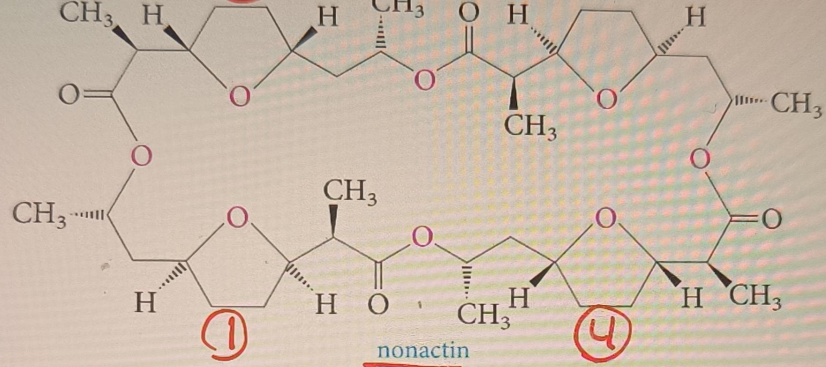
Problem 8.15: Write an equation for the reaction between ethylene oxide and:

- $CH_3CH_2CH_2CH_2MgCl$ followed by hydrolysis
- $C_6H_5CH_2MgBr$ followed by hydrolysis
- $H_2C=CHLi$ followed by hydrolysis
- $CH_3C\equiv C^-Na^+$ followed by hydrolysis



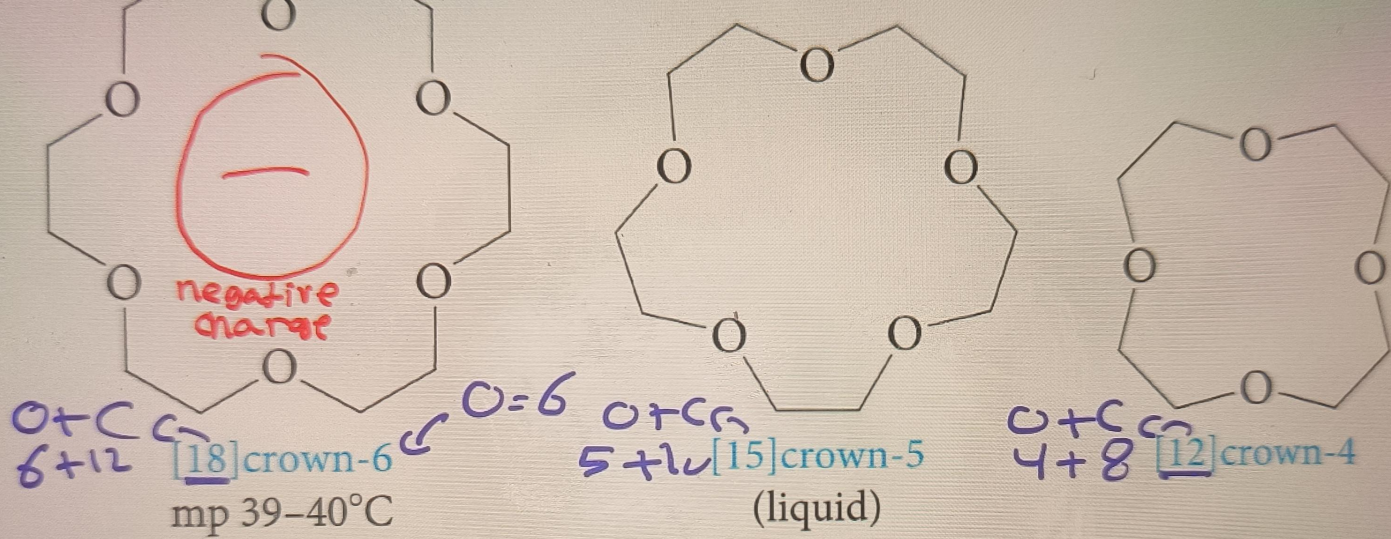
40





The selective binding of metallic ions by macrocyclic compounds is important in nature. Several antibiotics, such as nonactin, have large rings that contain regularly spaced oxygen atoms. Nonactin (which contains four tetrahydrofuran rings joined by four ester links) selectively binds K^+ (in the presence of Na^+) in aqueous media. Thus allowing selective transport of K^+ (but not Na^+) through the cell membranes

** nonactin selects K^+ rather than Na^+ because the capacity in this molecule is suitable for the K^+ .*



*
 These compounds are called Crown ethers because their molecule have a crown-like shape. The bracket number represents the ring size and the terminal numbers gives the number of oxygens. The oxygens are usually separated by two carbons.
 *