29 AUG. 2020

SYNTHETIC REAGENTS

LECTURE-15 , D-III (H)

ORGANIC CHEMISTRY , PAPER-VII

Topic : ORGANOBORANES

B2H6 --> Diborane

* The borane (BH_3) exists as the gaseous dimer, diborane (B_2H_6).

* Diborane is commercially available in the form of complexes with THF and can be prepared from borohydride and boron trifluoride.

$$3\,NaBH_4 + 4\,BF_3 \longrightarrow 3\,NaBF_4 + 2\,B_2H_6$$

* Organoboranes are readily prepared by the addition of borane to olefins and acetylenes.

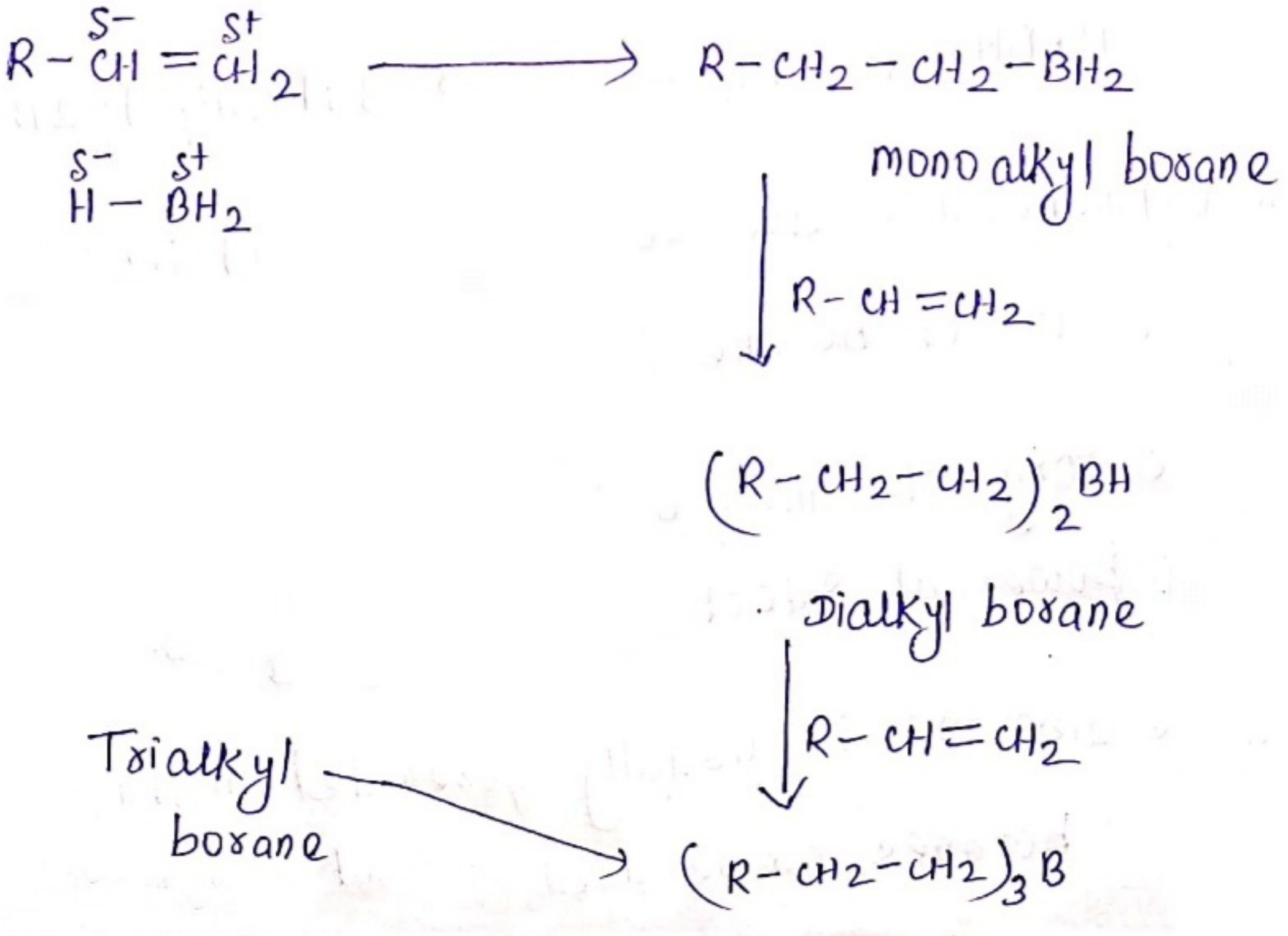
* The organoboranes and boranes were introduced as powerful selective reducing agents.

* The diborane is usually generated insitu, and the alkyl boranes can be used without isolation.

Hydroboration of Olefins 2.

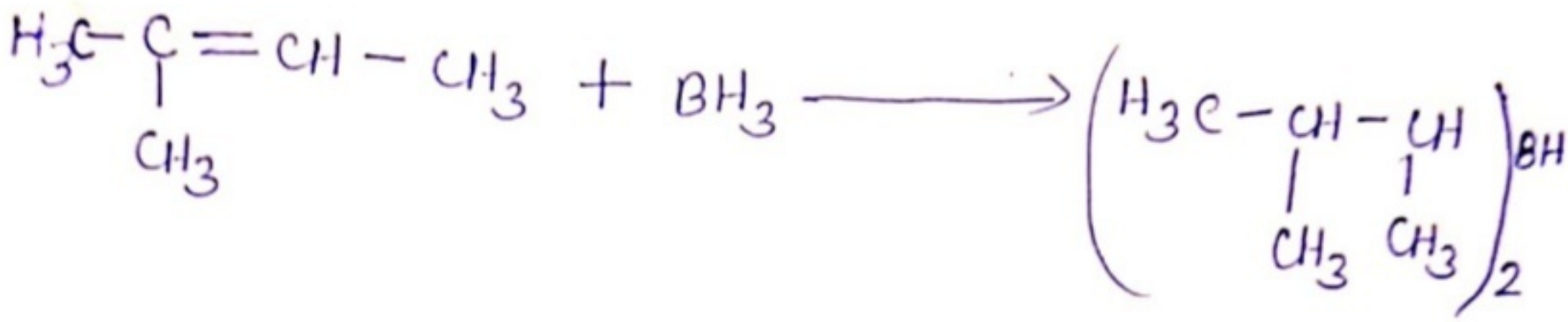
* Hydroboration is the process in which alkyl- and alkenyl boranes are prepared by the addition of borane to olefins and acetylenes.

* Normally, reaction of boranes with olefins does not stop after the addition of one BH_3 molecule, because resulting RBH_2 adds to another molecule of olefin to give R_2BH, which in turn adds to a third olefin molecule. thus the final product is trialkylborane (R_3B).

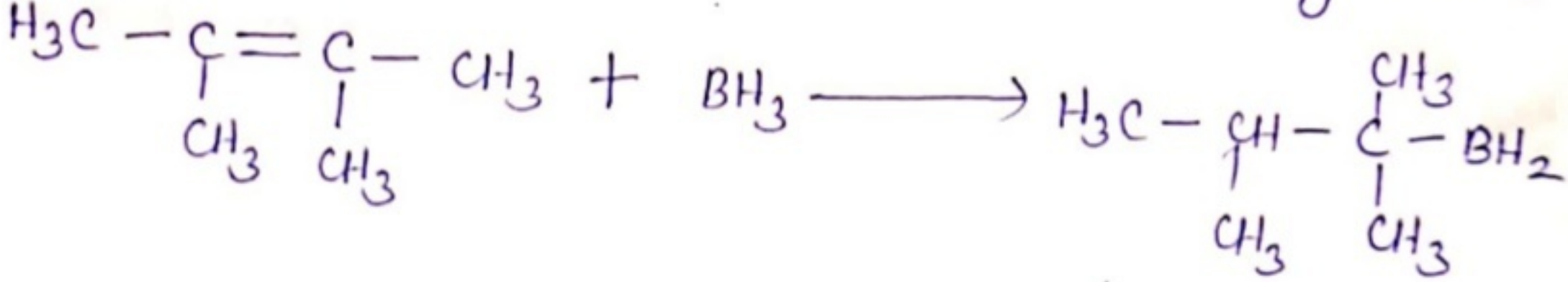


* With simple alkenes, borane reacts with three alkene molecule to form a trialkylborane as shown above.

However, hindered alkenes, owing to steric interactions give only partially substituted boranes as addition products.



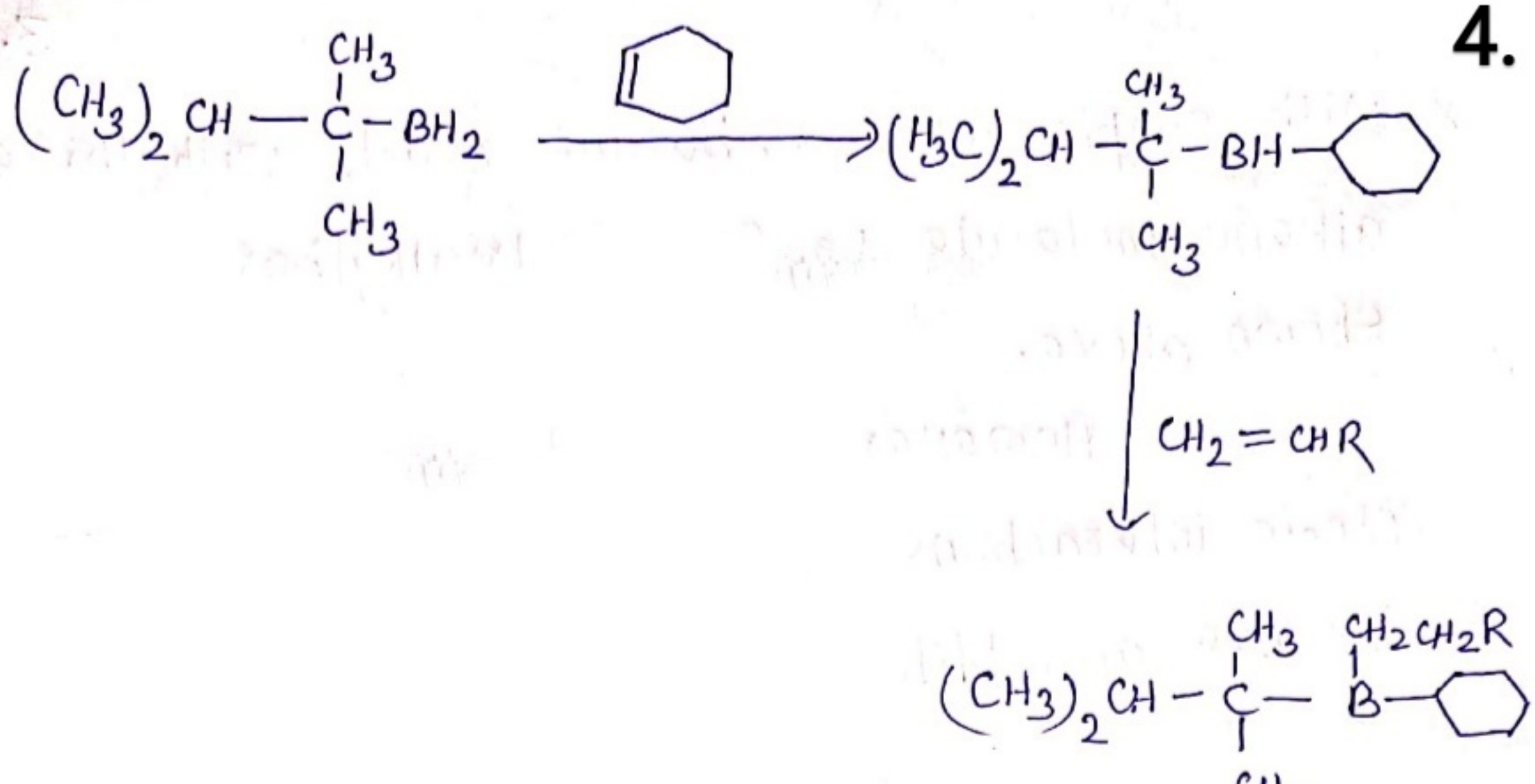
Disiamylborane



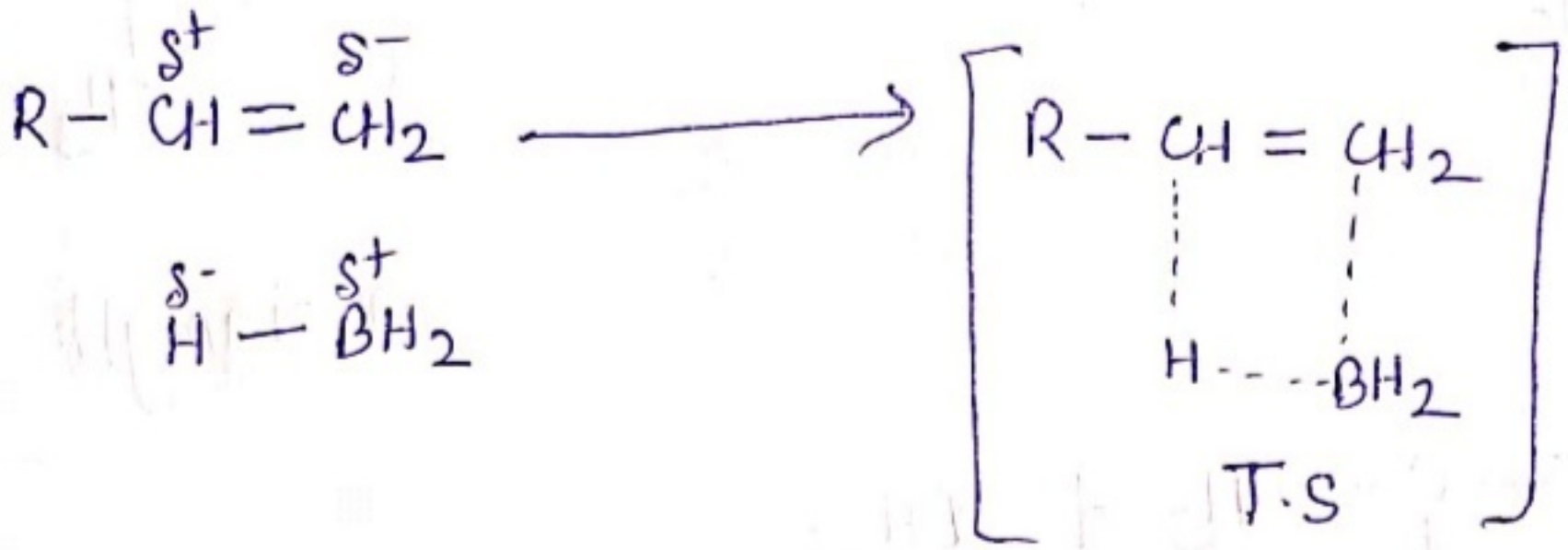
Thexylborane

* It is also possible to prepare mixed trialkylborane by the stepwise addition of monoalkylborane to two different hindered alkenes.

4.



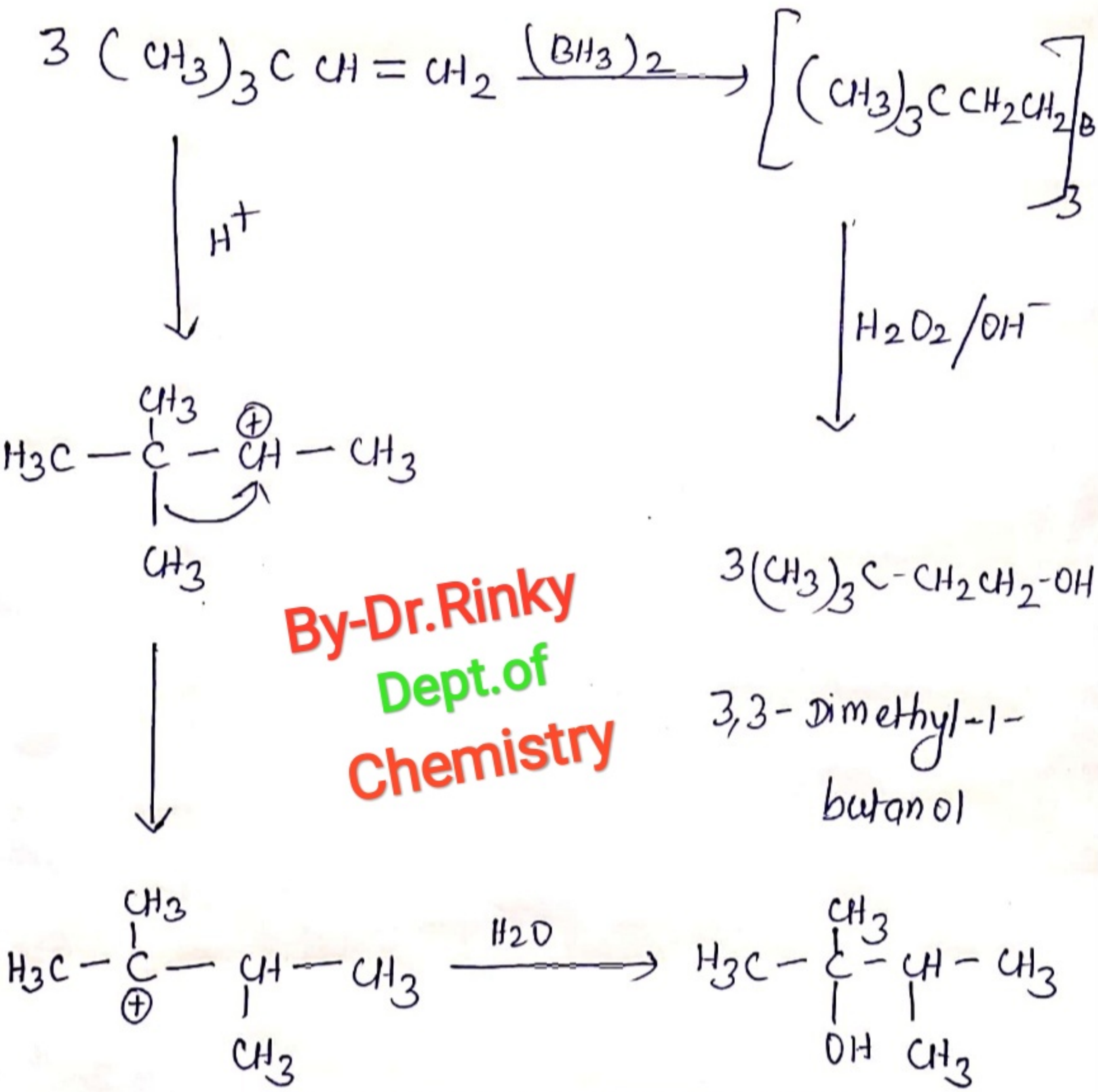
Mechanism



$R-CH_2-CH_2-BH_2$

* Hydroboration unlike ordinary electrophilic addition, proceeds without skeletal rearrangement at normal tempt. because carbocations are not formed as the intermediates.

* Thus, 3,3-dimethyl-1-butene on hydroboration followed by its oxidation yields the expected 3,3-dimethyl-1-butanol and not the rearranged product.



~To be continued in next lecture~