Chapter 9:

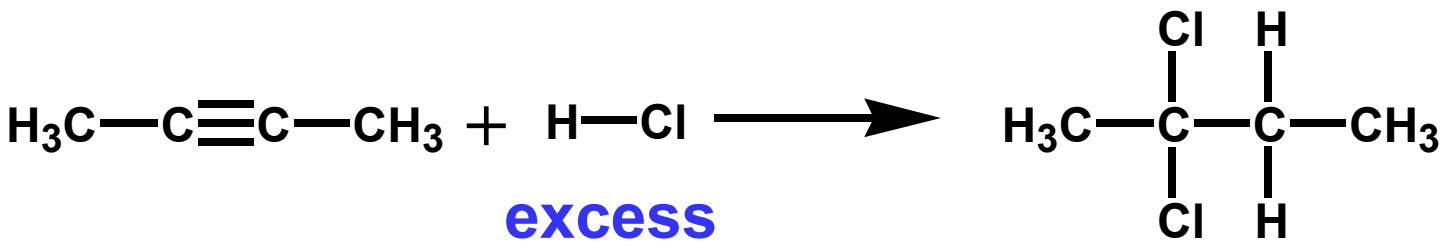
Alkynes and Reactions with Alkynes

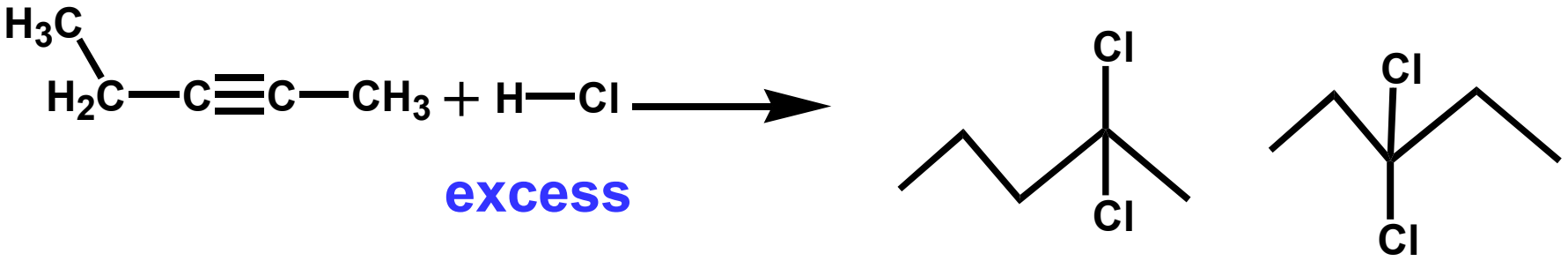
- Today (9.5-9.10) Reactions with Alkynes
- Friday (End Chapter 9)

✓ Preparation of Alkynes
✓ Acetylide Formation
✓ Hydrohalogenation
✓ Anti Markovnikov Hydrohalogenation

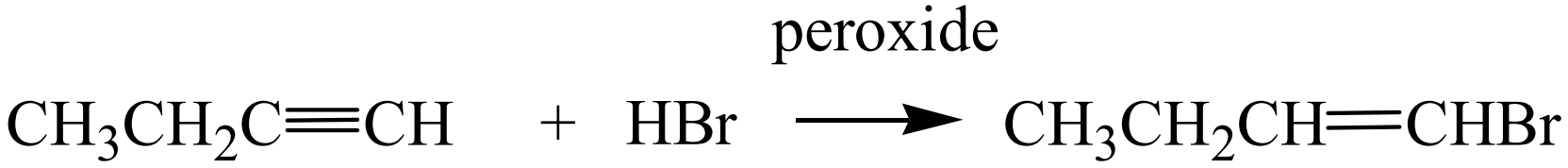
- Addition of Halogens
- Reduction of Alkynes
- Acid Catalyzed Addition of Water
- Hydroboration/Oxidation
- Oxidative Cleavage

Hydrohalogenation of Alkynes

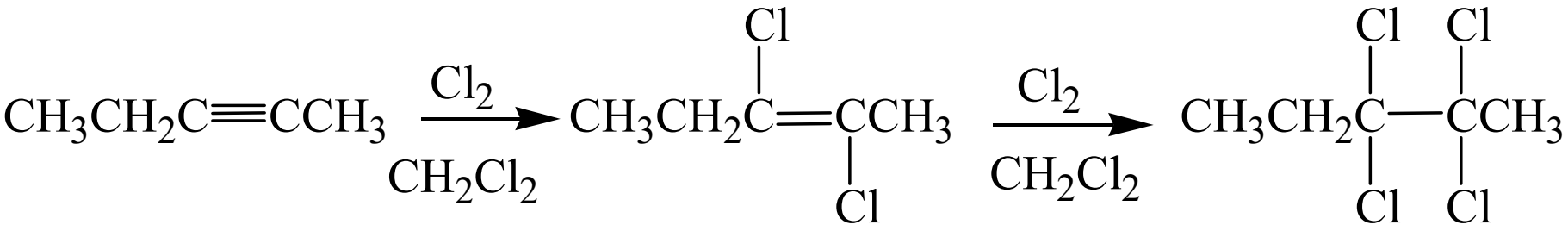


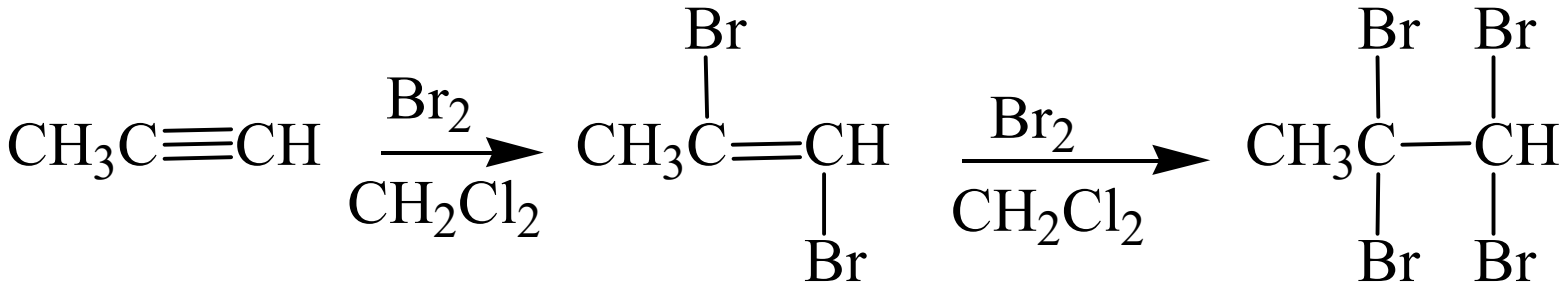


Anti- Markovnikov Addition



Halogenation of Alkynes

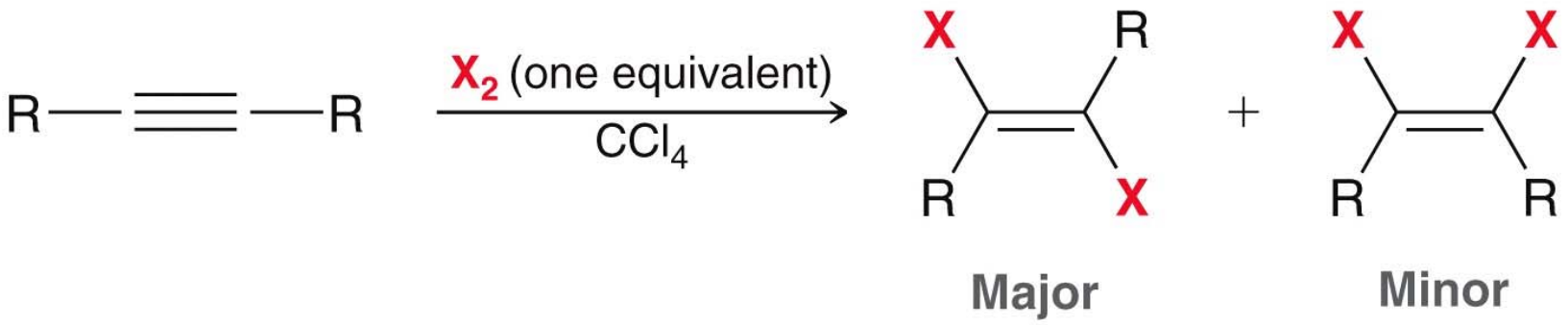




AEVG1

Halogenation of Alkynes

- When one equivalent of halogen is added to an alkyne, both *anti* and *syn* addition is observed

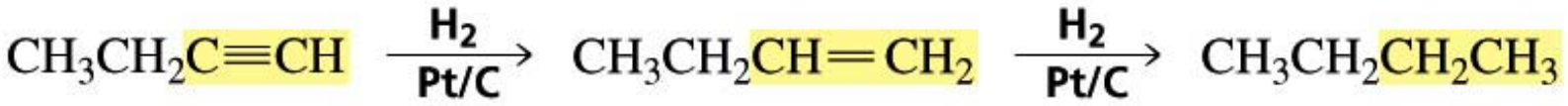


- The mechanism for alkyne halogenation is not fully understood. If it was like halogenation of an alkene, only the *anti* product would be obtained.

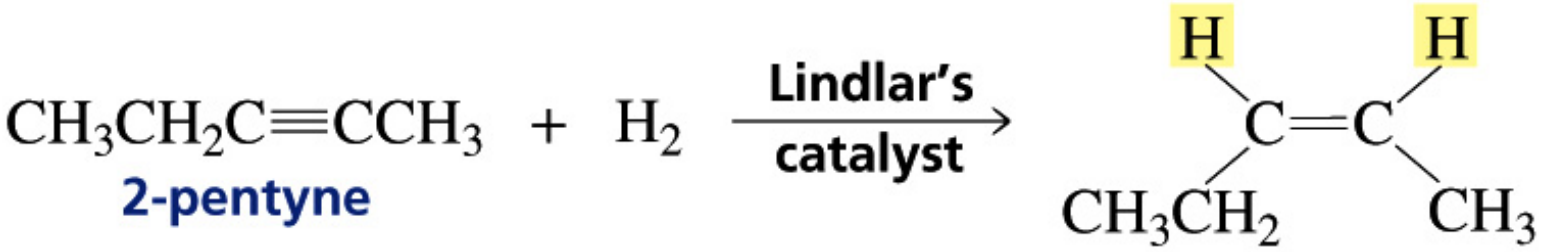
AEVG1 Anne E. V. Gorden, 10/28/2017

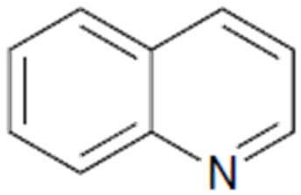
Addition of Hydrogen Formation of Cis Alkene

Like alkenes, alkynes can readily undergo hydrogenation.



A deactivated or poisoned catalyst can be used to selectively react with the alkyne.

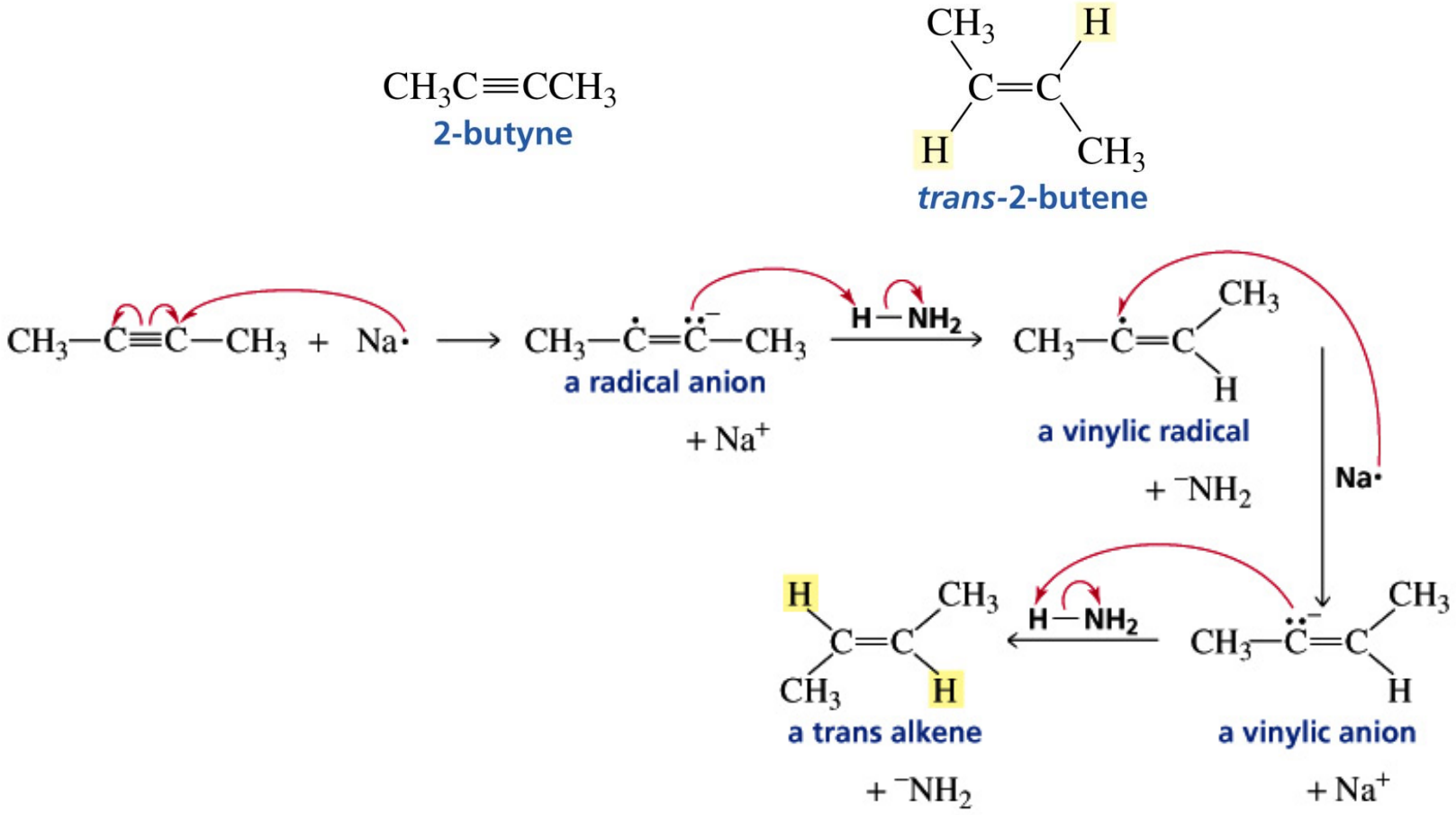


Lindlar's catalyst = 

, Pd / $BaSO_4$, CH_3OH

Quinoline

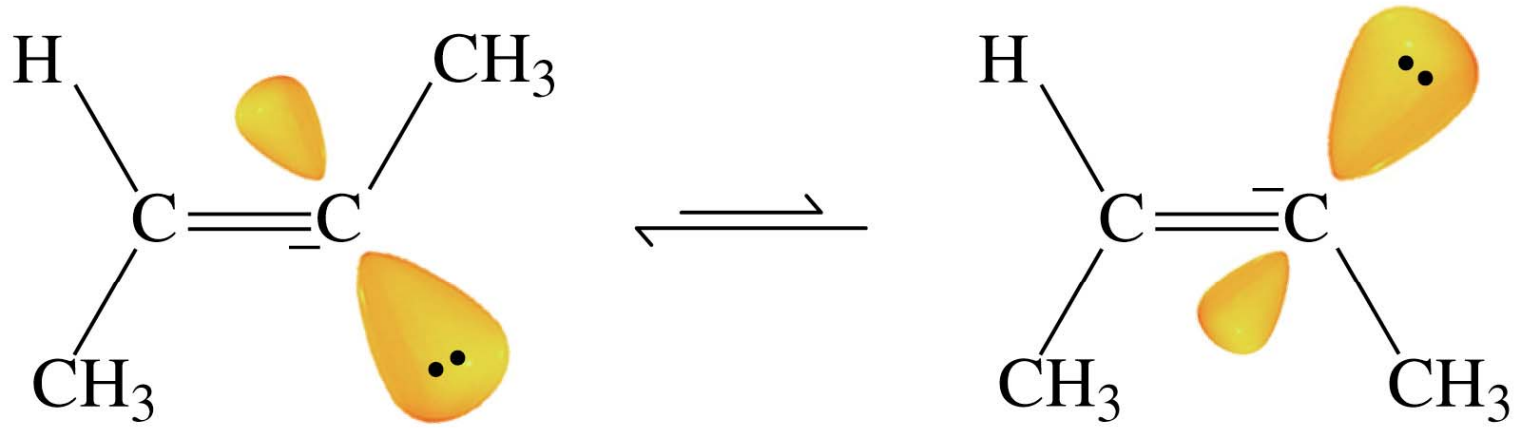
Chemical Reduction of Internal Alkynes to form Trans Alkenes



Dissolving metal conditions can give anti addition producing the trans alkene.

Reason for trans addition:

The radical anion adopts a trans configuration to reduce repulsion.

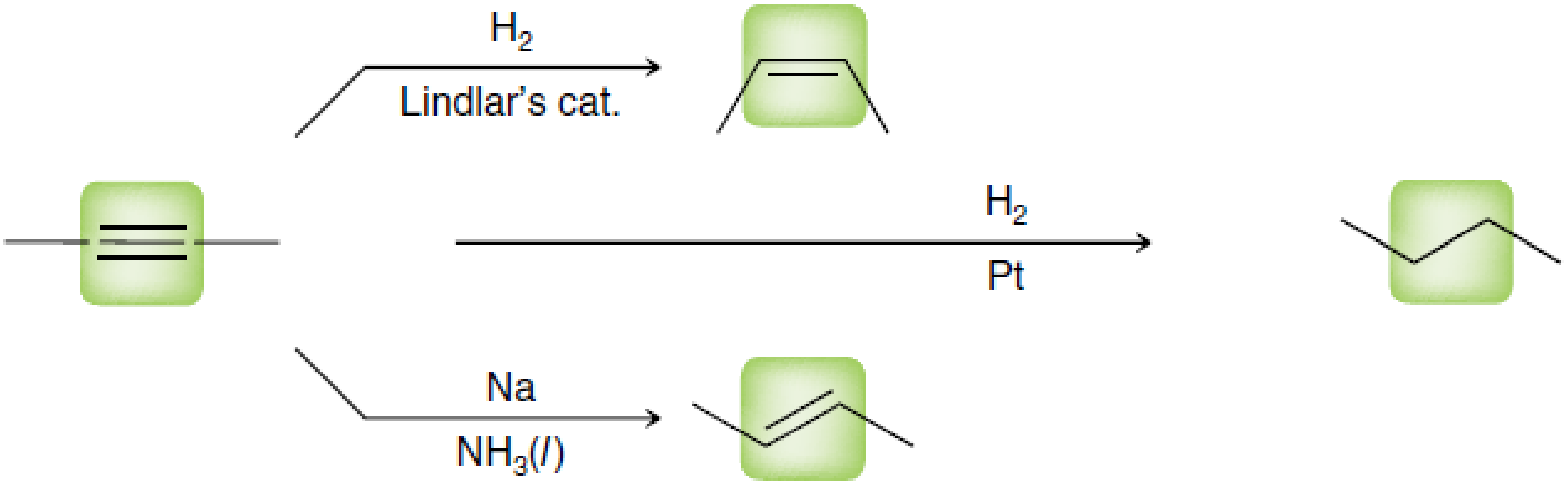


trans vinylic anion
more stable

cis vinylic anion
less stable

Reduction of Alkynes – Summary

- Two equivalents of H_2 are consumed for each alkyne→alkane conversion.



Suggested Homework Problems Chapter 9

1,7,9,13,18,20,32-37, 41,44,52,57