



Pre-Health Post-Baccalaureate Program Study Guide and Practice Problems

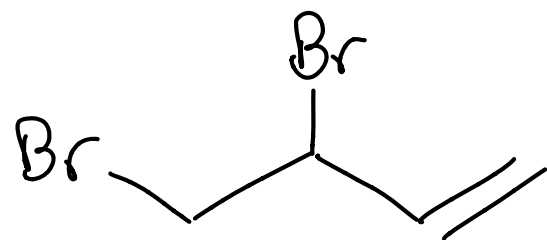
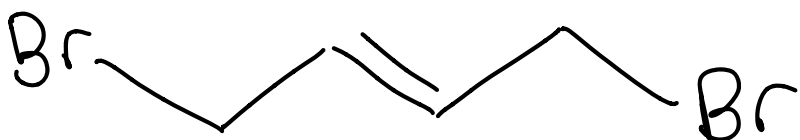
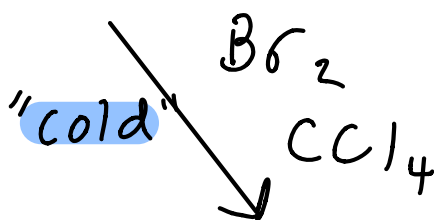
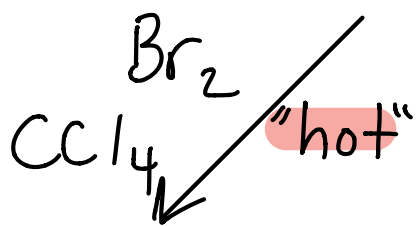
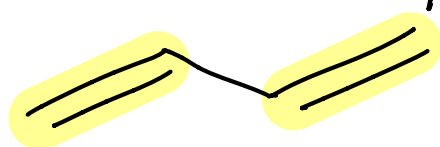
Course: CHM 2211

Textbook Chapter: 20 (Brown 6e)

Topics Covered: Non-Aromatic Conjugate
Additions
Pericyclic Reactions

Conjugate Additions

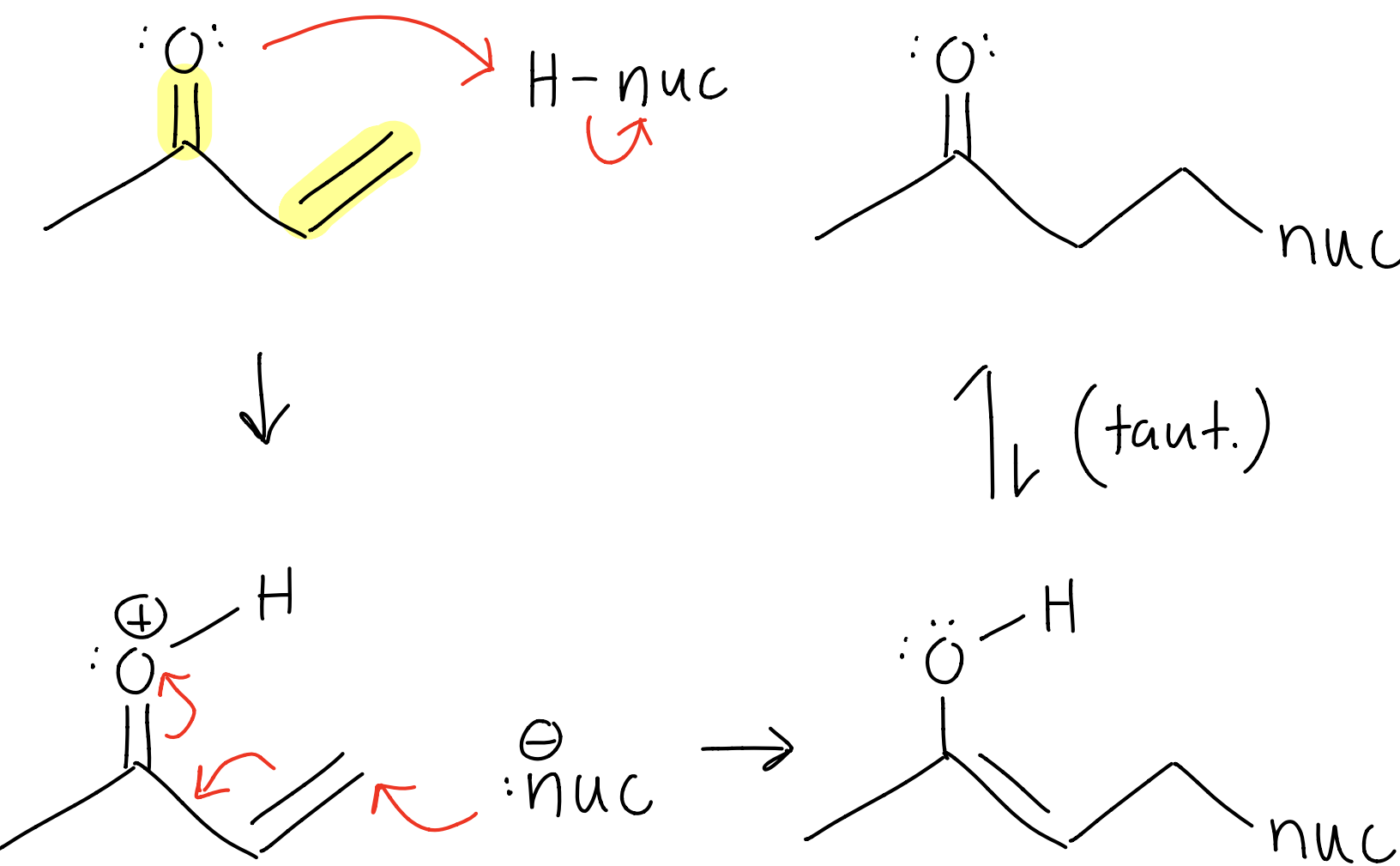
- We've done additions to alkenes before, but now we'll work with conjugated alkenes
- The resulting products can be 1,2 or 1,4
- Let's look at 1,3-butadiene...
What's the temperature?



1,4-product
"thermodynamic product"

1,2-product
"kinetic product"

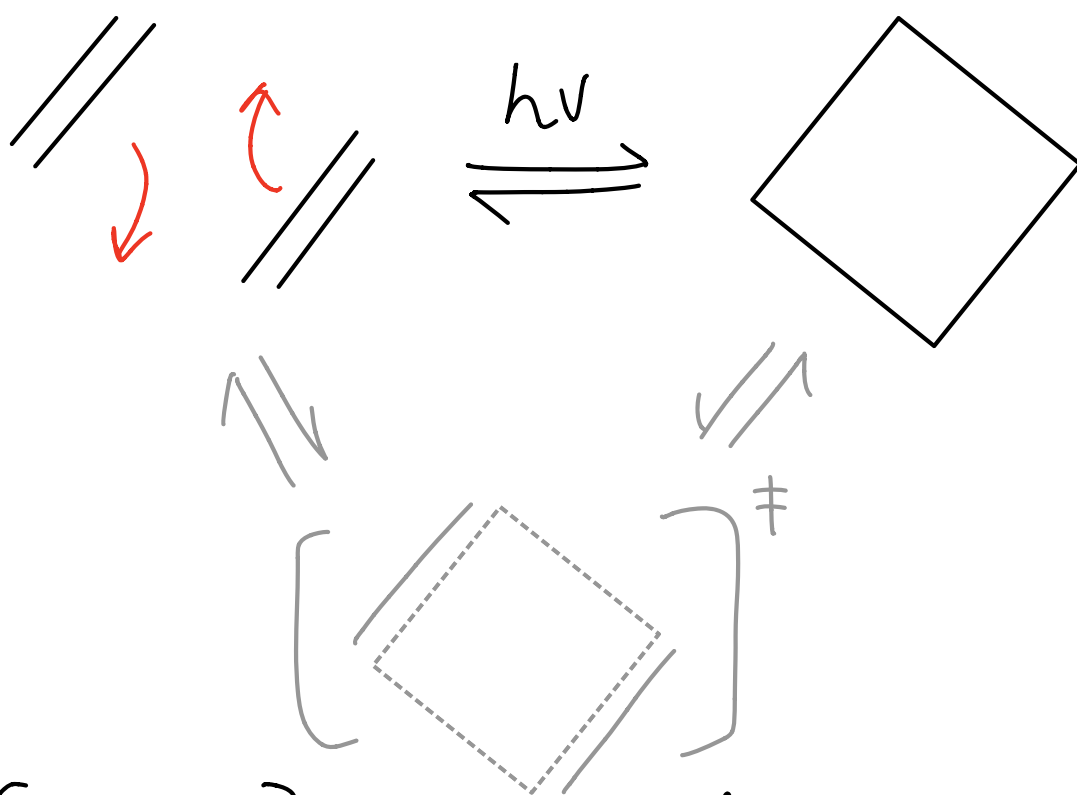
- This is most useful in helping us understand Michael Reactions.
- Michael Reactions involve a nucleophilic attack on an α, β -unsaturated carbonyl (think MVK).



— Compare this mechanism
to mows #4 and #9

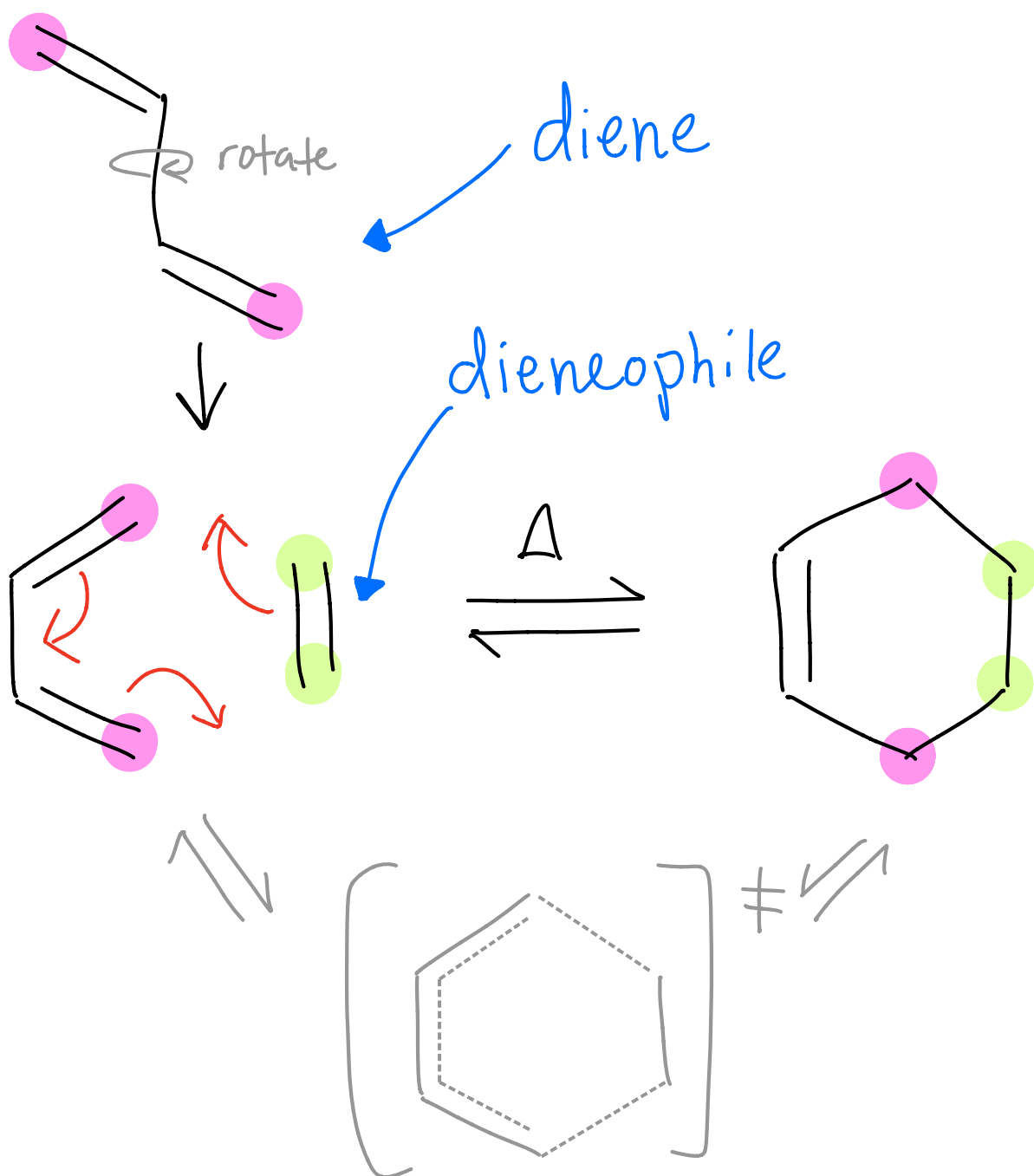
Pericyclic Reactions

- [2 + 2] cycloadditions occur when two adjacent ethylene molecules, positioned perfectly, react (catalyzed by light):



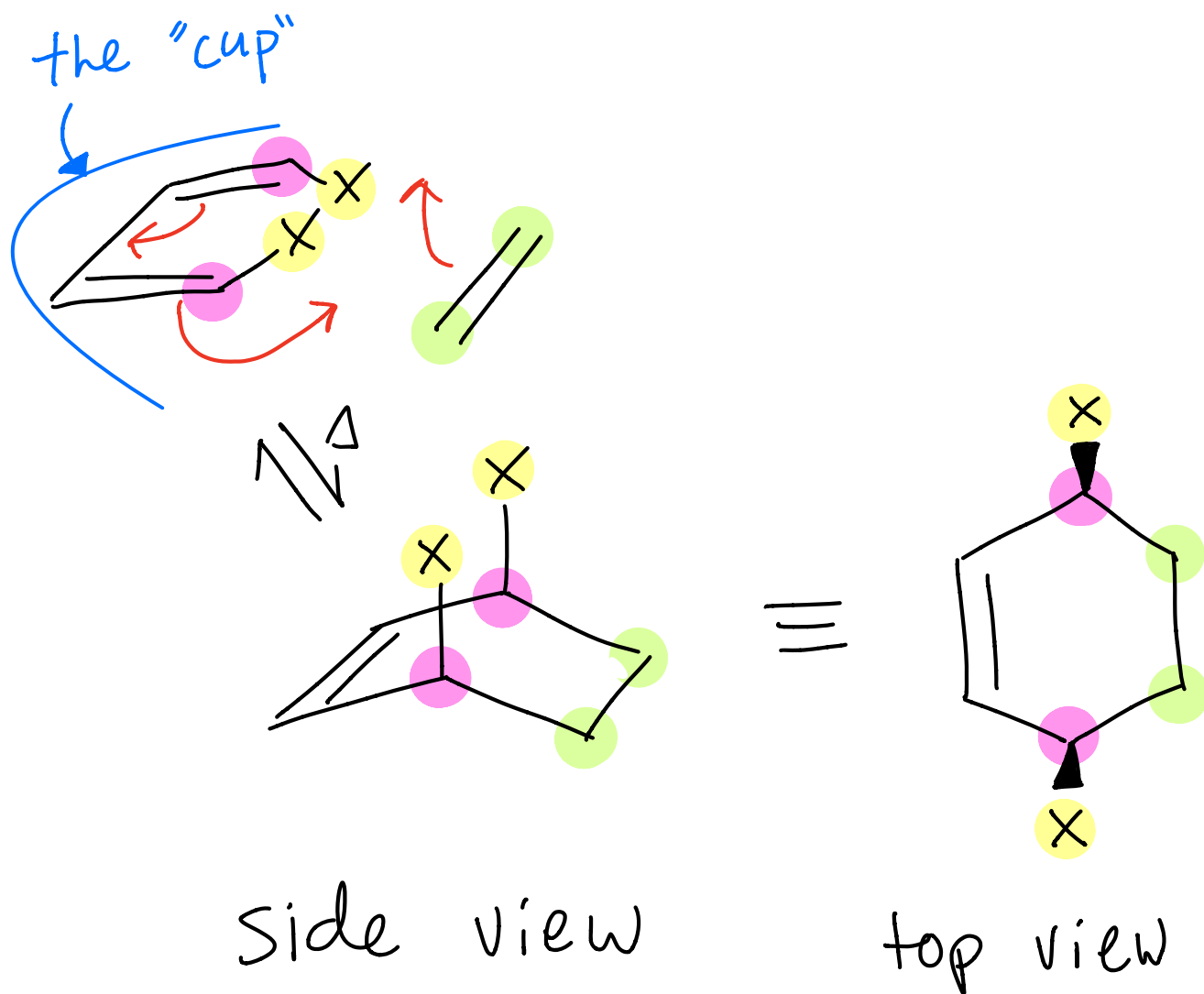
[2 + 2] is said to be "photochemically allowed" and "thermally forbidden"

- [4+2] cycloadditions occur when an electron-rich diene reacts with an electron-poor dienophile (catalyzed by heat)



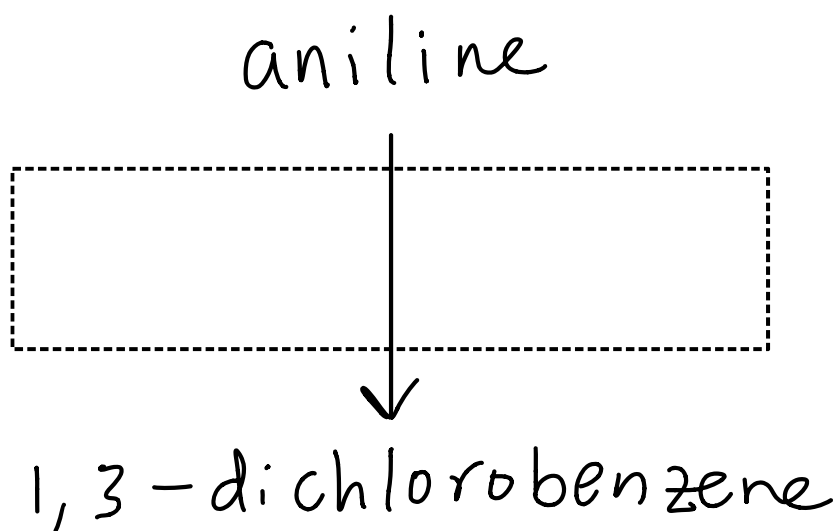
$[4+2]$ is said to be "thermally allowed" and "photochemically forbidden"

— The $[4+2]$ is the basis for the famous Diels-Alder Reaction: follow the rule, "in the 'cup', push it up!"



Problems

- ① Fill in the reagents and conditions for the following reaction:



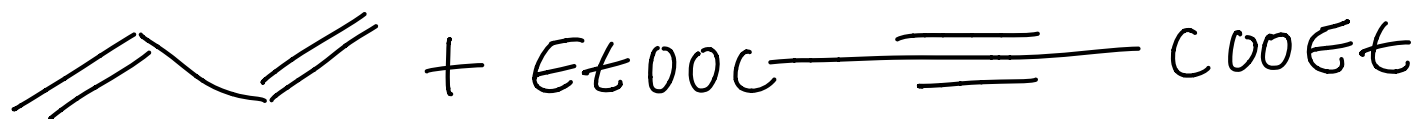
②

A [4+2] cycloaddition is...

1	v.	2
photochemically allowed		thermally forbidden

- a) 1
- b) 2
- c) Both
- d) Neither

③ How many pi bonds are in the expected product of the following cycloaddition reaction?



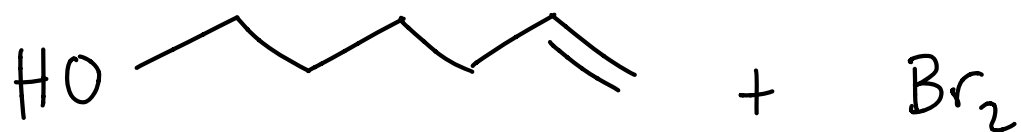
a) 6

b) 5

c) 4

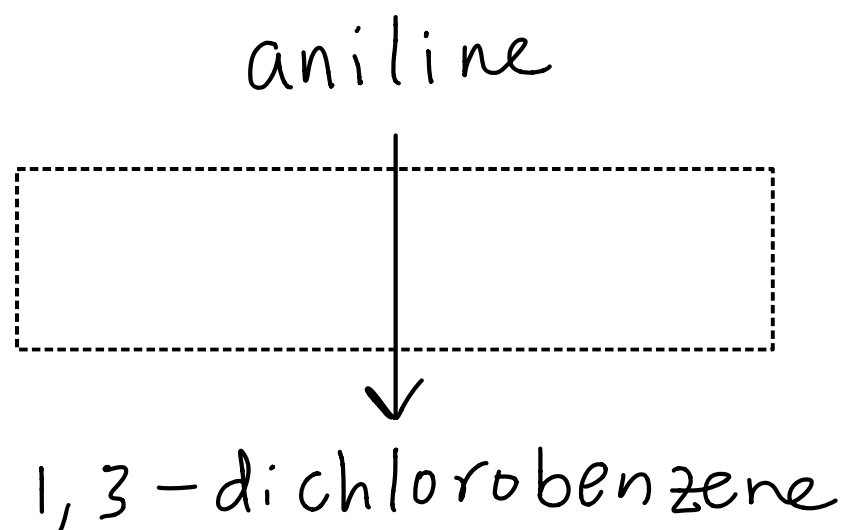
d) 2

④ Perform the mechanism for the following reaction:



Solutions

- ① Fill in the reagents and conditions for the following reaction:



- a) NaNO_2 , $\text{HCl}_{(aq)}$, -5°C
- b) warm to RT, CuCl

②

A [4+2] cycloaddition is...

	1	v.	2
	photochemically allowed		thermally forbidden

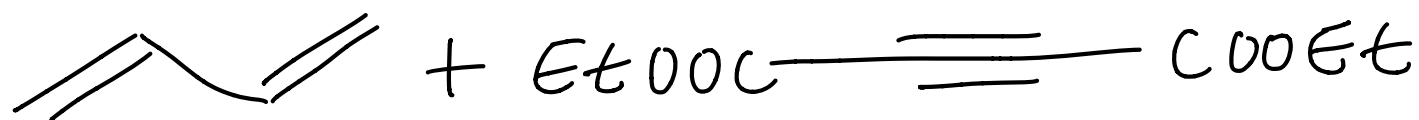
a) 1

b) 2

c) Both

d) Neither

③ How many pi bonds are in the expected product of the following cycloaddition reaction?



- a) 6
- b) 5
- c) 4
- d) 2

④ Perform the mechanism for the following reaction:

