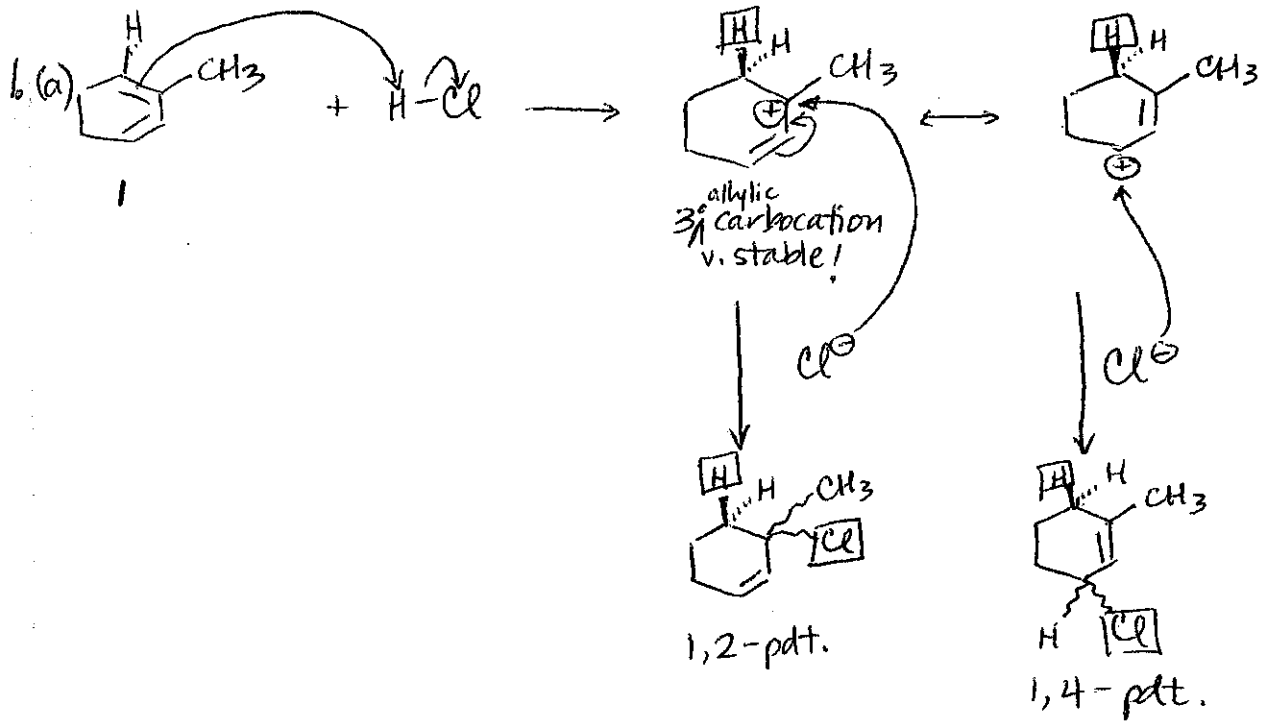
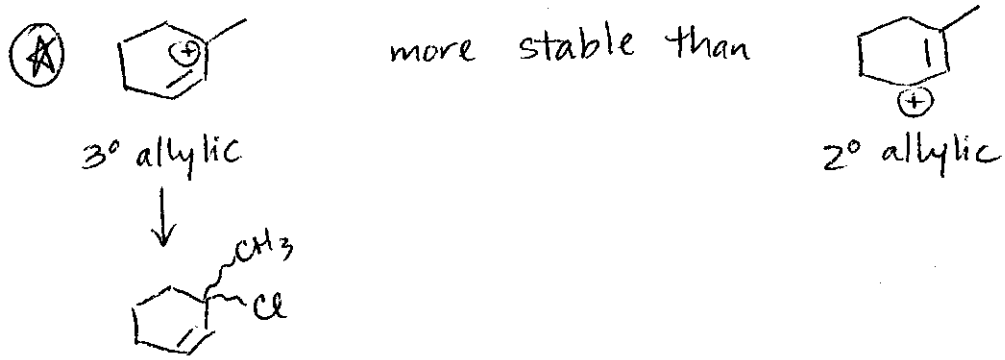
CHEM 3231
F'01

PROBLEM SET #3 SOLUTIONS

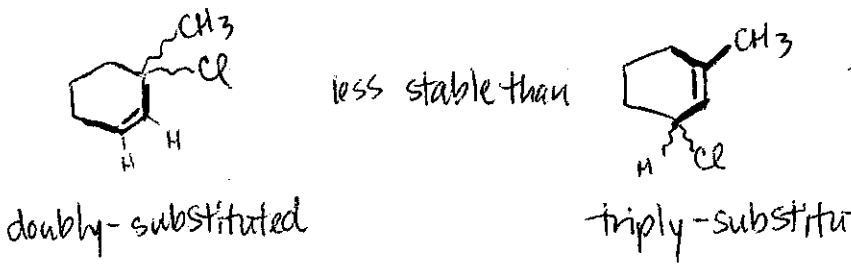
6. (a)



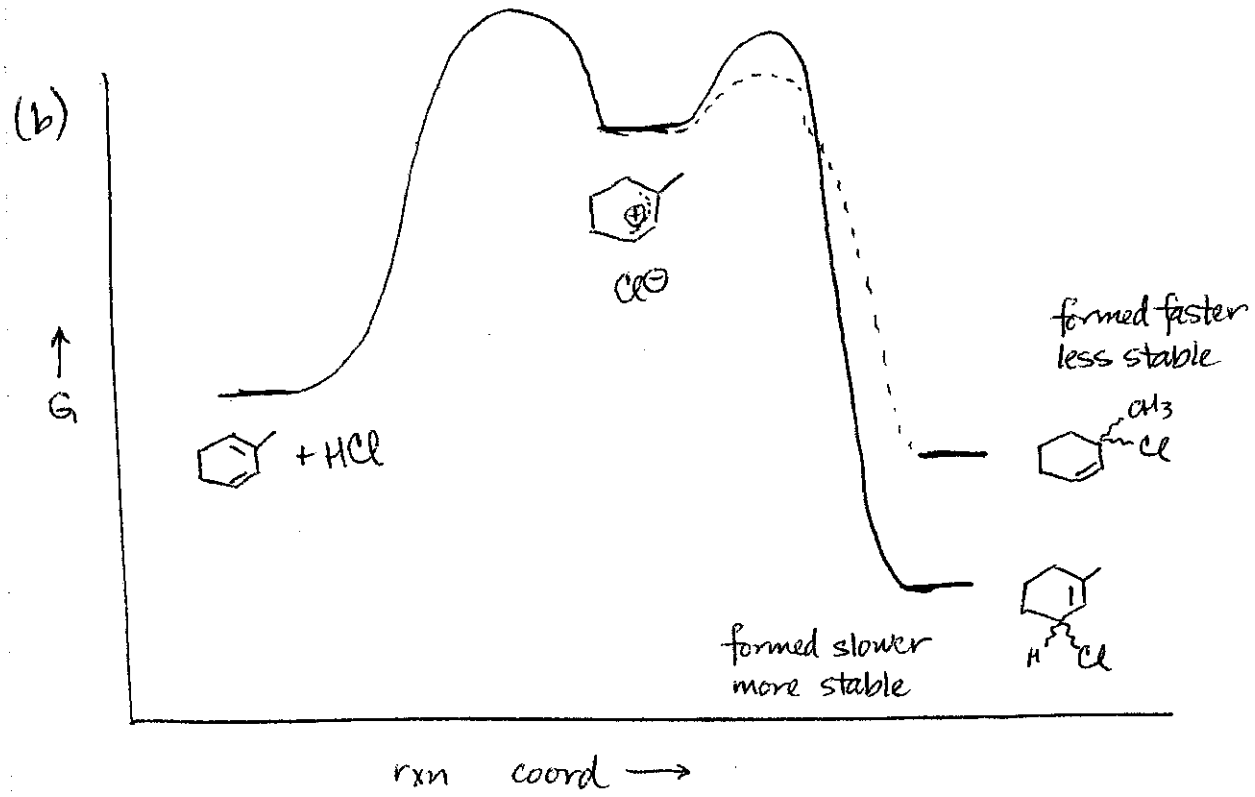
To determine kinetic pdt., look at INTERMEDIATES:



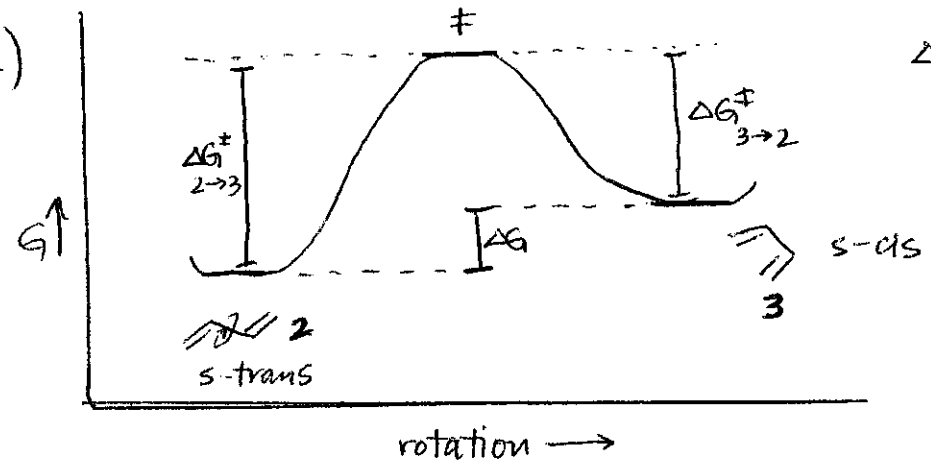
To determine thermodynamic pdt., look at ALKENE SUBSTITUTION:



(b)

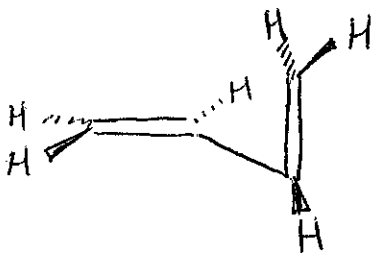


2. (a)

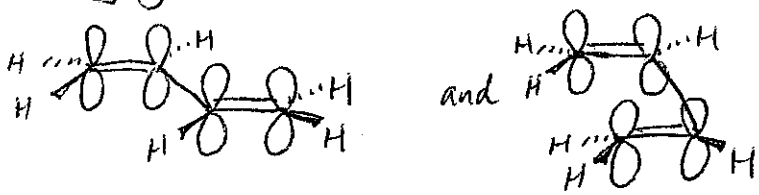


$\Delta G \approx 3$ kcal/mol

‡ looks (roughly) like:



(b) When all 4 carbons are in a plane, the π systems are conjugated:



(c) In order to rotate about the central C–C single bond, conjugation must be broken, thus sacrificing the stability imparted to the molecule from conjugation. (There is no conjugation to break in ethane (for example), so the rotational barrier is less.)

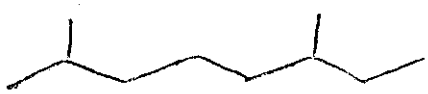
(d) The barrier for conversion of **3** → **2** (see $\Delta G^{\ddagger}_{3\to 2}$ in energy diagram) is smaller than for **2** → **3** ($\Delta G^{\ddagger}_{2\to 3}$); the rotation of **3** → **2** is faster than **2** → **3**.

3. $C_{10}H_{16}$: How many double bonds and/or rings?

→ For 10 C's, max # of H's = $2(10)+2 = 22$

⇒ $\frac{22-16}{2} = \boxed{3}$

Catalytic hydrogenation:

$C_{10}H_{16} \xrightarrow[Pt/C]{H_2\ (excess)}$ 

gives skeleton