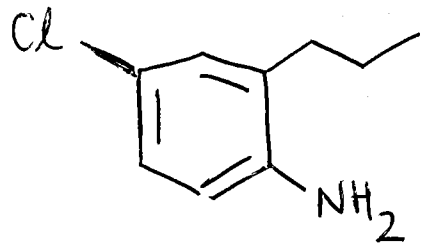
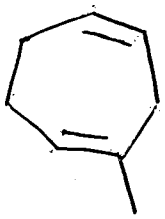
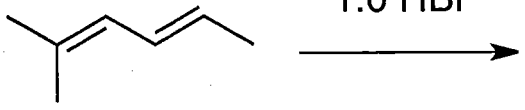
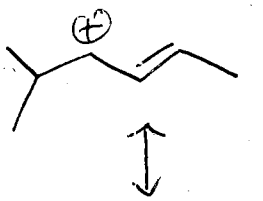
6 1. Nomenclature. Please give name for structure or structure for name.

	
4-chloro-2-propylaniline	2-methylcyclohepta-1,4-diene

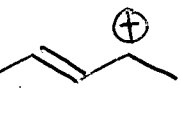
8 2. Please predict the kinetic and thermodynamic products formed when (*E*)-2-methylhexa-2,4-diene (shown below) reacts with HBr. Justify your choices.



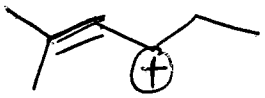
protonate left



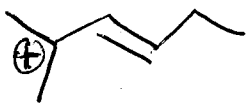
both 2° allyl



protonate right

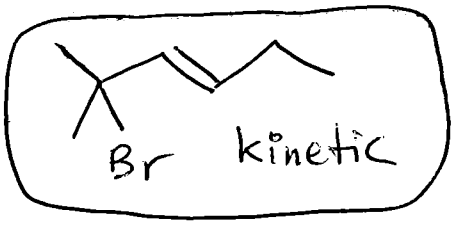


2° & 3° allyl

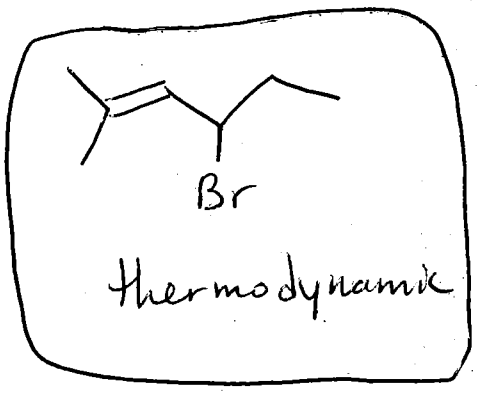


Analyze these

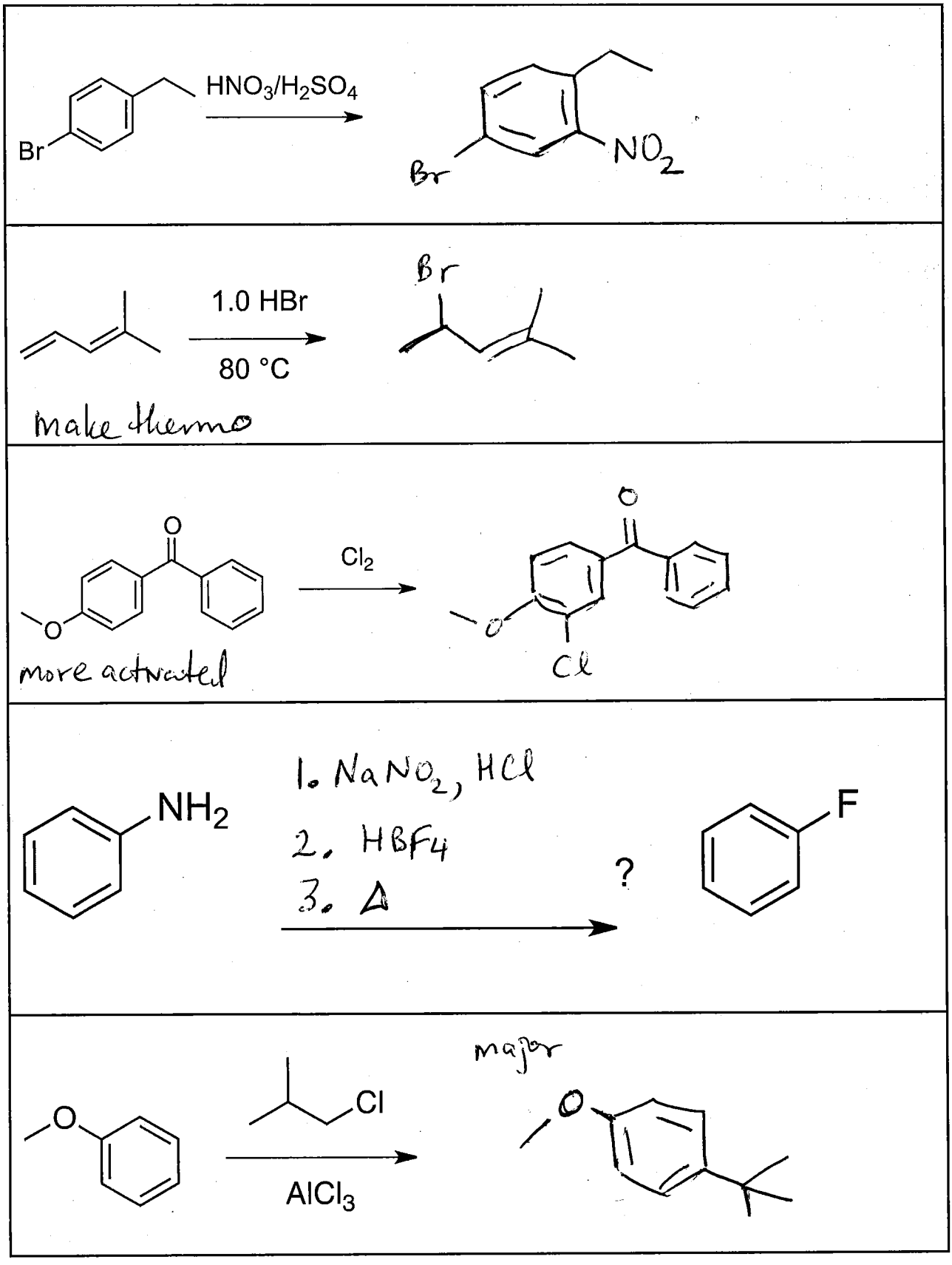
kinetic product comes from 3° allyl contributor



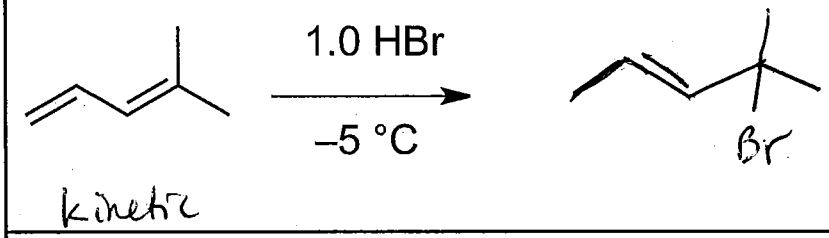
thermodynamic is the more substituted alkene



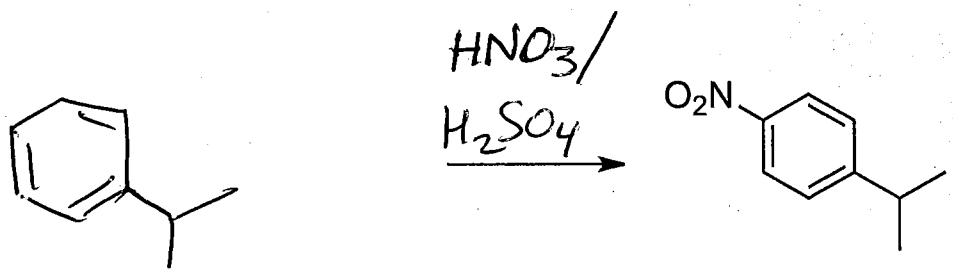
163. Fill in any of the missing starting material(s), reagent(s), and/or dominant product(s) for each single reaction. Please specifically denote all stereochemistry.

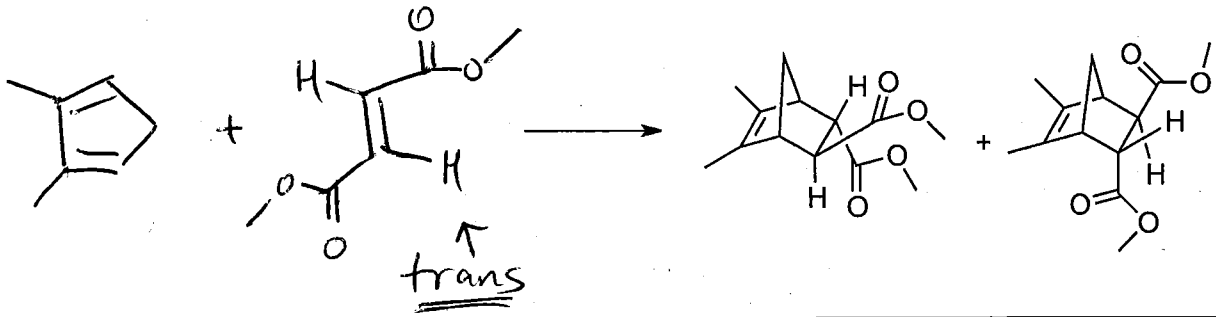


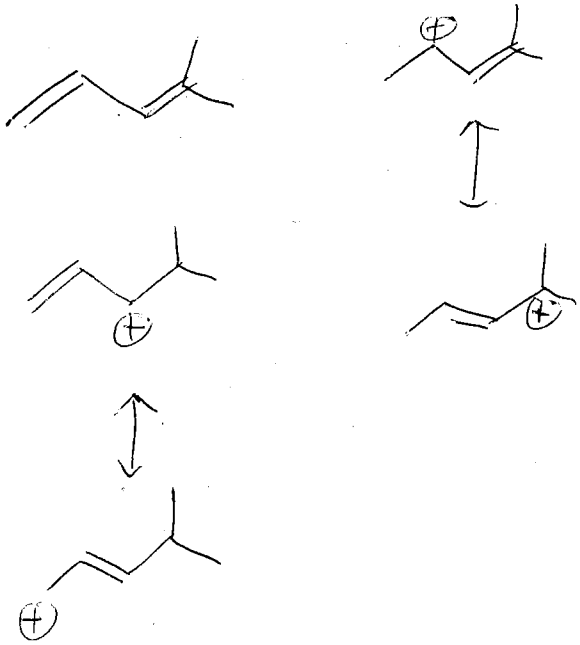
Question 3 continued.



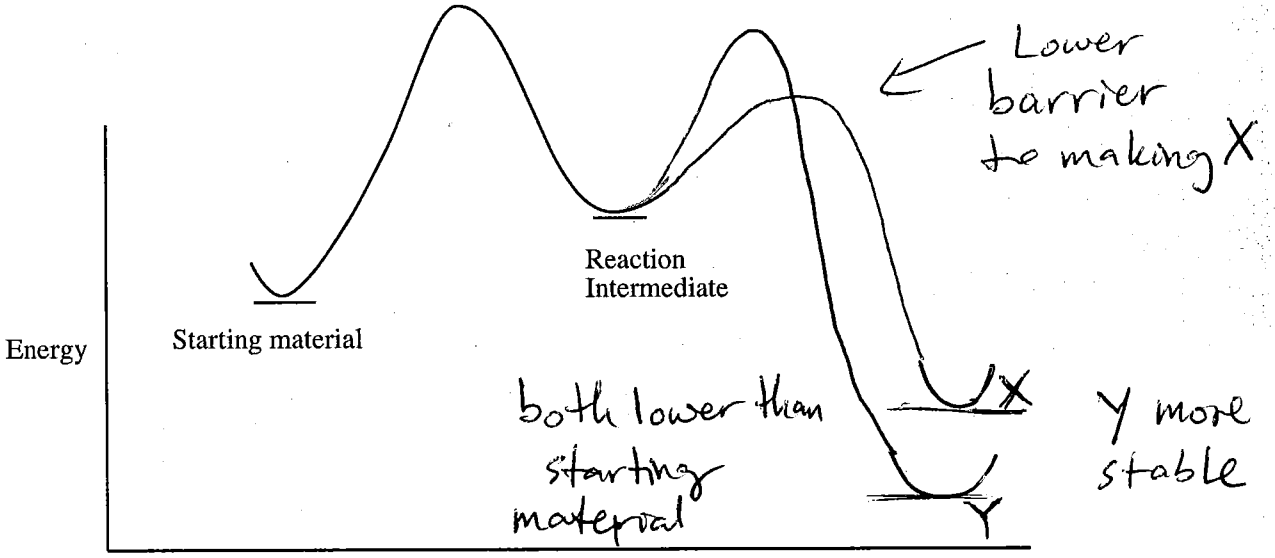
kinetic





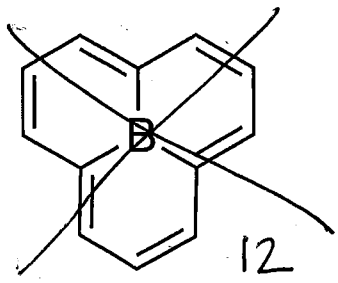


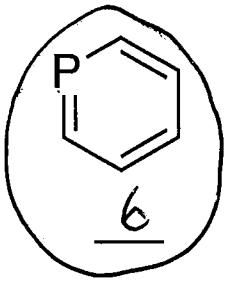
84. ***PAY ATTENTION TO ALL DIRECTIONS!!!***
Below is a **partial** energy versus reaction coordinate diagram for a reaction. The reaction has two possible products, **X** and **Y**. ***Complete the diagram*** according to the following restrictions. **X** and **Y** are each more thermodynamically stable than the starting material. **X** is known to be the only product formed at low temperatures. At high temperatures, the only product formed is **Y**.

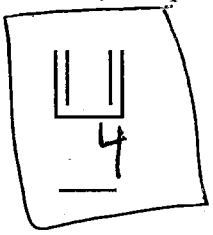


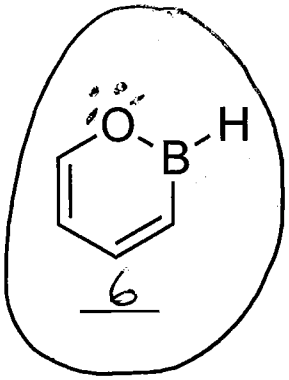
165. Under each molecule, write the # of π electrons in each molecule. Circle each molecule that is **aromatic**, put a box around each molecule that is **not aromatic**, and put an X through each molecule that is **anti-aromatic**.

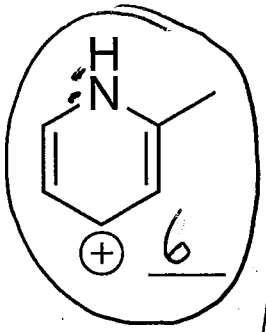
B keeps it flat

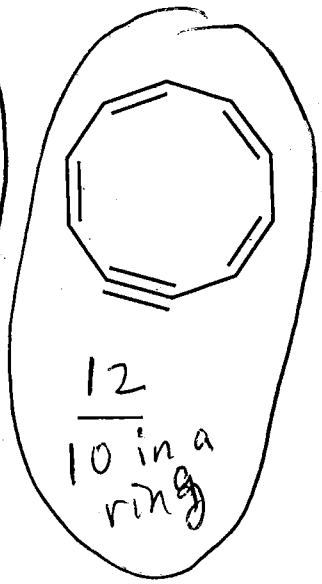


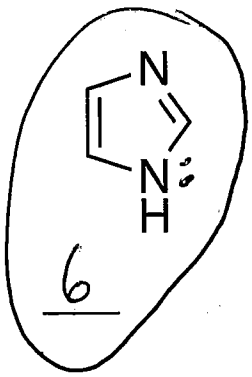


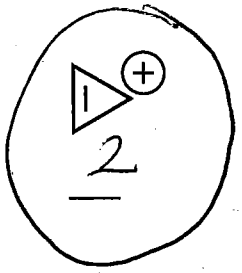




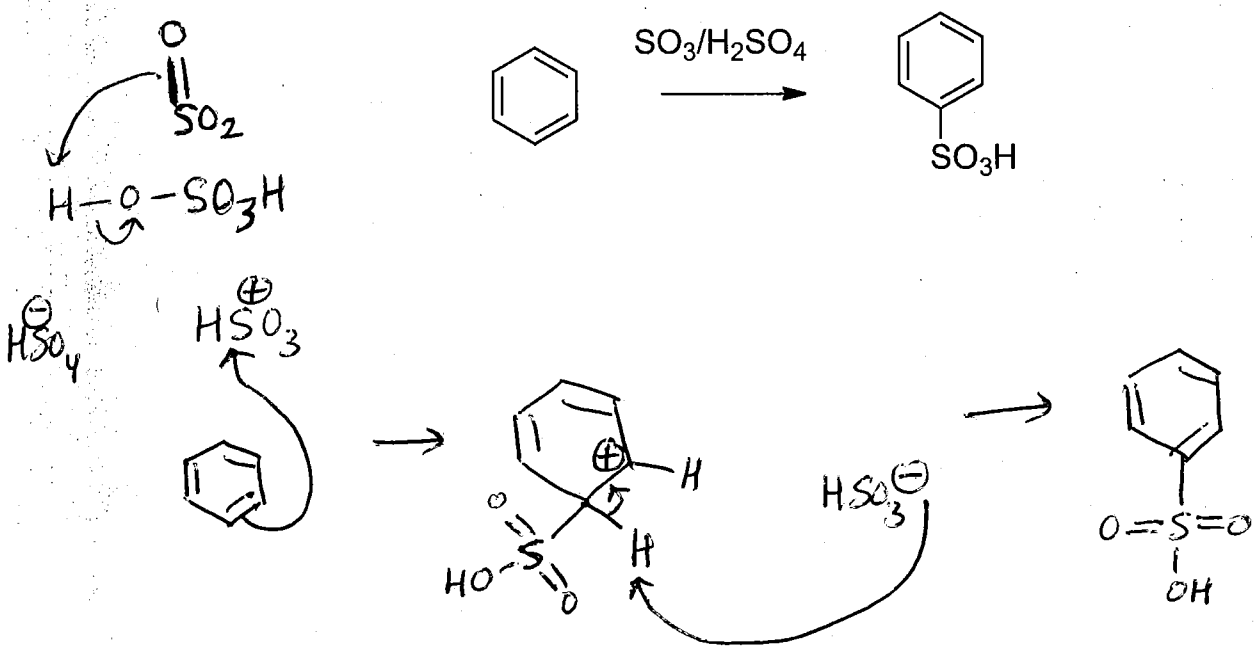






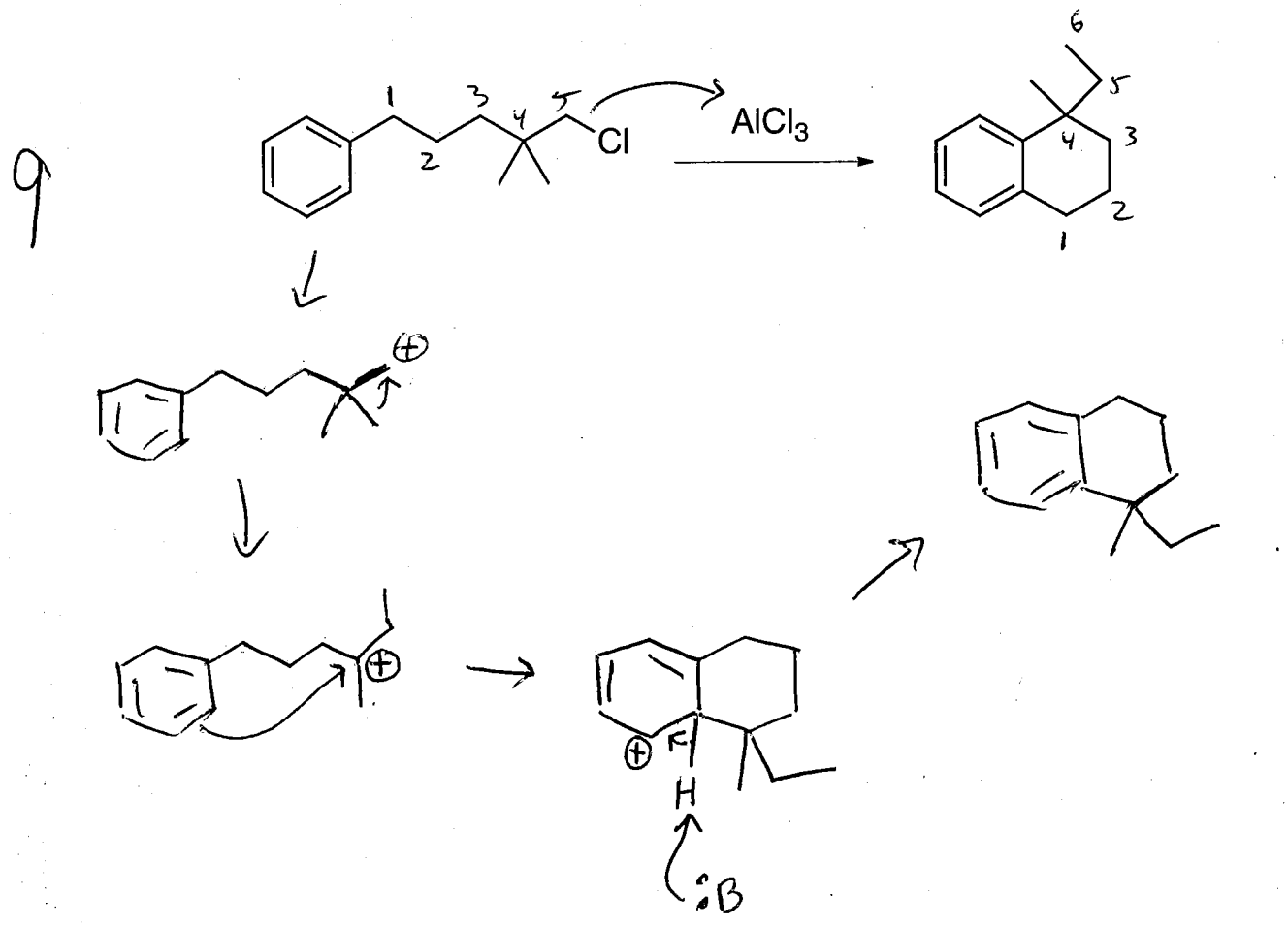


166. Please draw a stepwise electron pushing mechanism for the reactions shown below.

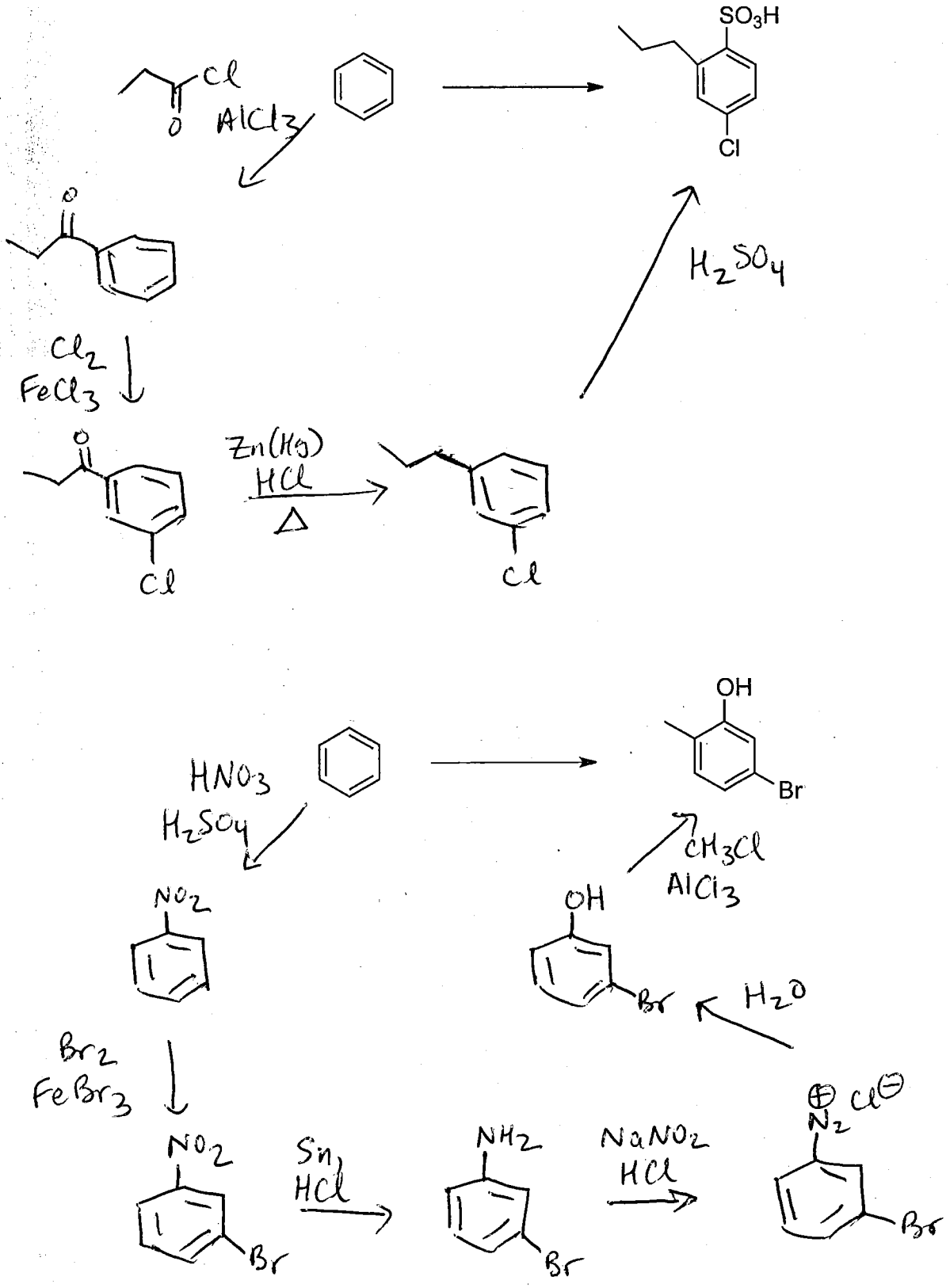


7

9

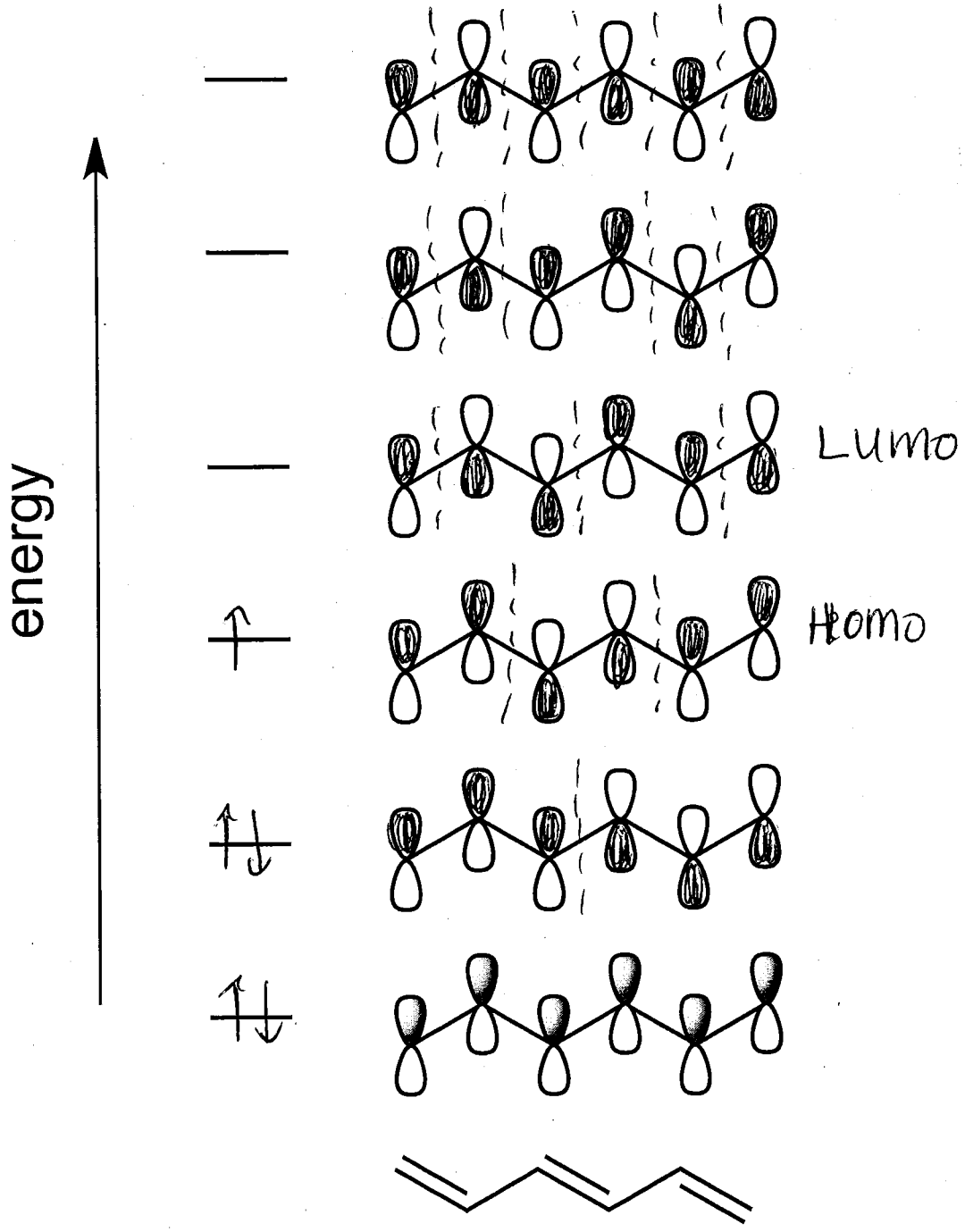


107. *Synthesis!* Please write a series of reactions that will produce the product from benzene. You may use any other reagent in your synthesis. You must draw every molecule along the way.

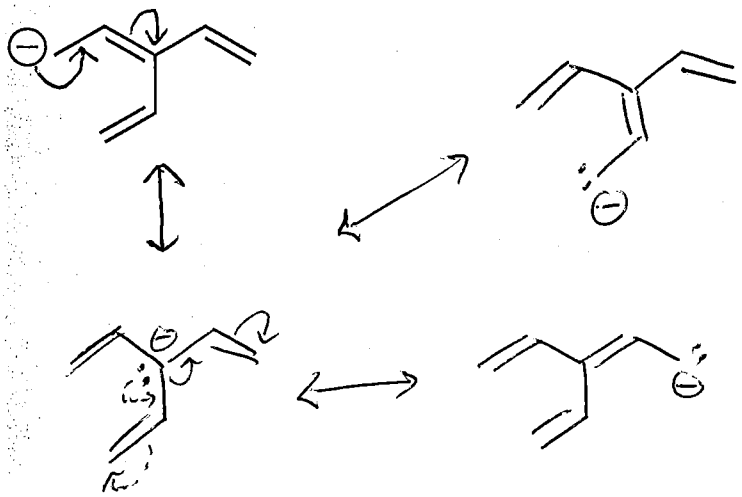


8. These are the π-molecular orbital diagrams for 1,3,5-hexatriene. ***The diagram for 1,3-butadiene is not complete.***

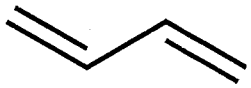
(a) Shade the lobes of the 1,3,5-hexatriene molecular orbitals correctly. The lowest energy orbital has been completed for you.
(b) Use dashed lines to show where nodes are present in the molecular orbitals.
(c) Fill in the electrons in each diagram for the **monocation of 1,3,5-hexatriene**.
(d) Identify the LUMO of ethene and the HOMO of the **monocation of 1,3,5-hexatriene**.



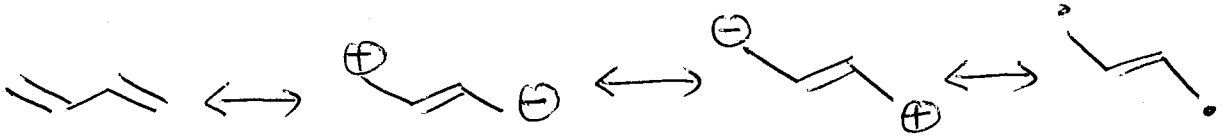
129. Please draw all of the resonance structures for the following molecule. Used curved arrows to show how you move elections to each new structure.



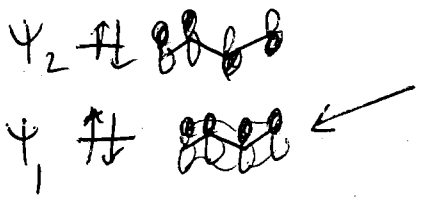
In 1,3-butadiene, the C–C single bond is shorter than a C–C single bond in butane. Explain, using either resonance theory or molecular orbital theory. Your answer will probably have both pictures and sentences.

	 (butane)	 (1,3-butadiene)
C2—C3 bond length (pm)	154	147

minor resonance structures for 1,3-butadiene have double-bond character between C2 and C3:



In the π-molecular-orbital system, an orbital that puts electron density between C2 and C3 is occupied:



this orbital is π-bonding with respect to C2 & C3