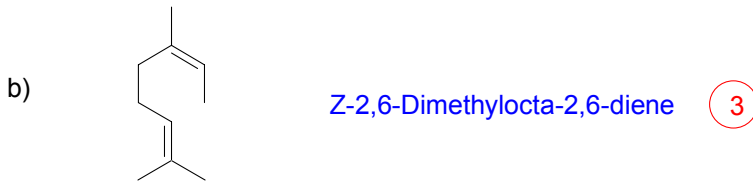
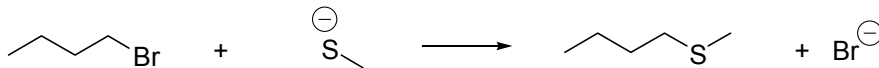


**CHM 1321**  
**Sample Mid Term 2**

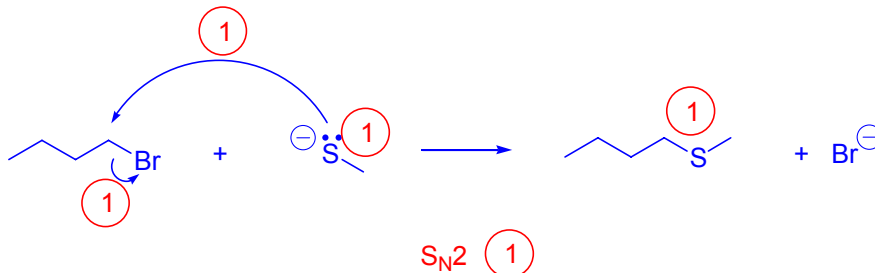
1. Name the following compounds (6 points):



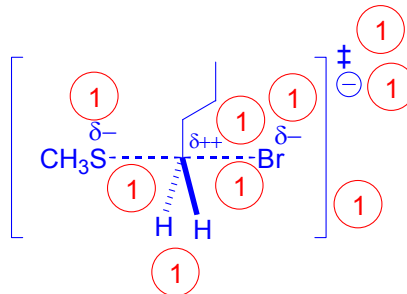
2. Consider the following reaction.



a) Write a detailed mechanism for this transformation (5 points).

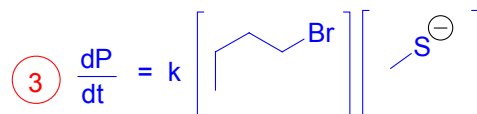


b) Draw the transition state for the rate determining step (9 points).



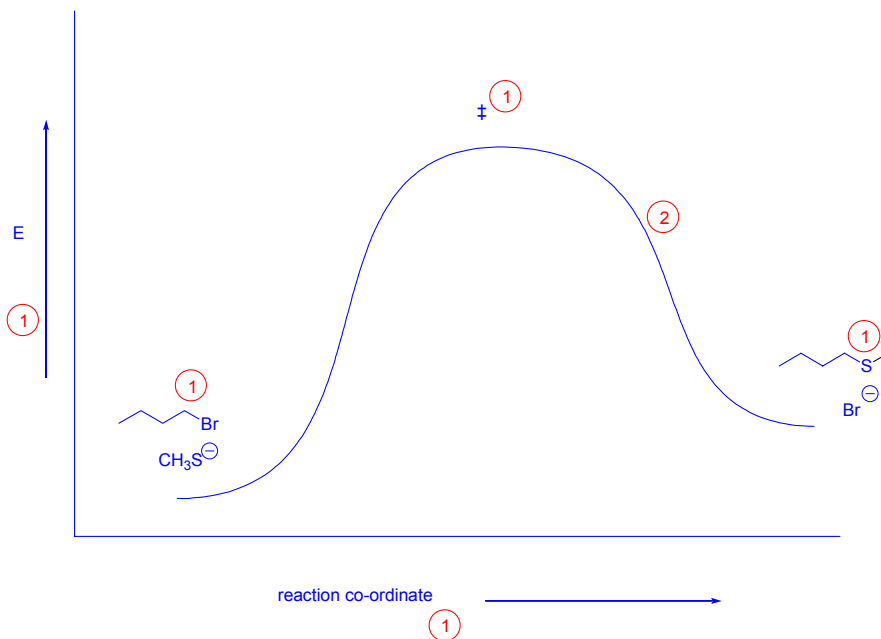
c) What will be the effect on the overall rate of the reaction if the concentration of  $\text{CH}_3\text{S}^-$  is doubled? Briefly explain why using the rate expression (6 points).

(1) rate will double



(2) rate is proportional to the concentration of  $\text{CH}_3\text{S}^-$

d) Draw the reaction co-ordinate diagram for this process. Label the starting materials, products and transition state(s) (7 points).



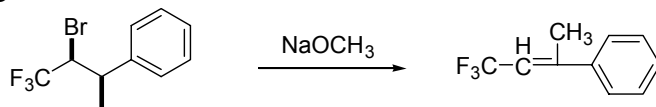
e) What will be the effect on the rate of the reaction if Cl is used in place of Br? Briefly explain (6 points).

- (1) rate will decrease
- (1) Cl<sup>-</sup> is higher in the periodic table than Br<sup>-</sup>
- (1) Cl is a smaller atom, charge on Cl<sup>-</sup> is therefore less dispersed and Cl<sup>-</sup> is therefore a stronger base than Br<sup>-</sup>
- (1) Cl<sup>-</sup> is therefore not as good a leaving group as Br<sup>-</sup>
- (1) the leaving group is involved in the rate determining step so the reaction is slower

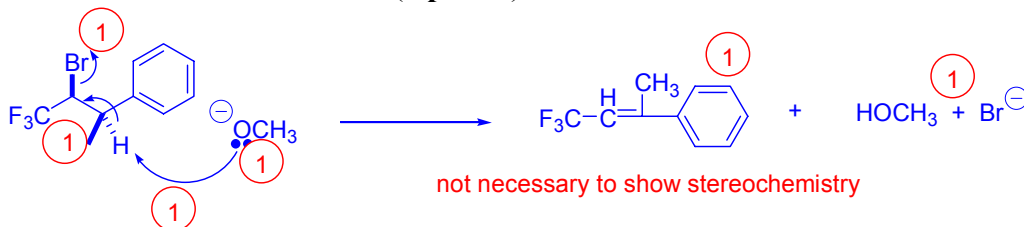
f) What will be the effect on the rate of the reaction if HSCH<sub>3</sub> is used in place of CH<sub>3</sub>S<sup>-</sup>? Briefly explain. (6 points)

- (1) rate will decrease
- (1) CH<sub>3</sub>S<sup>-</sup> has more electron density on sulfur than CH<sub>3</sub>SH
- (1) CH<sub>3</sub>S<sup>-</sup> has more electron density to donate
- (1) CH<sub>3</sub>S<sup>-</sup> has a higher free energy than CH<sub>3</sub>SH
- (2) Activation energy for the reaction with CH<sub>3</sub>S<sup>-</sup> is therefore smaller than for CH<sub>3</sub>SH

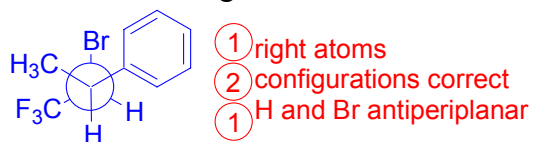
3. Consider the following reaction:



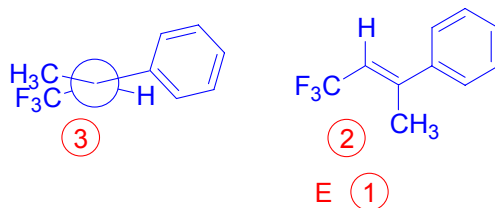
a) Draw the mechanism of the reaction (6 points).



b) Draw the Newman projection of the starting material in its reactive conformation (4 points).



c) Draw the product using both line notation and a Newman projection. Name the product (E or Z). (6 points).



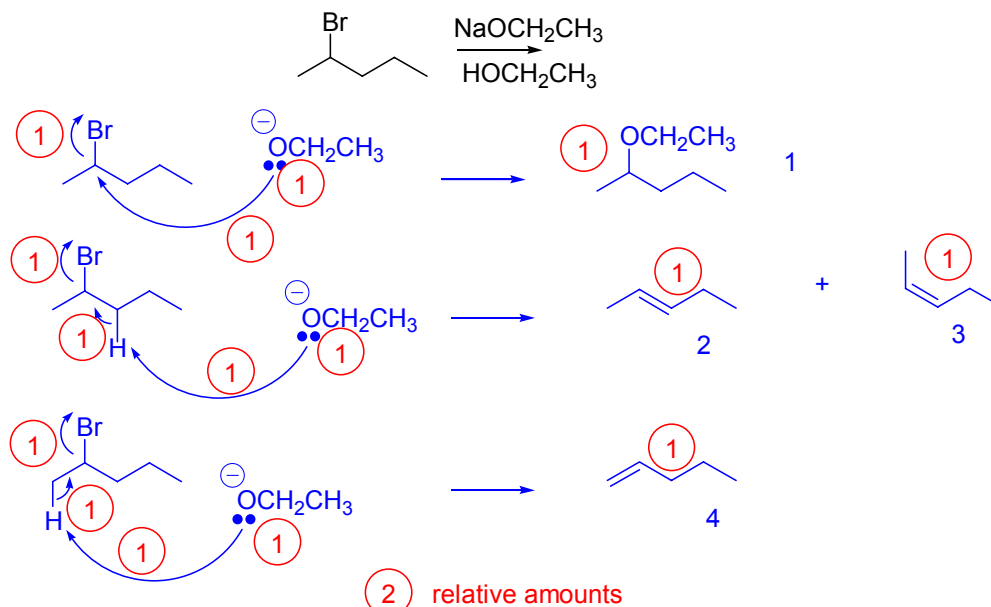
d) What is the relationship between the hydrogen and leaving group in the transition state? (1 point)

Antiperiplanar ①

e) What kind of reaction is this? (1 point)

E2 ①

4. Show all the possible products (there are 4) of the following reaction including mechanisms for their formation. Rank the products in the order of the relative amounts formed (1= most; 4 = least). (17 points)



5. Suggest a synthesis of the following compound. You may use any starting material containing two carbons or less. Be sure to include a retrosynthesis. (14 points)

