

Problem 1 (30 points) Give the mechanistic symbols (S_N1 , S_N2 , E1, E2) that are most consistent with each of the following statements. Circle your answer.

A) Reaction of methyl bromide with sodium ethoxide proceeds through which mechanism(s).

S_N1 S_N2 E1 E2

B) Reaction of ethyl bromide with sodium ethoxide proceeds through which mechanism(s).

S_N1 S_N2 E1 $E2$ *if only S_N2 - that is OK*

C) When cyclohexyl bromide is treated with sodium ethoxide in ethanol, the major product is formed by this mechanism.

S_N1 S_N2 E1 $E2$

D) The substitution product obtained by solvolysis of tert-butyl bromide in ethanol arises by this mechanism.

S_N1 S_N2 E1 E2

E) In ethanol that contains sodium ethoxide, tert-butyl bromide reacts mainly by this mechanism.

S_N1 S_N2 E1 $E2$

F) These reactions mechanisms represent concerted processes.

S_N1 S_N2 E1 $E2$

G) Reactions that proceed by these mechanisms are stereospecific.

S_N1 S_N2 E1 $E2$

H) These reactions involve carbocations.

S_N1 S_N2 $E1$ E2

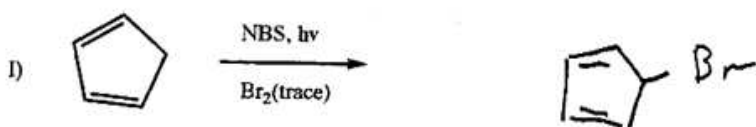
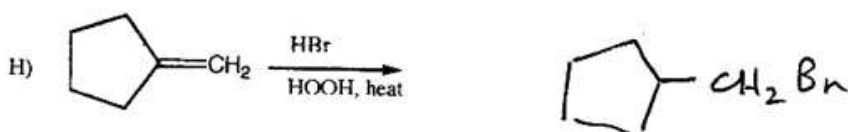
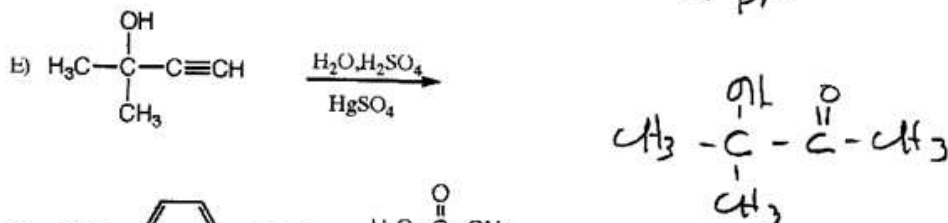
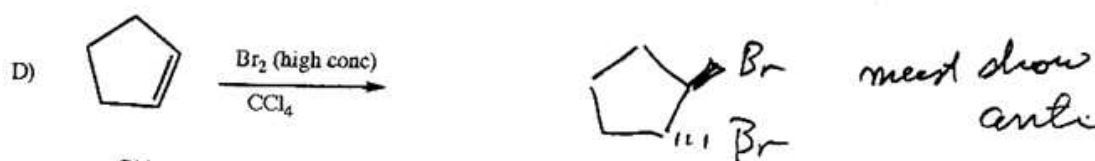
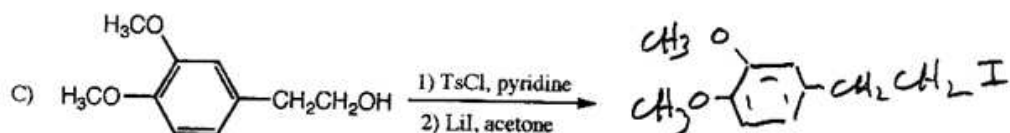
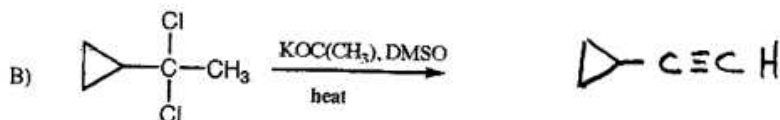
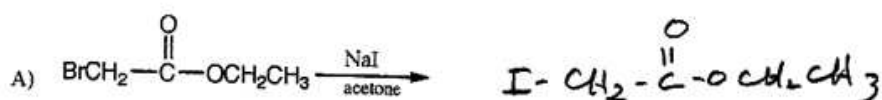
I) If a carbon skeleton rearrangement occurs, it most likely to occur in which mechanism(s).

S_N1 S_N2 $E1$ E2

J) Alkyl iodides react faster than alkyl bromides in reactions that proceed by these mechanisms.

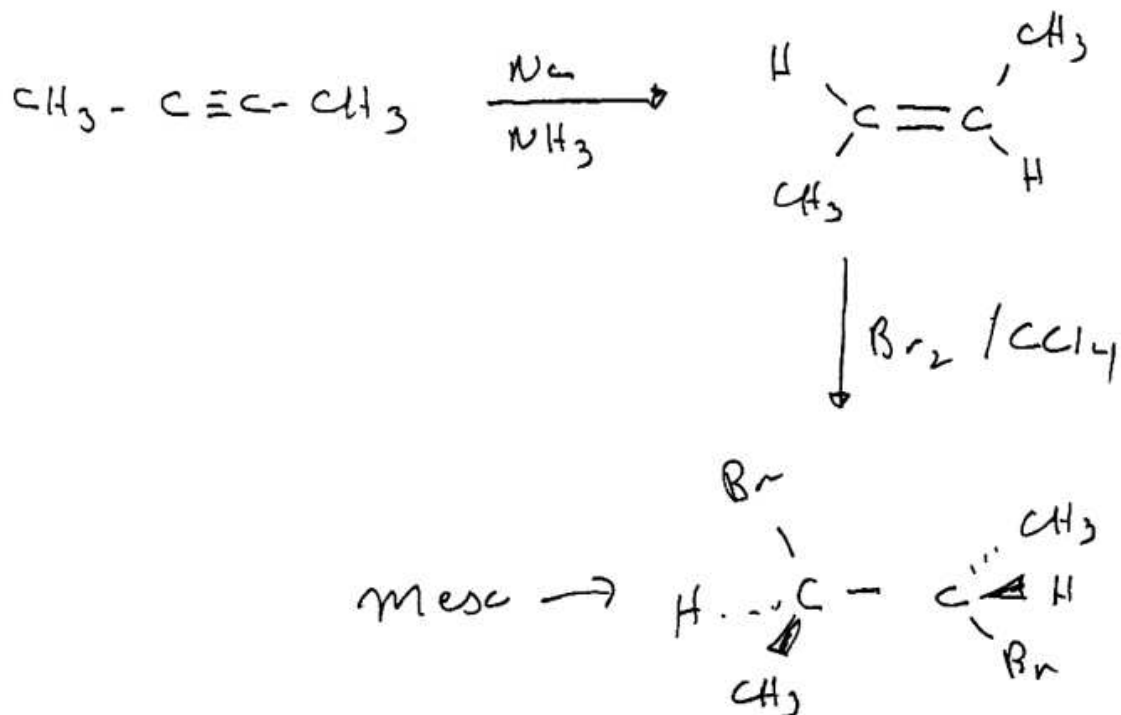
S_N1 S_N2 $E1$ $E2$

Problem 2. (30 points) Give only the major products for the following reactions. If no reaction occurs, please state so.

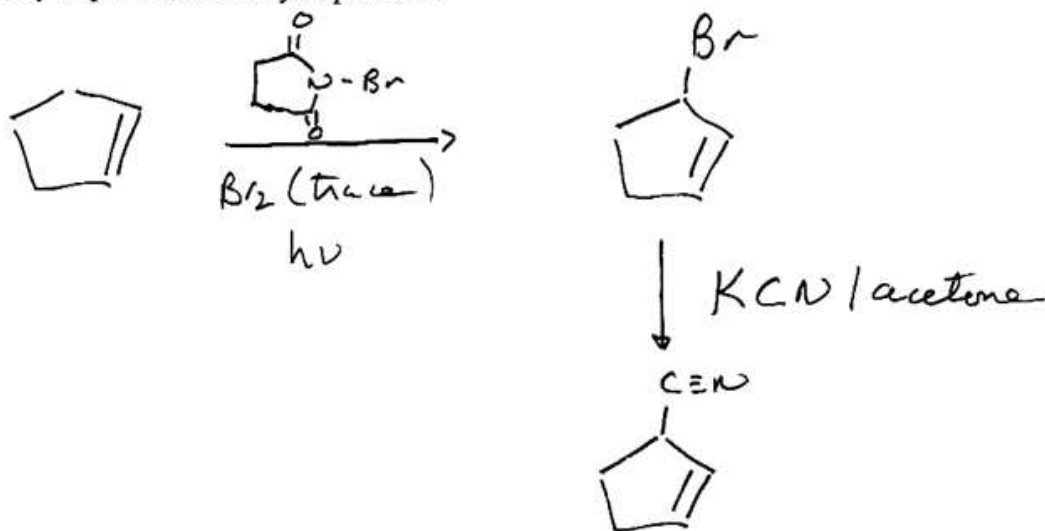


Problem 3. (20 points) How would you prepare the following compounds from the designated starting materials and any necessary organic or inorganic reagents.

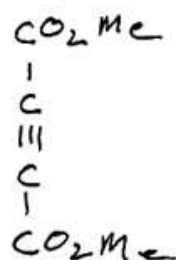
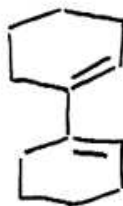
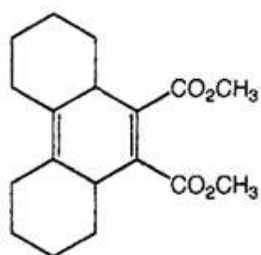
A) meso-2,3-Dibromobutane from 2-butyne.



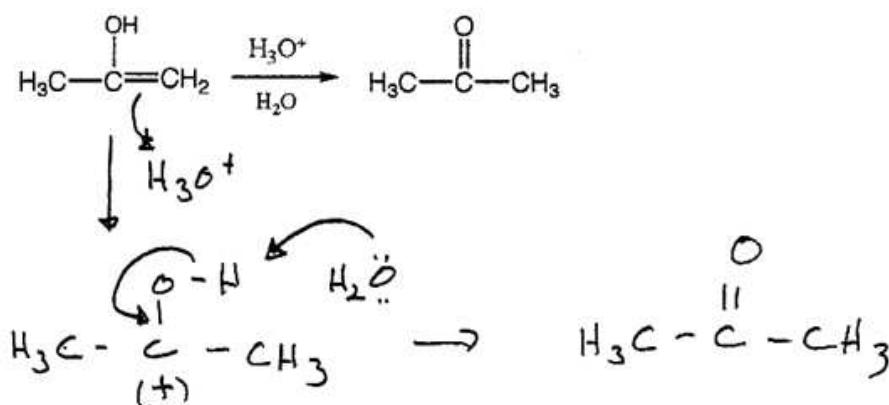
B) 3-Cyanocyclopentene from cyclopentene.



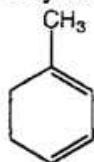
Problem 4. (5 points) What two compounds would you use as starting material for the synthesis of the following compound employing the Diels-Alder reaction?



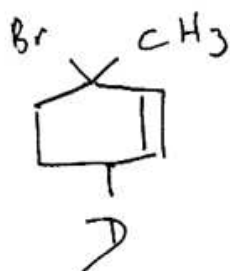
Problem 5. (5 points) Give the mechanism for the following reaction. Use curved arrows to show the flow of electrons.



Problem 6. (10 points) Consider the addition of 1 equivalent of DBr in ethanol to the following compound. What product corresponds to the one formed under kinetic control and the one formed under thermodynamic control.



kinetic product=



thermodynamic product=

