

Problem 1 (10 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) In ethanol containing sodium ethoxide, *tert*-butyl bromide reacts by these mechanisms.

S_N1 S_N2 E1 **E2**

B) What reaction mechanisms proceed through a concerted process?

S_N1 **S_N2** E1 **E2**

C) Reactions proceeding through these mechanisms are stereospecific.

S_N1 **S_N2** E1 **E2**

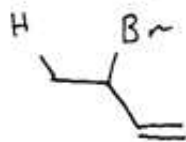
D) Alkyl iodides react faster than alkyl bromides in reactions that proceed by these mechanisms.

S_N1 **S_N2** E1 E2

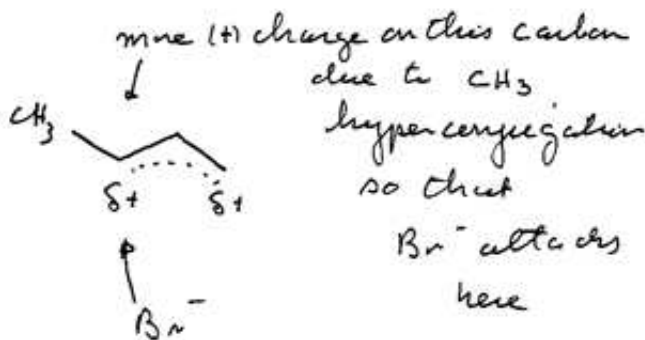
E) These reaction mechanisms are most likely to have been involved when the products are found to have a different carbon skeleton from the substrate.

S_N1 S_N2 **E1** E2

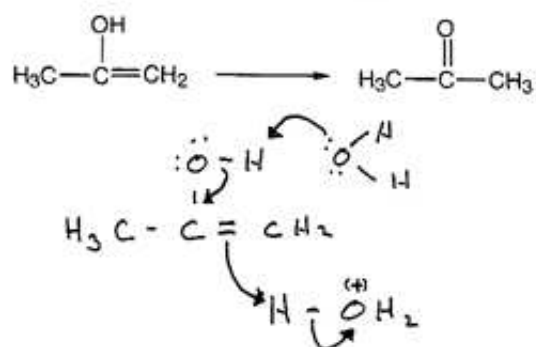
Problem 2. (5 points) When HBr is added to 1,3-butadiene in a polar solvent at low temperature, what is the predominate product? Briefly explain why this product is formed.



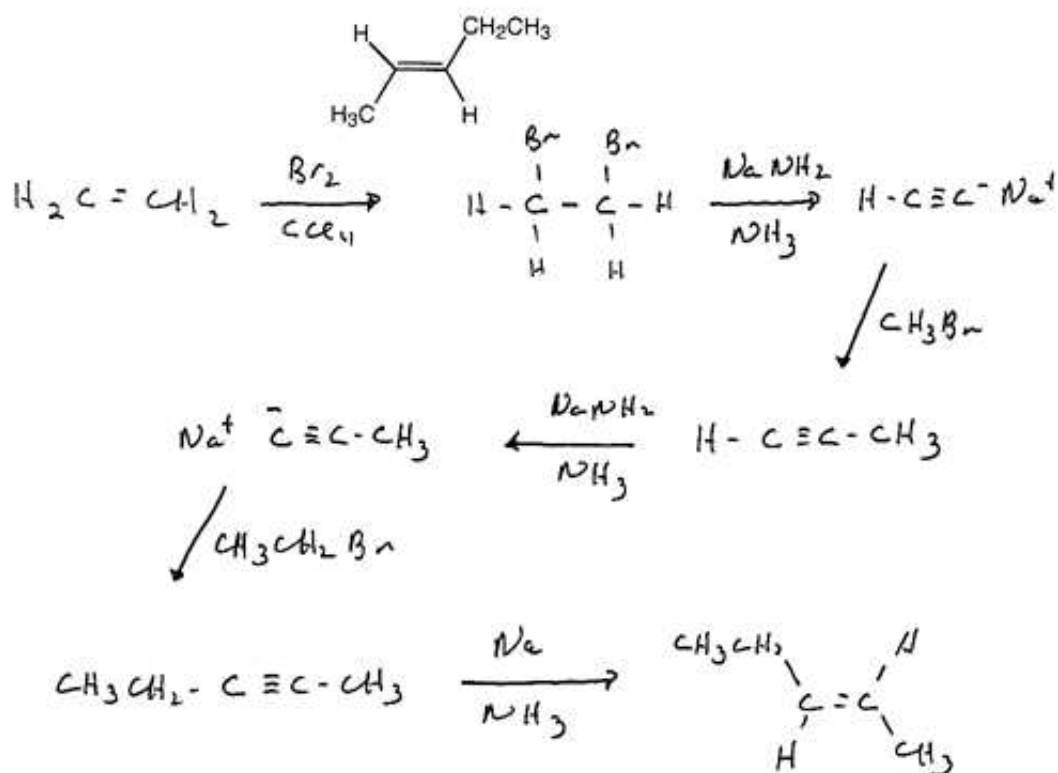
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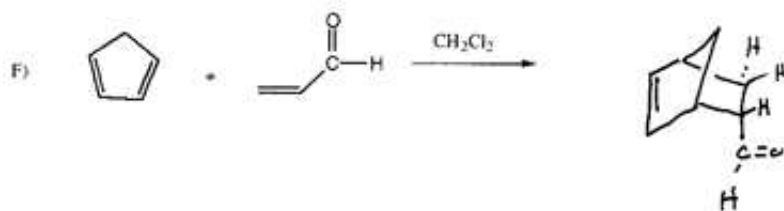
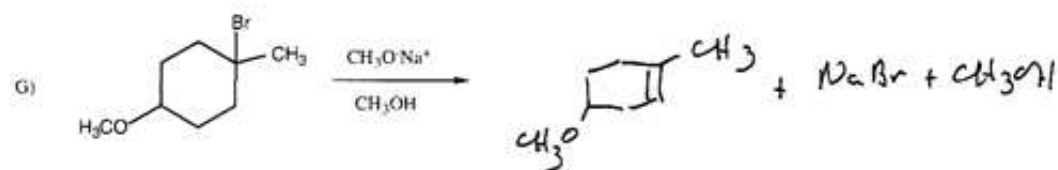
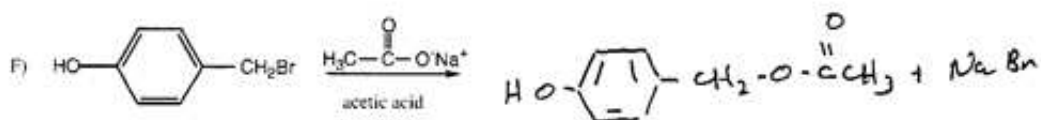
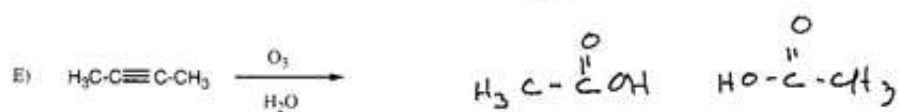
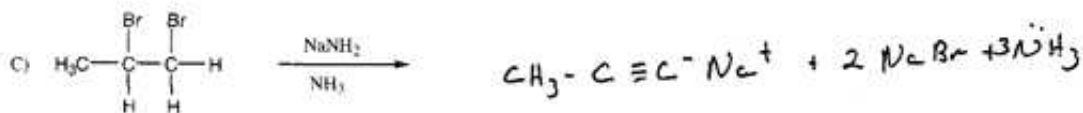
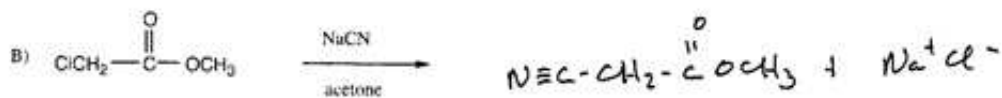
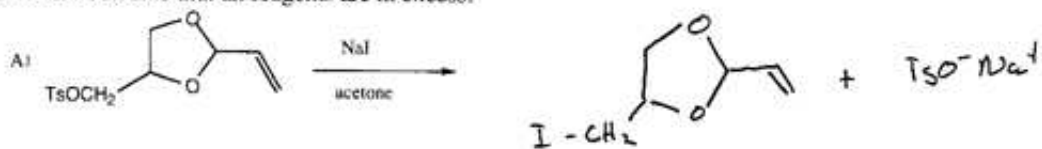
Problem 3. (5 points) Give the mechanism, using curved arrows, for the conversion of an enol to the corresponding ketone under acid conditions in water.



Problem 4. (20 points) Starting with ethylene (which must be used in the synthesis) and any other organic compounds, how would you synthesize the following compound?



Problem 5. (40 points) Give the product or products for the following reactions. Circle your answer. Assume that all reagents are in excess.



Problem 6. (5 points) Do S_N2 reactions proceed faster in protic or aprotic solvents. Explain.

aprotic - is faster
 protic solvents hydrogen bond to nucleophile
 which reduces its reactivity.

Problem 7. (15 points) How would you carry out the following transformations? More than one step may be required but no more than 3 steps.

