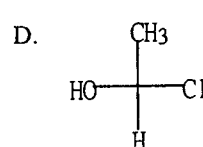
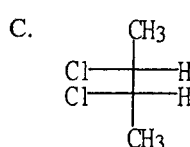
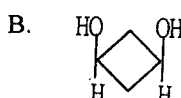
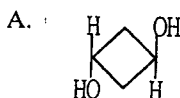


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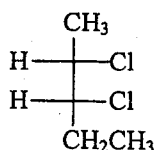
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I. Multiple choice: 30 %

- () Which of the following describes racemic mixtures?
 A. optically active B. contain a *meso* compound
 C. equal mixtures of enantiomer D. rotate plane-polarized light in one direction only
- () Which of the following describes chiral compound?
 A. optically active B. have planes of symmetry
 C. superposable on their mirror images D. compounds with stereocenters must be chiral
- () Which of the following is NOT a *meso* compound?



- () What is the configuration of the compound shown?

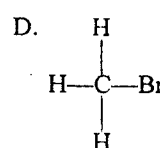
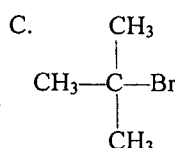
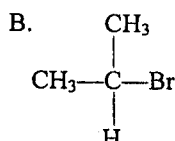
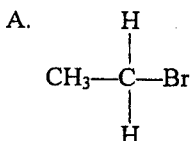


- A. 2R, 3R B. 2R, 3S C. 2S, 3R D. 2S, 3S

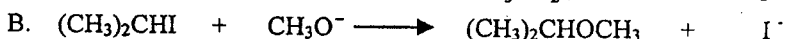
- () How many steps are involved in the S_N2 mechanism?

- A. 1 B. 2 C. 3 D. 4

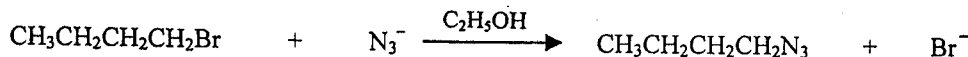
- () Which of the following compounds would react the fastest in an S_N2 mechanism?



- () Assuming that each of the following reactions proceeds via an S_N2 mechanism, predict which one would occur at the fastest rate.

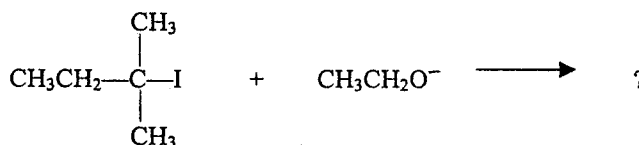


- () Which of the following changes would cause the greatest increase in the rate of the following S_N2 reaction?



- A. Change $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$ to $(\text{CH}_3)_3\text{CBr}$
 B. Change $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$ to $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$
 C. Change $\text{C}_2\text{H}_5\text{OH}$ to H_2O .
 D. Change $\text{C}_2\text{H}_5\text{OH}$ to $(\text{CH}_3)_2\text{S} = \text{O}$

- () By which mechanism are the major products of the following reaction most likely to form?

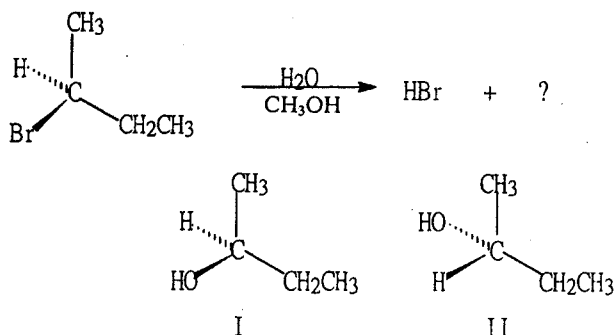


- A. S_N1 B. S_N2 C. $E1$ D. $E2$

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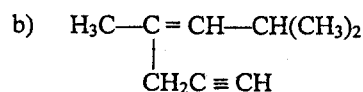
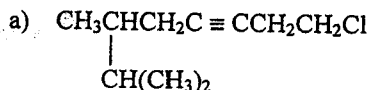
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() Which of the following statements is true about the two possible products (I and II) of the reaction shown below?

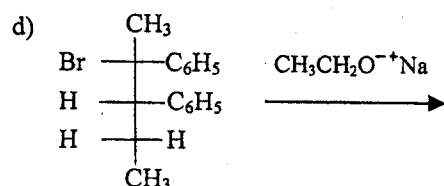
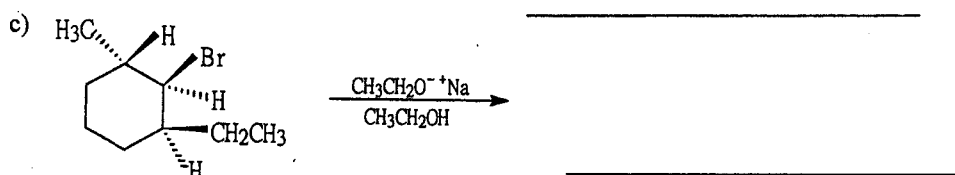
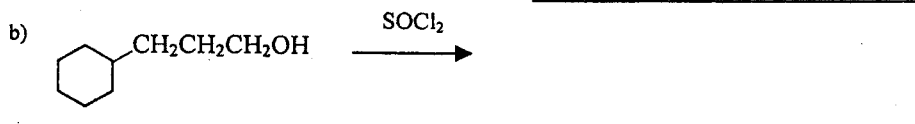
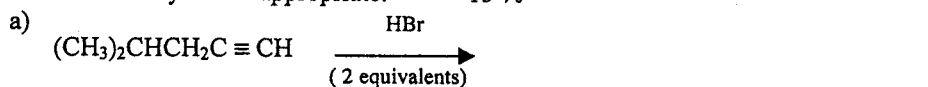


- A. Compound I is the only organic product if the mechanism is $\text{S}_{\text{N}}1$, but compound II is the only organic product if the mechanism is $\text{S}_{\text{N}}2$.
- B. Compound II is the only organic product if the mechanism is $\text{S}_{\text{N}}1$, but compound I is the only organic product if the mechanism is $\text{S}_{\text{N}}2$.
- C. Compounds I and II are both products if the mechanism is $\text{S}_{\text{N}}1$, but compound II is the only organic product if the mechanism is $\text{S}_{\text{N}}2$.
- D. Compound I is the only organic product if the mechanism is $\text{S}_{\text{N}}1$, but compounds I and II are both products if the mechanism is $\text{S}_{\text{N}}2$.

II. Give IUPAC names for the following compounds: 6 %

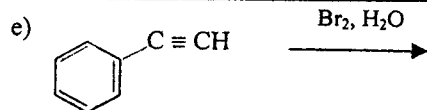


III. Give the major product(s) of the following reactions, indicating both regiochemistry and stereochemistry where appropriate: 15 %

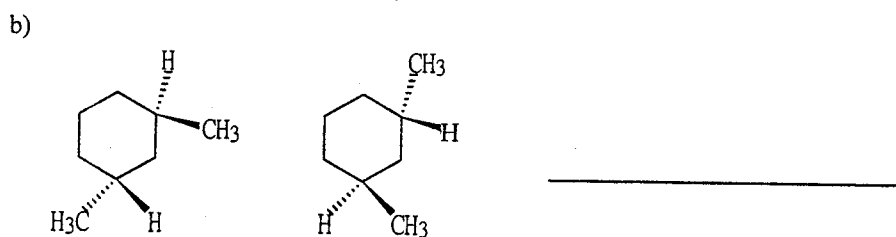
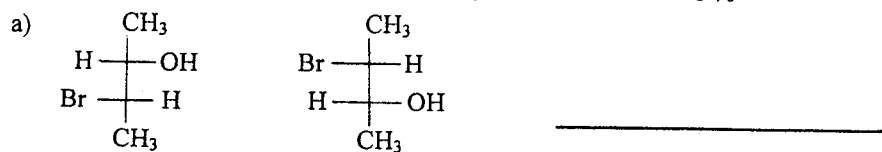


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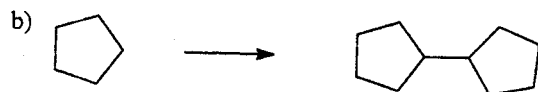
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IV. Give the stereochemical relationships between each pair of isomers. Examples are same compound, structural isomers, enantiomers, diastereomers. 6 %



V. How would you carry out the following transformation? 12 %

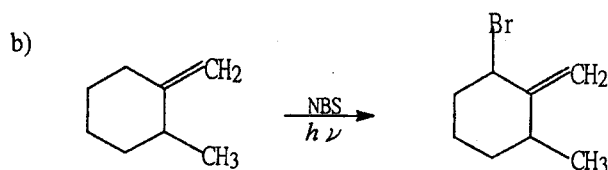
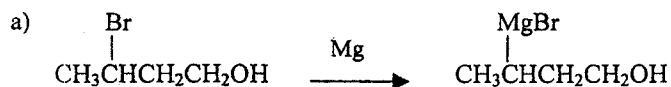


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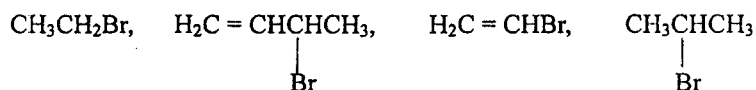
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VI. How many stereoisomers are there of 1,3-dimethylcyclohexane? Are any of the structures chiral? 3 %

VII.. The syntheses shown here are unlikely to occur as written, What is wrong with each? 6 %



VIII. Rank the following substances in order of their expect $\text{S}_{\text{N}}1$ reactivity: 3 %



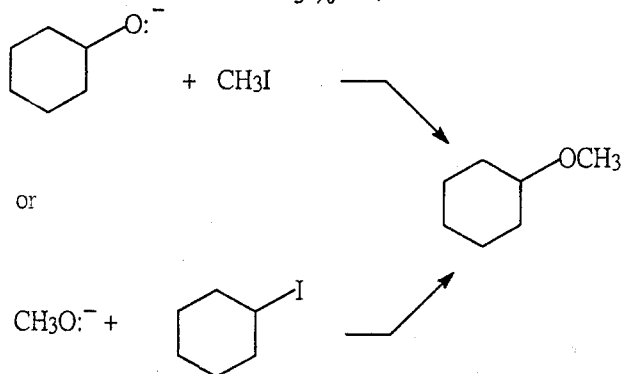
IX. Which isomer would you expect to undergo $\text{E}2$ elimination faster, trans-1-bromo-4-tert-butylcyclohexane or cis-1-bromo-4-tert-butylcyclohexane? Explain. 3 %

X. The reaction of 1-chlorooctane with CHCOO^- to give octyl acetate is greatly accelerated by adding a small quantity of iodide ion. Explain 3 %

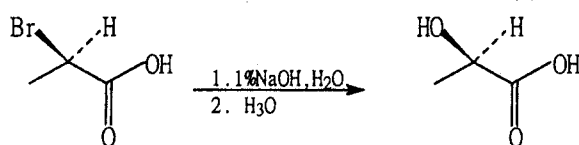
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- XI. Ethers can often be prepared by S_N2 reaction of alkoxide ions, RO^- , with alkylhalides. Suppose you wanted to prepare cyclohexyl methyl ether. Which of the two possible routes shown below would you choose? Explain. 3 %



- XII. The following substitution reaction occurs with S_N2 reaction, however, it occurs with complete retention of configuration. Propose a mechanism. 3 %



- XIII. Compound A is optically inactive and has the formula $C_{16}H_{16}Br_2$. On treatment with strong base, A gives hydrocarbon B, $C_{16}H_{14}$. Compound B absorbs 2 equivalents of hydrogen when reduced over a palladium catalyst and reacts with ozone to give two fragments. One fragment, C, is an aldehyde with formula C_7H_6O . The other fragment is glyoxal, $(CHO)_2$. Write the reactions involved, and suggest structures for A, B, and C. What is the stereochemistry of A? 6 %