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Organic Chemistry I Drill (CHEM 2210D) Practice Exam 2

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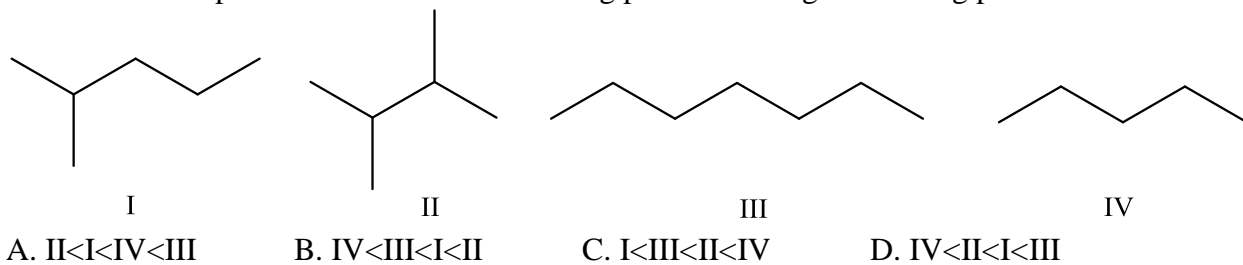
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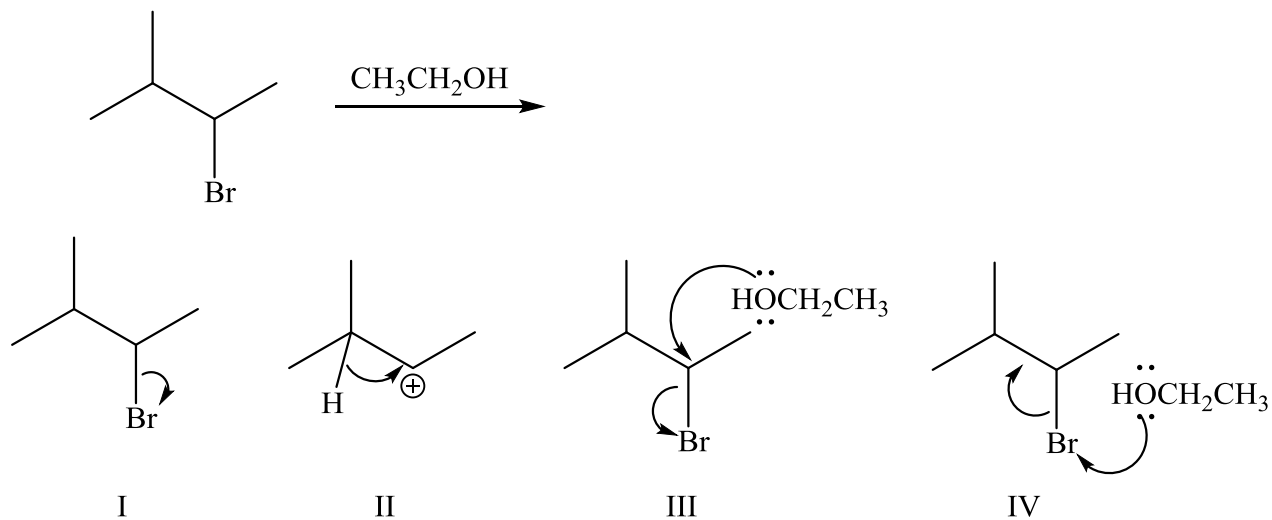
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Practice Hour Exam 2, Chemistry 2210, Organic Chemistry I

1. Rank the compounds from the lowest boiling point to the highest boiling point.

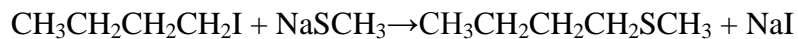


2. Consider the following E1 mechanism. Which of the following is (are) NOT a step(s) in the mechanism?



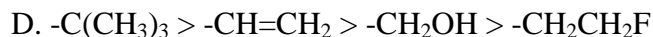
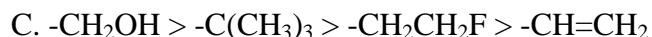
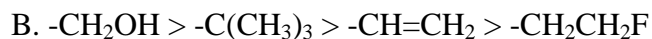
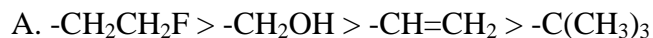
A. III, IV B. II, III, IV C. I, II, III D. I, II, IV

3. What is the rate equation for the following reaction?

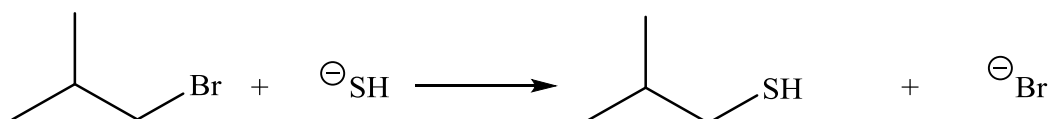


- A. Rate = $k[\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{I}]$
 B. Rate = $k[\text{NaSCH}_3]$
 C. Rate = $k[\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{I}][\text{NaSCH}_3]$
 D. Rate = $k[\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{I}][\text{NaI}]$

4. What is the correct priority of these groups with respect to (*R,S*) determination in stereochemistry, with highest priority group first? Assume these groups are all bonded to the same chirality center.



5. Which of the following changes will increase the rate of the following reaction?



A. Replace ^-SH with H_2S

B. Replace $(\text{CH}_3)_2\text{CHCH}_2\text{Br}$ with $\text{CH}_3\text{CH}_2\text{CHBrCH}_3$

C. Replace $(\text{CH}_3)_2\text{CHCH}_2\text{Br}$ with $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$

D. Use the solvent DMSO instead of methanol

6. Which of the following statements is true of transition states?

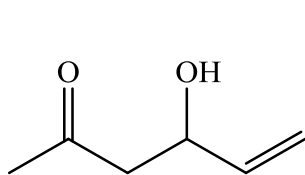
A. A transition state represents a minimum on the reaction path diagram and can be isolated.

B. A transition state represents a maximum on the reaction path diagram and can be isolated.

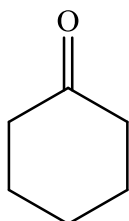
C. A transition state represents a minimum on the reaction path diagram and cannot be isolated.

D. A transition state represents a maximum on the reaction path diagram and cannot be isolated.

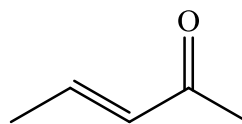
7. Which structure has a HDI = 2 and the following major IR bands: 3500 cm^{-1} and 1750 cm^{-1} ?



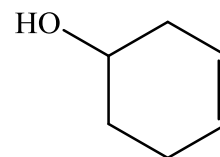
A.



B.

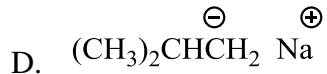
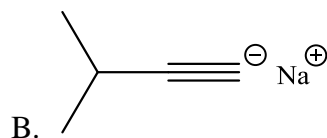
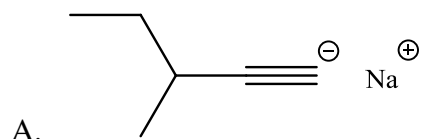


C.

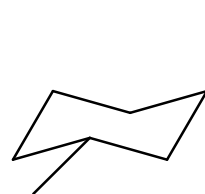
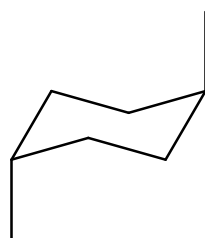
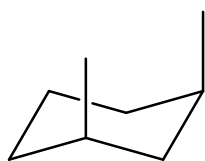
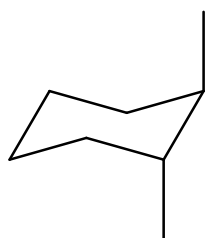


D.

8. Which of the following nucleophiles should you mix with ethyl bromide to obtain 5-methyl-3-heptyne?



9. Which of the following compounds is/are meso?



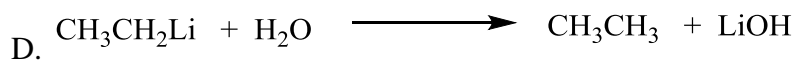
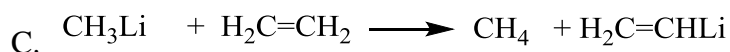
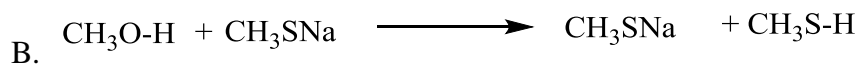
A. I only

B. III only

C. II only

D. II and III

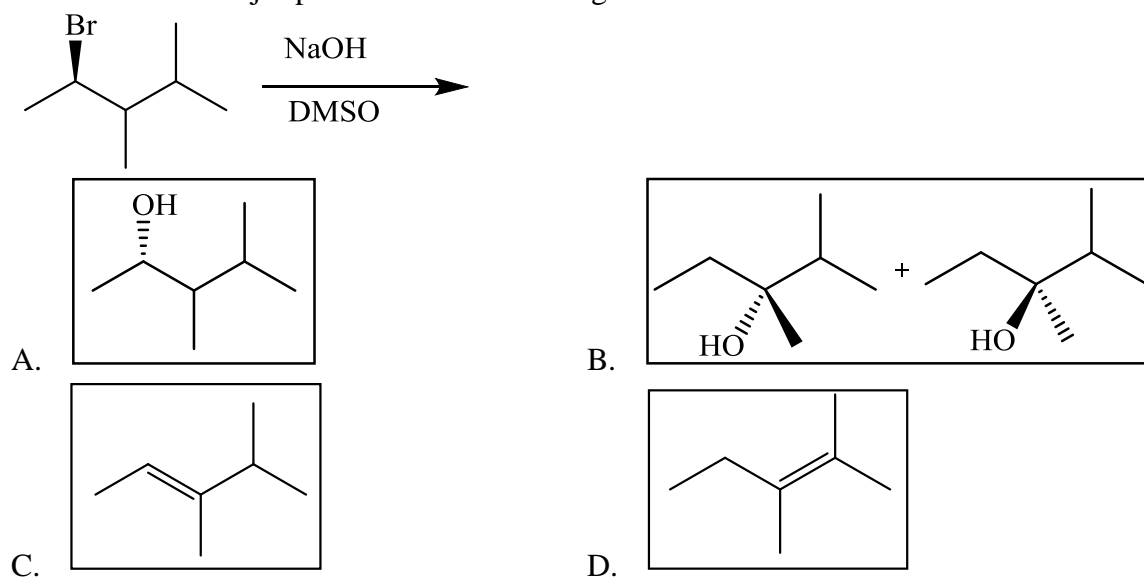
10. Which of the following acid-base reactions will NOT take place as written?



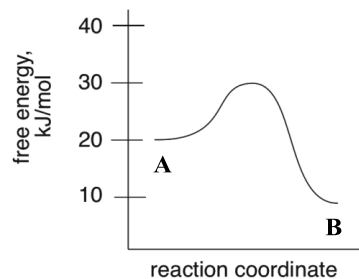
11. Which of these statements is **false** regarding the reaction mechanism of the $\text{S}_{\text{N}}2$ reaction between CH_3O^- and $\text{CH}_3\text{CH}_2\text{Cl}$?

- A. The leaving group leaves as a strong base.
- B. The nucleophile is most reactive when the solvent is polar, aprotic.
- C. At the transition state, the oxygen and chlorine both have partial bonds to the same carbon.
- D. The CH_3O^- attacks the $\text{CH}_3\text{CH}_2\text{Cl}$ carbon at the same time as the Cl departs.

12. What is the major product of the following reaction?



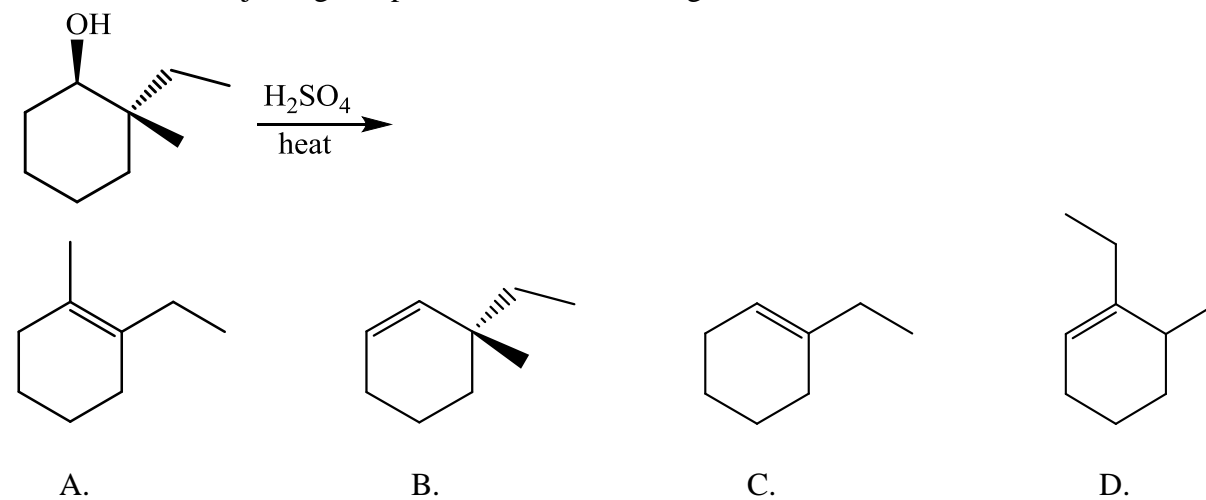
13. What is the E_{act} of the reaction $A \rightarrow B$? Based on the energy diagram is the reaction exothermic or endothermic?



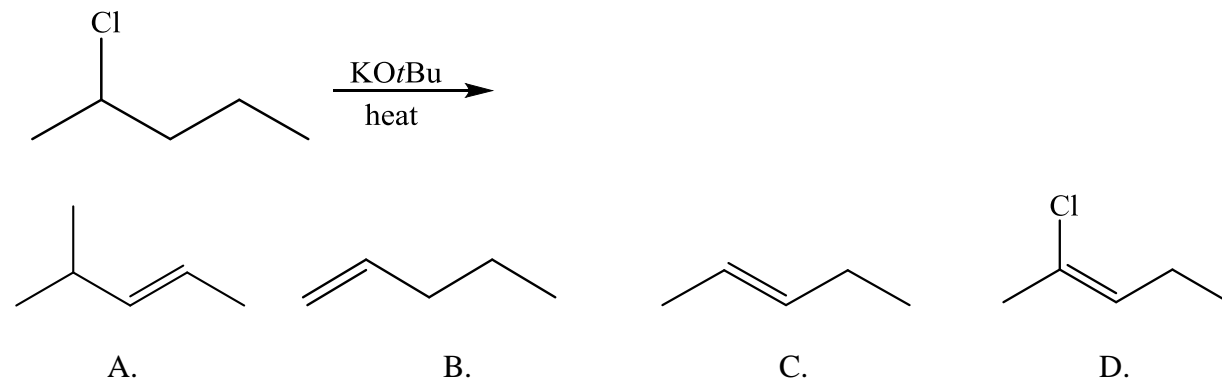
A. 20 kJ/mol; endothermic
C. 20 kJ/mol; exothermic

B. 10 kJ/mol; endothermic
D. 10 kJ/mol; exothermic

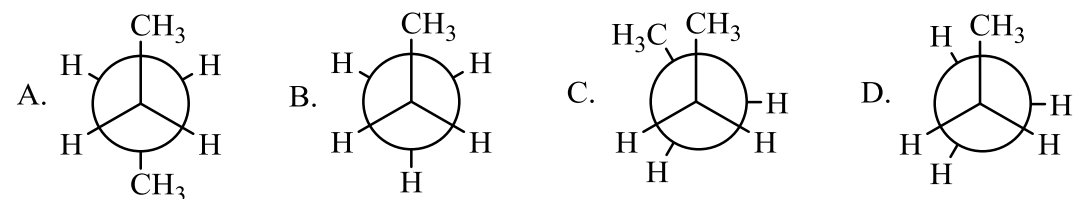
14. Predict the major organic product of the following reaction.



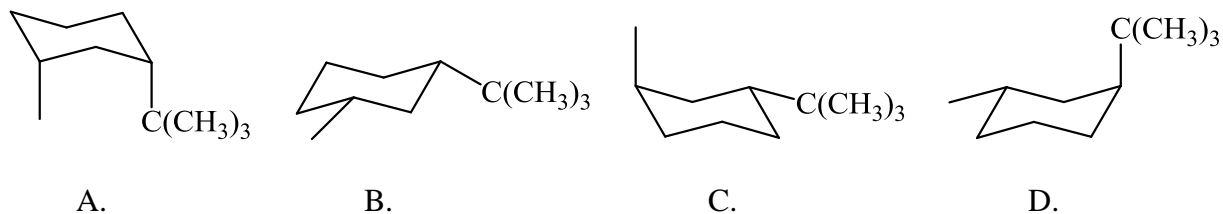
15. Predict the major organic product of the following reaction.



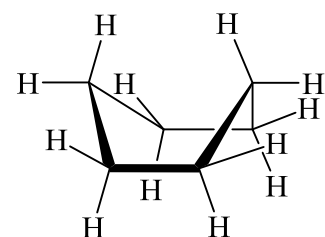
16. Which of the following structures is the least stable conformation of butane?



17. Which of these is the most stable conformation of *cis*-1-*tert*-butyl-3-methylcyclohexane?

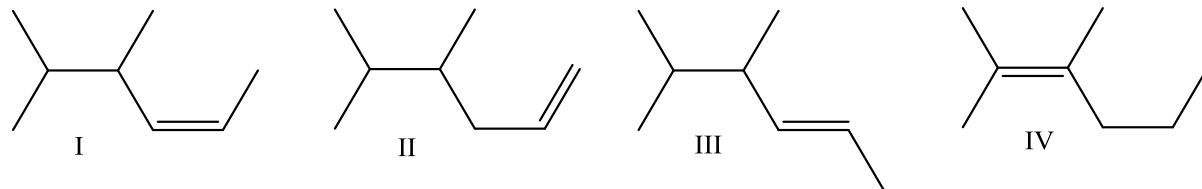


18. What type(s) of strain is/are present in this structure?



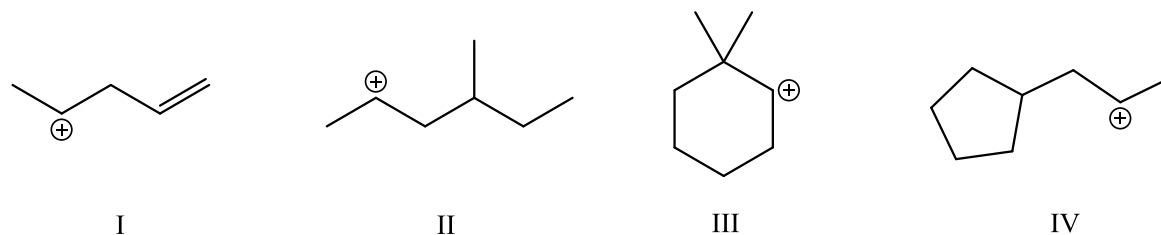
A. Torsional only B. Torsional and Angle C. Steric only D. Torsional and Steric

19. Arrange these alkenes by stability, *most* exothermic $\Delta H_{\text{combustion}}$ first:



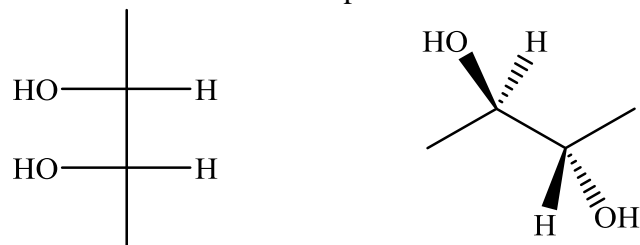
- A. IV > III > II > I B. IV > III > I > II C. II > III > II > IV D. II > I > III > IV

20. Which of the following carbocations will rearrange?



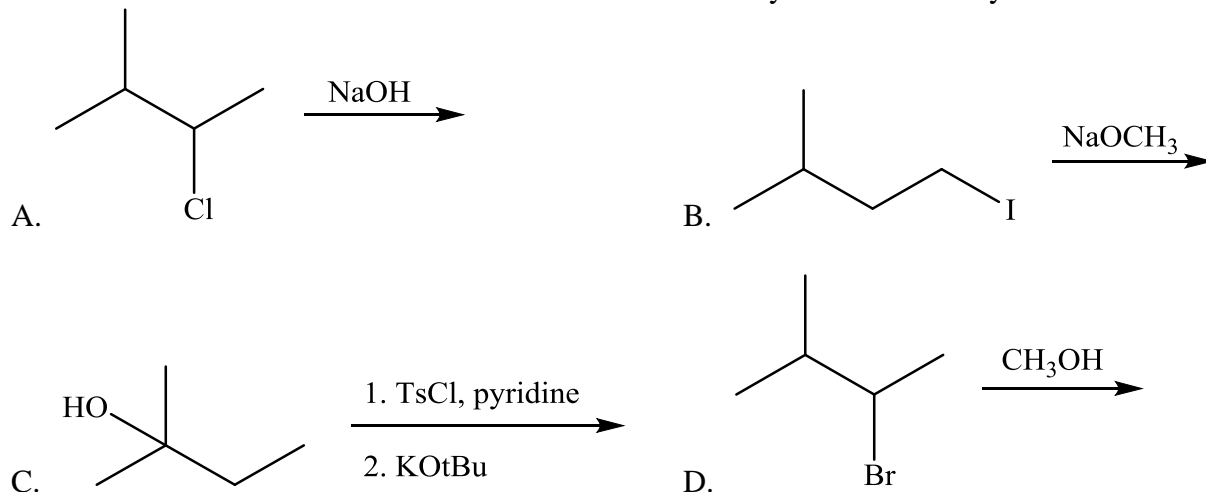
- A. I, III B. III, IV C. II, IV D. I, II, III

21. What is the relationship between these two molecules?

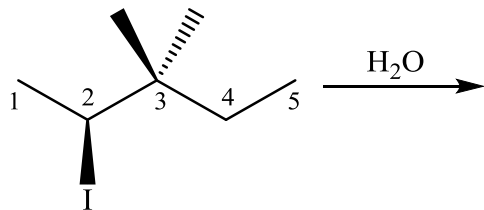


- A. enantiomers B. same molecule C. diastereomers D. constitutional isomers

22. What is the best reaction or series of reactions used to synthesize 2-methylbut-2-ene?

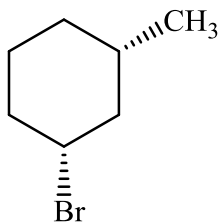


23. What statement is true regarding the substitution mechanism of this reaction?



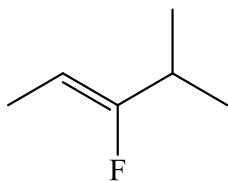
- A. S_N2 : the nucleophile attacks as the leaving group leaves and 1 product is formed (retention) with OH group at C2
- B. S_N2 : the nucleophile attacks as the leaving group leaves and 1 product (inversion) is formed with OH group at C2
- C. S_N1 : the leaving group leaves, nucleophilic attack occurs, and 2 products (racemic mixture) are formed with OH group at C2
- D. S_N1 : the leaving group leaves, a methyl shift occurs from C3 to C2, nucleophilic attack occurs, and 2 products are formed (racemic mixture) with OH group at C3

24. Give the correct IUPAC name for the following compound:



- A. (1*R*, 3*R*)-1-bromo-3-methylcyclohexane
- B. (1*S*, 3*R*)-1-bromo-3-methylcyclohexane
- C. (1*R*, 3*S*)-1-bromo-3-methylcyclohexane
- D. (1*S*, 3*S*)-1-bromo-3-methylcyclohexane

25. Give the correct IUPAC name for the following compound:



- A. (*E*)-3-fluoro-4-methyl-2-pentene
- B. (*Z*)-3-fluoro-4-methyl-2-pentene
- C. (*E*)-1-fluoro-1-isopropyl-1-propene
- D. (*Z*)-1-fluoro-1-isopropyl-1-propene