CHEMISTRY 61
Exam 2: October 10, 2002
Dr. M.T. Crimmins

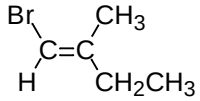
Name_____

Pledge: I have neither given nor received aid on this exam.

Signature_____

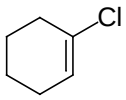
I. NOMENCLATURE (6 points) Give the IUPAC name for compounds: Indicate R, S, cis, trans, E, or Z where appropriate.

1.



E-1-bromo-2-methyl-1-butene

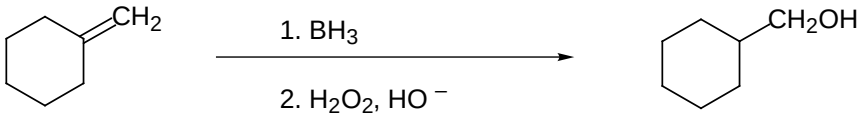
2.



1-chlorocyclohexene

II. REACTIONS: Predict the major organic products of the following reactions. **INDICATE STEREOCHEMISTRY AS NEEDED.** (4 points each)

3.



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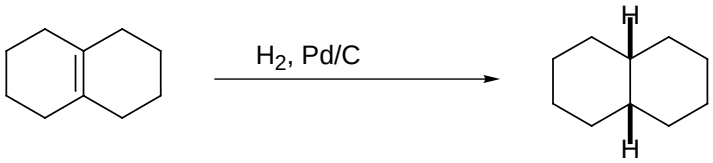

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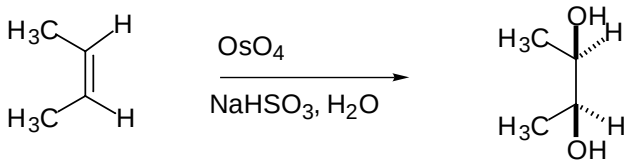

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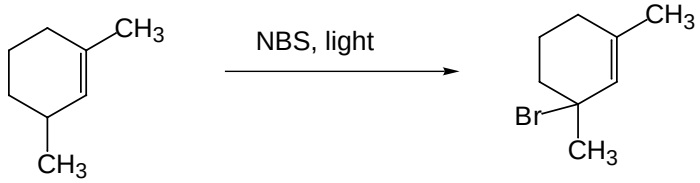

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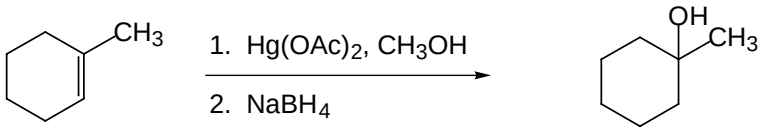

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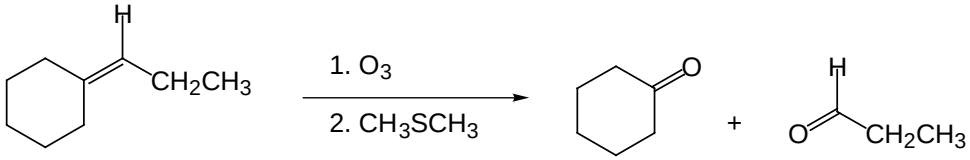

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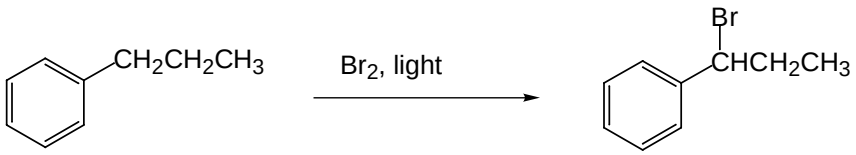

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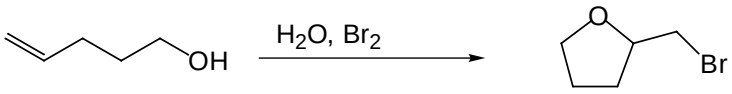
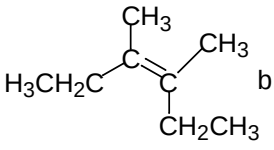
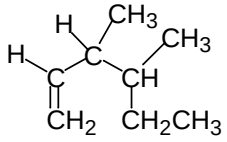
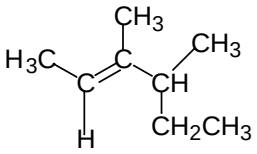


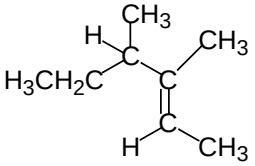
II. Multiple Choice: Circle the best answer **(only one)**. (3 points each)

13. Which of the following alkenes has the lowest heat of hydrogenation? **A**

a. 

b. 

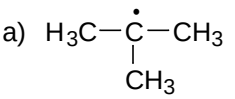
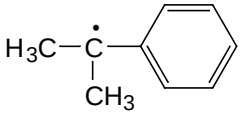
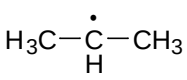
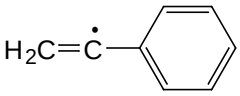
c. 

d. 

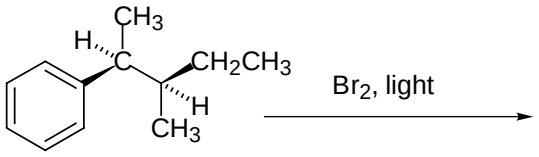
14. Which of the following is the **least** stable carbocation? **B**

a. $+C(CH_3)_2C_6H_5$
b. $+CH_2CH_3$
c. $+CH_2–CH=CH_2$
d. $+C(CH_3)_3$

15. Which of the following free radicals is the **most** stable? **B**

a) 
b) 
c) 
d) 

16. The product of the reaction below would be **C**



a) a racemic mixture b) a single enantiomer c) a mixture of two diastereomers d) a single, achiral compound

17. Which of the following reactions would proceed the slowest? **C**

a. $CH_3CH_2CH_3 + Cl_2 + \text{light} \rightarrow CH_3CHClCH_3$
b. $CH_3CH_2CH_3 + Br_2 + \text{light} \rightarrow CH_3CHBrCH_3$
c. $CH_3CH_2CH_3 + Br_2 + \text{light} \rightarrow CH_3CH_2CH_2Br$
d. $CH_3CH_2CH_3 + Cl_2 + \text{light} \rightarrow CH_3CH_2CH_2Cl$

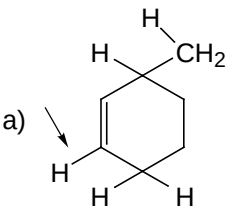
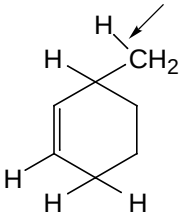
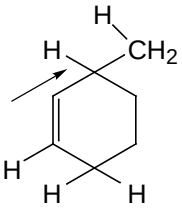
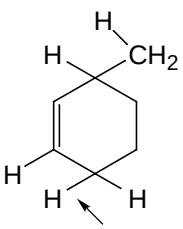
18. Which of the following would be a radical initiation step? **B**

a. $CH_3CH_2\cdot + Br_2 \rightarrow CH_3CH_2Br + Br\cdot$
b. $Br_2 \rightarrow 2\ Br\cdot$
c. $2\ CH_3CH_2\cdot \rightarrow CH_3CH_2CH_2CH_3$
d. $CH_3CH_3 + Br\cdot \rightarrow CH_3CH_2\cdot + HBr$

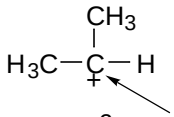
19. The energy of activation of a reaction is **D**

a. the difference in energy between the reactants and an intermediate in the reaction
b. the difference in energy between the transition state and the products
c. the difference in energy between the reactants and the products
d. the difference in energy between the reactants and the transition state
e. the difference in energy between the intermediate and the products

20. Which of the following bonds is the weakest? **C**

a) 
b) 
c) 
d) 

21. What is the hybridization of each of the indicated atoms below?



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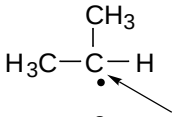

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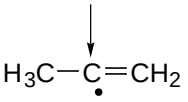


sp

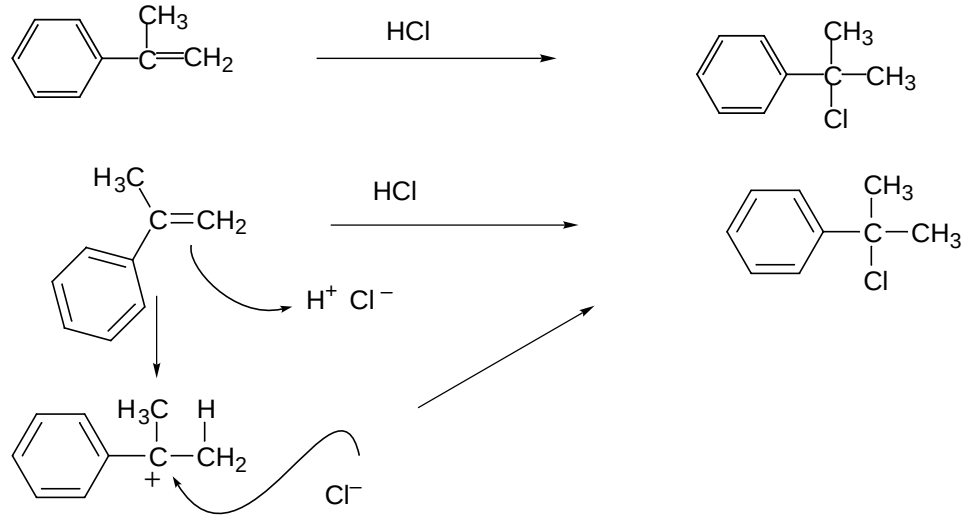
22. What two factors can affect the stability of a carbocation? (4 points)

___sigma donation (hyperconjugation)___ _____pi donation__(resonance)__

23. What is the rate limiting step in free radical halogenation? _hydrogen atom abstraction_

V. Mechanisms. Give a stepwise, detailed mechanism with arrows and intermediates for the following reactions. (4 points each)

24.



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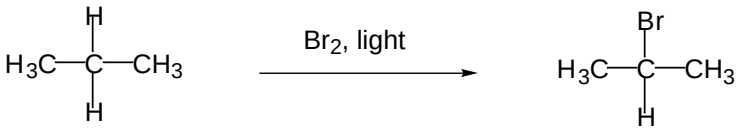
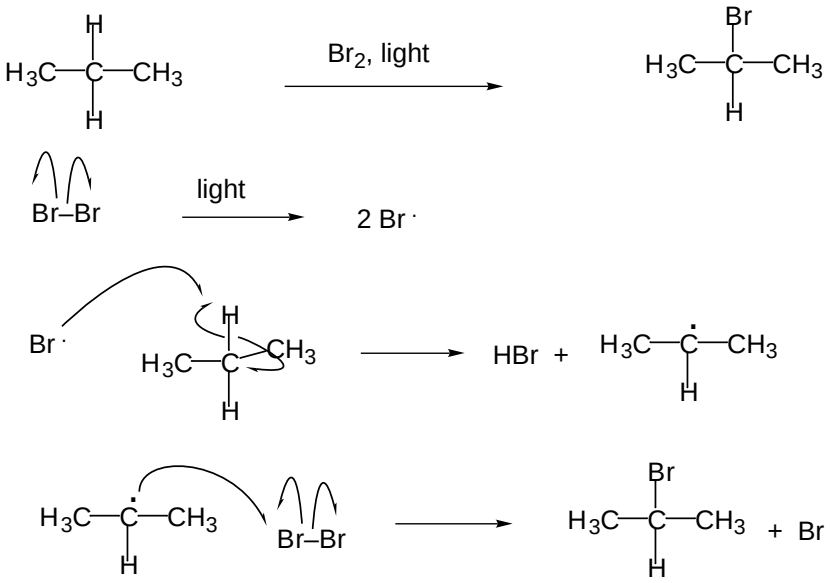
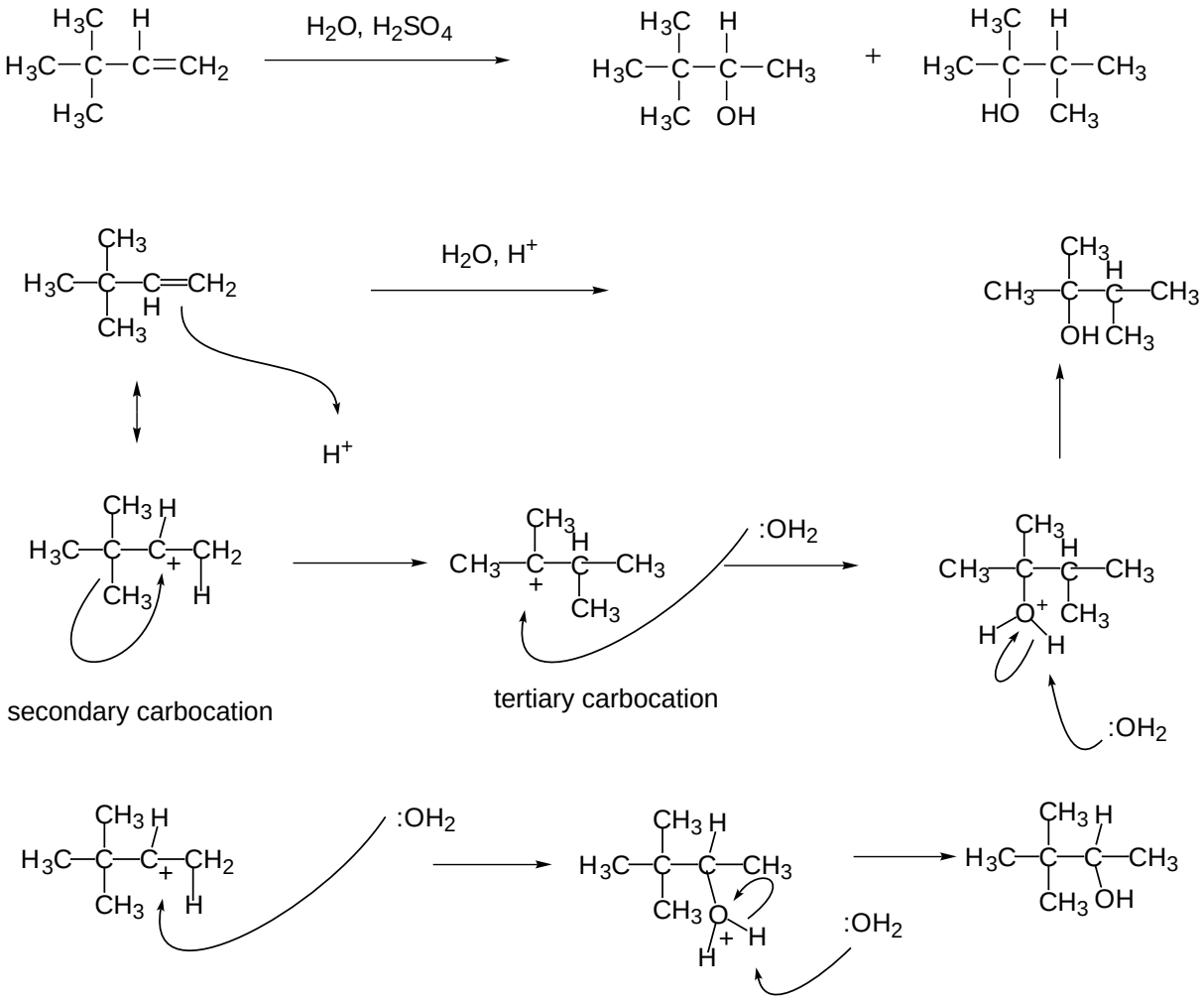
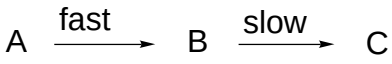


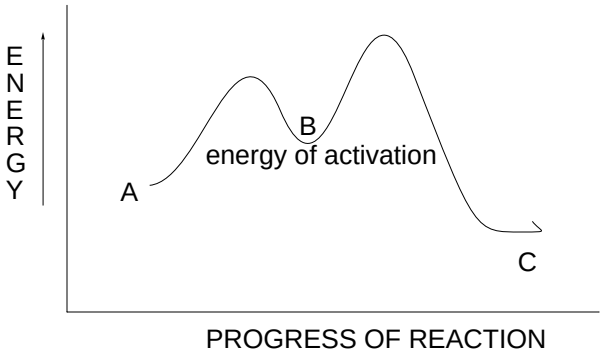


27.



28. Draw an energy diagram for the hypothetical exothermic reaction below where B is an unstable intermediate.
Label the positions for A, B, and C on the diagram. (3points)





29. A diene of the molecular formula C_8H_{14} was treated with ozone and then dimethyl sulfide (CH_3SCH_3). The products of the reaction were acetone (2-propanone) and glyoxal (OHC–CHO) . What is the structure of the diene? (3 points)