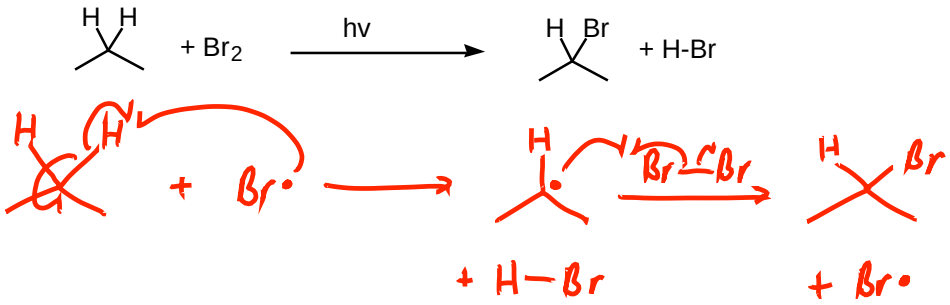
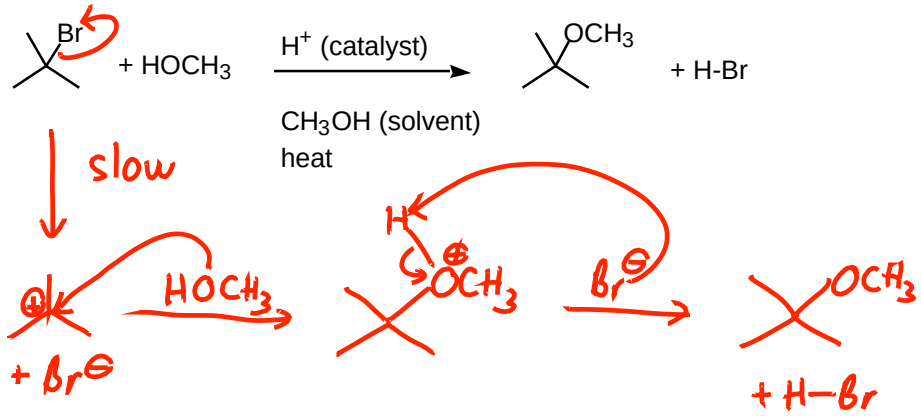
JASPERSE CHEM 350 TEST 2 VERSION 4
Ch. 4 The Study of Chemical Reactions
Ch. 5 Alkyl Halides: Nucleophilic Substitution and Elimination
Ch. 6 Stereochemistry

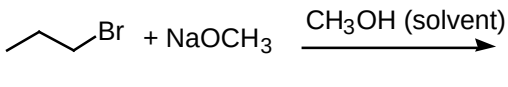
1. Draw the mechanism for the following reaction, and write "slow" next to the rate-determining step. Be sure to draw all intermediates, and to correctly draw "electron-movement" arrows or half-arrows. (Show the propagation steps only.) (4 points)

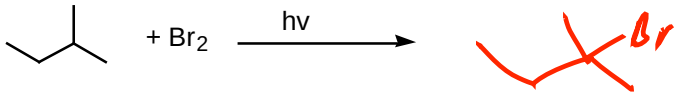


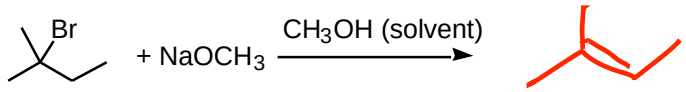
2. Draw the mechanism for the following reaction, and write "slow" above the rate-determmning step. Be sure to draw all intermediates, and to correctly draw "electron-movement" arrows. (5 points)



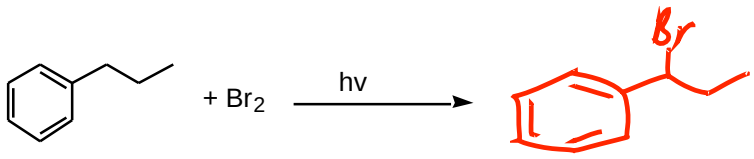
3. Predict the major products for the following reactions. (4 points each)

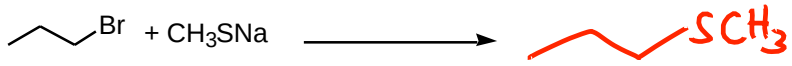
a) 

b) 

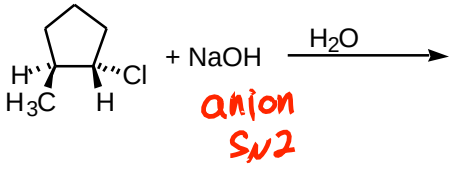
c) 

E2

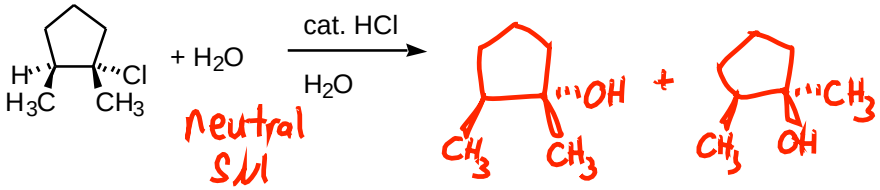
d) 

e) 

4. Draw the <u>substitution products</u> for the following reactions. (Do not draw the accompnaying elimination products). <u>Include stereochemistry in your answer, and if two substitution products are formed draw them both.</u> (4 points each)

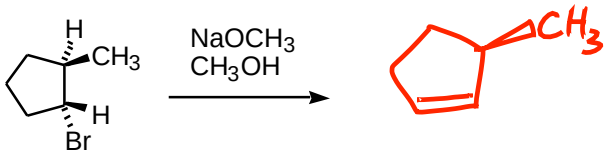
a) 

inversion

b) 

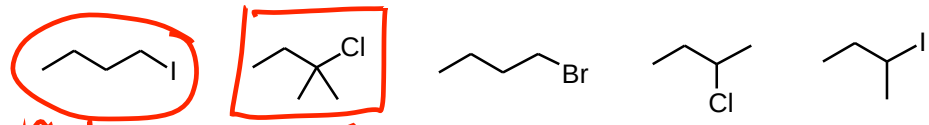
racemization

5. Draw the <u>E2 elimination product(s)</u> [do not draw the substitution product(s)]. (4 points each)



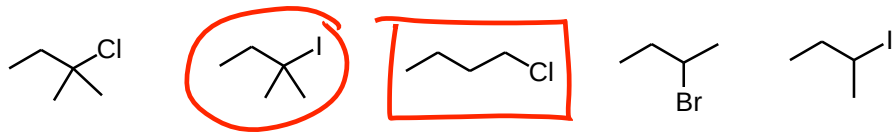
E2, trans H required

6. Of the following alkyl halides, (3 points)
a) Circle the one that would be the most reactive toward S_N2 substitution
b) Put a box around the one that would be the least reactive toward S_N2 substitution



1°, best leaving group
3°, worst leaving group

7. Of the following alkyl halides, (3 points)
c) Circle the one that would be the most reactive toward S_N1 substitution
d) Put a box around the one that would be the least reactive toward S_N1 substitution



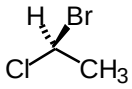
8. Rank the stability of the following carbocations, from 1 (most stable) to 4 (least stable) (4 pts)

4 3 1 2

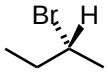
9. Rank the stability of the following radicals, from 1 (most stable) to 4 (least stable) (4 pts)

1 3 4 2

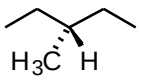
10. Classify as R or S (2 pts each)

a) 

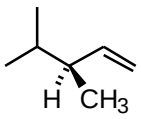
S

b) 

R

c) 

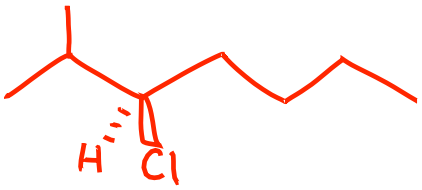
achiral, no R or S

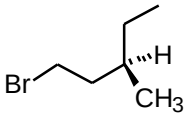
d) 

S

11. Provide the structure and the IUPAC name for the following (3 pts each)

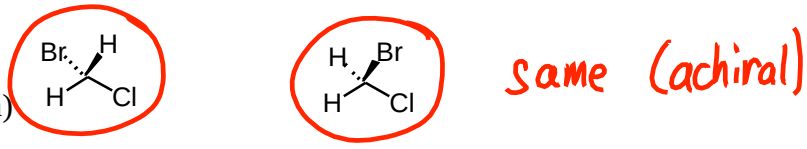
a) (R)-3-chloro-2-methylheptane



b) 

(R)-1-bromo-3-methylpentane

12. Classify the paris of molecules as not isomers, structural isomers, diastereomers, enantiomers, or identical, and circle any molecules that are achiral. (2 pts each)

a) 

same (achiral)

b) 

enant

c) 

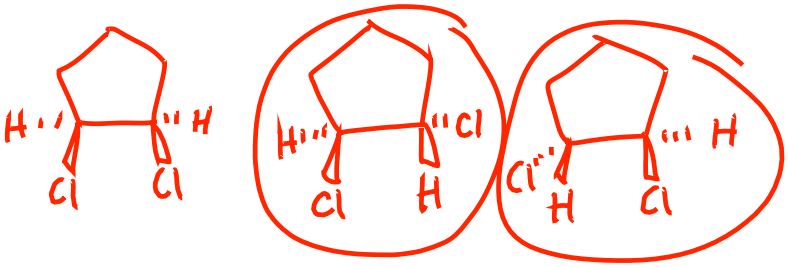
S R

enant

13. For 1,2-dimethylcyclopentane, (8 pts)

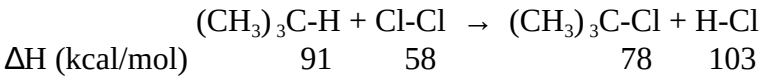
a) How many stereocenters are present 2

b) Draw all the possible stereoisomers, and circle those that are chiral.



Each of the following multiple choice problems is worth 3 points.

14. For the reaction shown below, with bond dissociation energies listed below each key bond, the overall ΔH is:

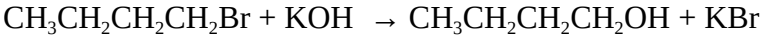


a) +58 kcal/mol
b) -32 kcal/mol
c) +32 kcal/mol
d) -57 kcal/mol
e) +181 kcal/mol

15. Which factor would <u>not</u> increase the rate of an E1 reaction:

a) Use of a more polar solvent
b) Use of a 3˚ rather than a 2˚ alkyl halide
c) Doubling the concentration of the base
d) Using iodide rather than bromide as leaving group

16. Consider the S_N2 reaction shown below. Assuming no other changes, what effect on the rate would simultaneously doubling the concentrations of both 1-bromobutane and KOH have?



a) No effect
b) It would double the rate
c) It would triple the rate
d) It would increase the rate by four times
e) It would increase the rate six times

17. Of the S_N1/S_N2/E1/E2 reactions, rearrangements are likely to occur in:

a) S_N1 reactions only
b) S_N2 reactions only
c) E1 reactions only
d) Both S_N1 and E1 reactions
e) Both S_N2 and E2 reactions