

CHEMISTRY 241 EXAMINATION II  
TUESDAY, November 2, 1999  
6:30 - 7:50 P.M.  
Professor William P. Dailey

NAME: \_\_\_\_\_

\_\_\_\_\_

SOCIAL SECURITY

NUMBER: \_\_\_\_\_

QUESTIONS	POINTS	SCORE
1.	9	_____
2.	6	_____
3.	9	_____
4.	20	_____
5.	10	_____
6.	7	_____
7.	8	_____
8.	9	_____
9.	10	_____
10.	12	_____
	TOTAL	_____

READ ALL QUESTIONS CAREFULLY BEFORE ANSWERING THEM.  
BE SURE TO INDICATE STEREOCHEMISTRY IF APPROPRIATE.

1. (9 points) Draw structural representations of each of the following molecules. Be sure that your structure shows the configuration at each stereocenter.

a. (R)-2-chlorobutane

b. (2R, 3R)-2-fluoro-3-methyloctane

c. (1S, 2S, 4S)-4-bromo-1-ethyl-2-methylcyclohexane

2. (6 points) a. Provide an example of a compound that contains chiral carbon atoms but is achiral.

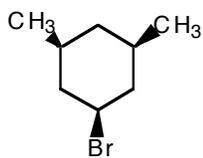
b. Provide an example of a molecule that contains no chiral carbon atoms but is chiral.

3. (9 points) a. Draw all the **structural isomers** of molecular formula  $C_6H_{12}$  that contain a four membered ring.

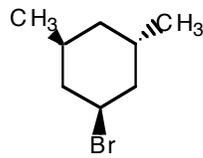
b. For each of these structural isomers, draw all the possible **stereoisomers**.

c. Circle all the stereoisomers that are chiral.

4. (7 Points) a. Compound **A** reacts faster by the  $S_N2$  mechanism than compound **B**. Explain this difference.

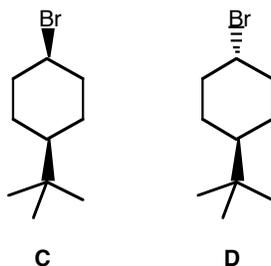


**A**



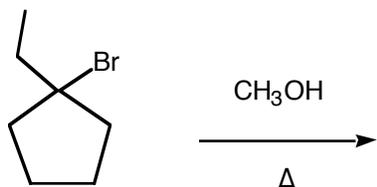
**B**

(7 Points) b. Compound **C** reacts faster by the  $S_N1$  mechanism than compound **D**. Explain this difference.



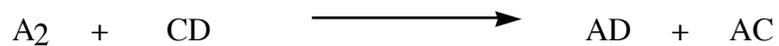
(6 Points) c. In contrast to the reaction of other bromocycloalkanes, the reaction of bromocyclopropane under  $S_N2$  conditions doesn't take place. Can you offer an explanation for this lack of reactivity?

5. (10 Points) Provide the product(s) for the following reaction and propose a mechanism using the "curved arrow" formalism.



6. (7 Points) When dichloriodomethane,  $\text{CHCl}_2\text{I}$ , is treated with strong  $\text{NaOH}$  solution, an intermediate is formed that reacts like a carbene. Draw the structure of this reactive intermediate and give a mechanism to account for its formation.

7. (8 Points) Consider the following reaction which occurs by a free radical chain mechanism.



The bond dissociation energies are:

A-A	35 kcal/mol
A-C	60 kcal/mol
A-D	75 kcal/mol
C-D	70 kcal/mol

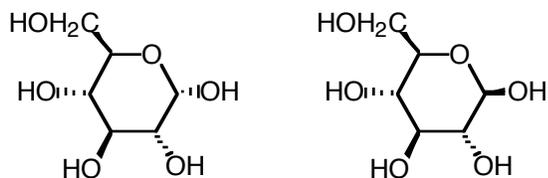
a) Write the propagation steps for this reaction.

b) Calculate  $\Delta H^\circ$  for the reaction.

c) Which of the propagation steps is rate determining?

d) Would you expect this reaction to be highly selective towards different types of C-D bonds (C-D bonds with slightly different BDE)? Why or why not?

8. (9 Points) The following are representations of two forms of glucose. The six-membered ring is known to exist in a chair in each form. Draw clear representations of the most stable conformation of each. Are they two different conformations of the same molecule, or are they stereoisomers? Clearly note which substituents (if any) occupy axial sites.



9. (10 Points) Draw all the **monochloro products** you would expect to obtain from the radical chlorination of 2-methylpentane. Given that the relative reactivity of chlorination of tertiary:secondary:primary C-H bonds is 5.0:3.0:1.0, calculate the percentage of each product that would be formed.

10. (12 Points) Complete the following reactions. If no reaction is expected, then say so.

