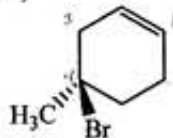




Give appropriate regiochemistry and stereochemistry when it applies.

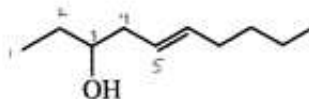
(16 points) 1. Name the following compounds. Be sure to use R, S, cis, trans, E, or Z designations if appropriate.

a)



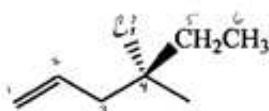
R-4-bromo-4-methylcyclohexene

c)



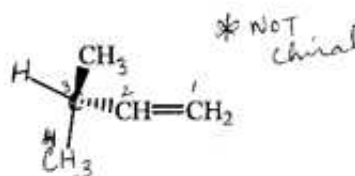
trans-5-decen-3-ol

b)



S-4-chloro-4-methyl-1-hexene

d)



3-methyl-1-butene

(6 points) 2. The specific rotation of (R)-(+)-glyceraldehyde is +8.7°. If the observed specific rotation of a mixture of (R)-(-)glyceraldehydes and (S)-glyceraldehyde is +1.4°, what percent of glyceraldehyde is present as the R enantiomer?

$$\text{optical purity} = \frac{1.4}{8.7} \times 100\% = 16\%$$

$$16\% = |2R - 2S|$$

$$16\% = |x - (100\% - x)|$$

$$116 = 2x$$

$$x = 58\% = \%R$$

(4 points) 3. Rank the following in order of increasing dielectric constant. (1 being the lowest and 4 being the highest).

Methanol

3

dimethyl sulfoxide

2

trifluoroacetic acid

4

pentane

1

(2 points) 4. Which of the above would be the best solvent for an S_N2 reaction?

DMSO - polar aprotic

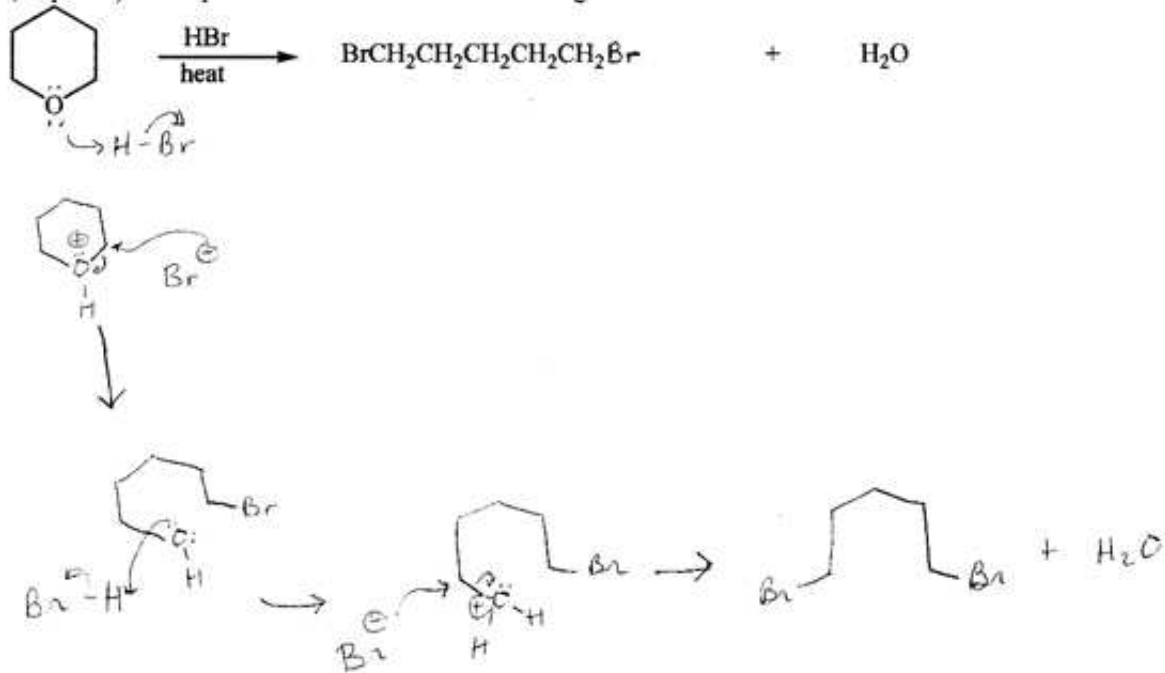
(6 points) 5. a) Which of the following is a better nucleophile in methanol? Why?

(3 pts) Cl^- or Br^- → larger electron cloud
more difficult to solvate

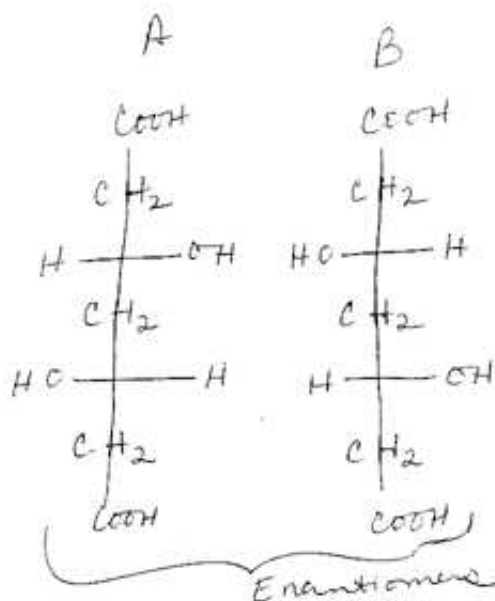
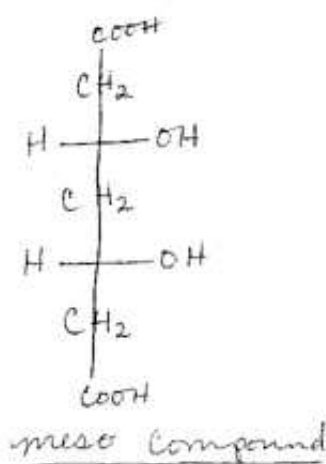
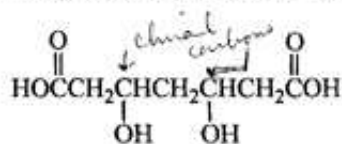
b) Which of the following is a better nucleophile in acetonitrile? Why?

(3 pts) NH_3 or CH_3O^- has negative charge - stronger Nu^-
Note: (also strong base)
↓
Don't need to put this,
but may mention

(10 points) 6. Propose a mechanism for the following reaction.



(8 points) 7. How many stereoisomers does the following compound have? Draw each of them as Fischer projections and identify the pairs of enantiomers and the pairs of diastereomers as well as any meso compounds that may be present.

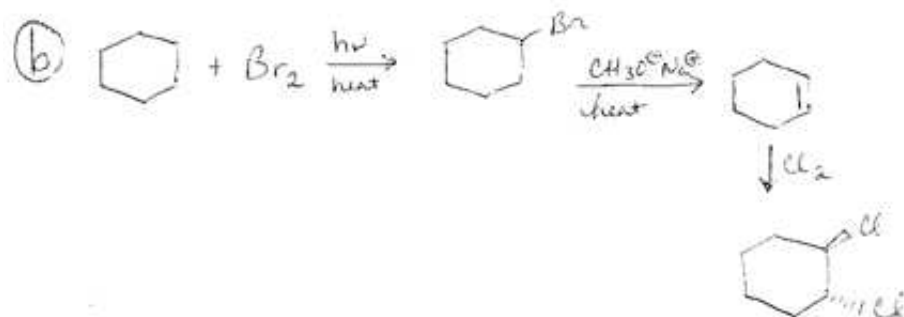
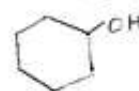
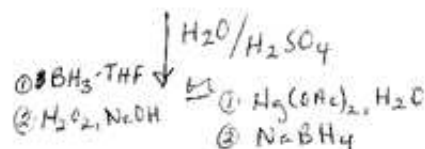
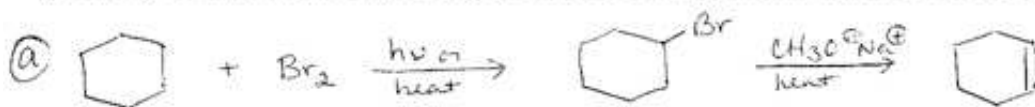


A & B are both related to the meso compound as diastereomers

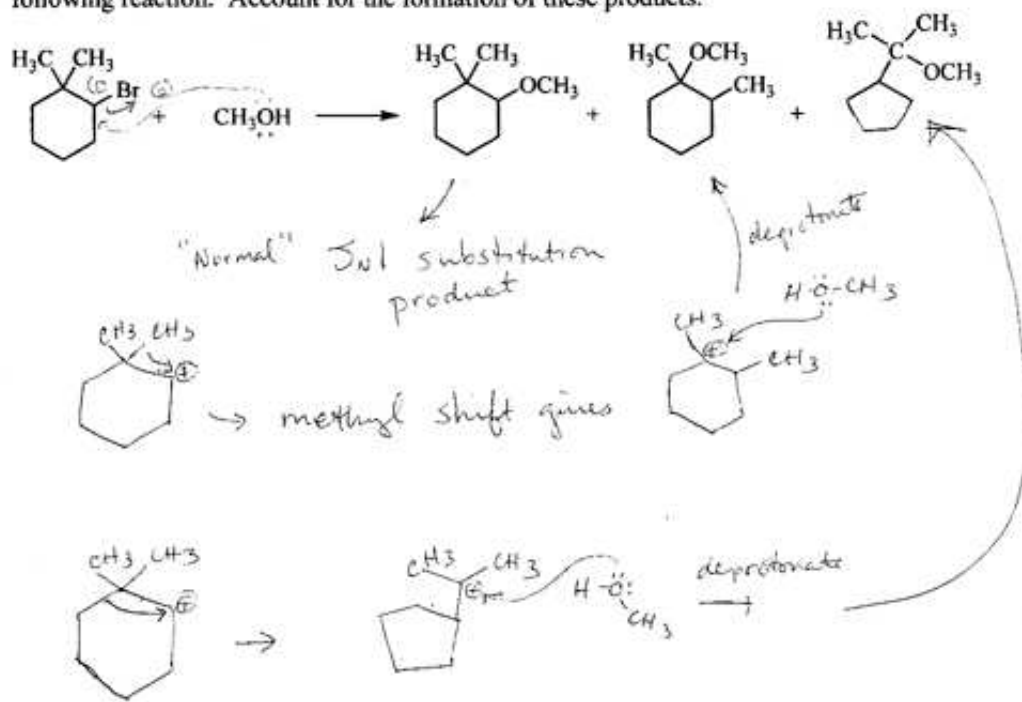
(8 points) 8. Choose one of the following to complete. Show each step, but not the mechanism. Be sure to indicate which problem you would like to have graded if you attempt both (a) and (b). If you do not indicate which you would like to have graded, the first problem attempted will be graded.

a) Starting with cyclohexane as your only source of carbons, synthesize cyclohexanol.

b) Starting with cyclohexane as your only source of carbons, synthesize *trans*-1,2-dichlorocyclohexane.



(10 points) 9. Three substitution products (not including any elimination products) are obtained from the following reaction. Account for the formation of these products.



(3 points each) 10. Fill in the missing reactants or **major** products for the following reactions. Be sure to include stereochemistry or regioselectivity when appropriate.

