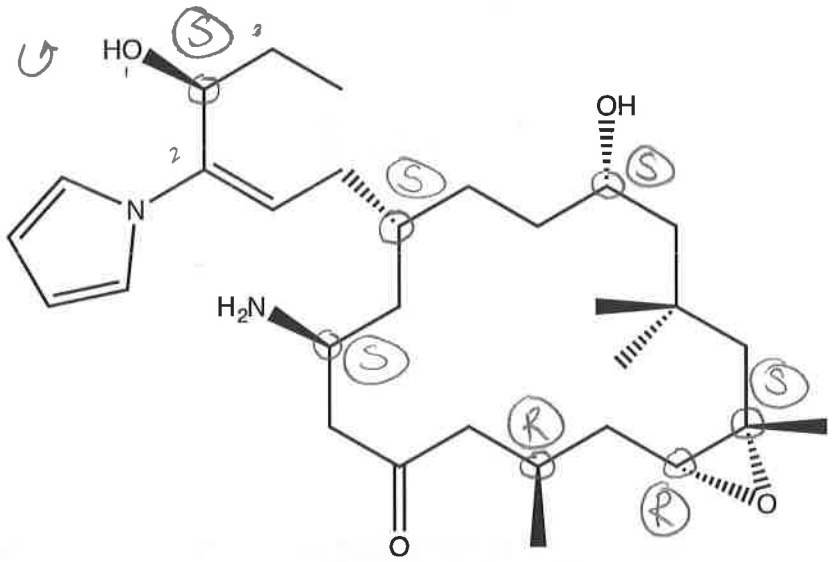
Organic Chemistry I

Exam 2

1.) Given the molecule below, **identify all the stereocenters** and **correctly assign the stereochemical configurations** (assign R&S where appropriate and assign correctly).



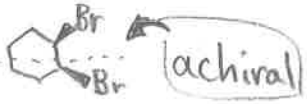
2.) The following True-False questions below are to see if you truly understand the principles/terminology of stereochem. Circle T for true, F for false:

a.) A chiral molecule has a non-superimposable mirror image and is optically active.

Definition of chirality

(T) F

b.) A molecule is **always** chiral as long as it has one or more stereocenters.

example 

achiral

T (F)

A structure can have stereocenters and have a plane of symmetry (be meso) ⇒ making it achiral

c.) A meso structure has an enantiomer.

Meso structures are achiral

T (F)

d.) Enantiomers and diastereomers are 2 types of stereoisomers.

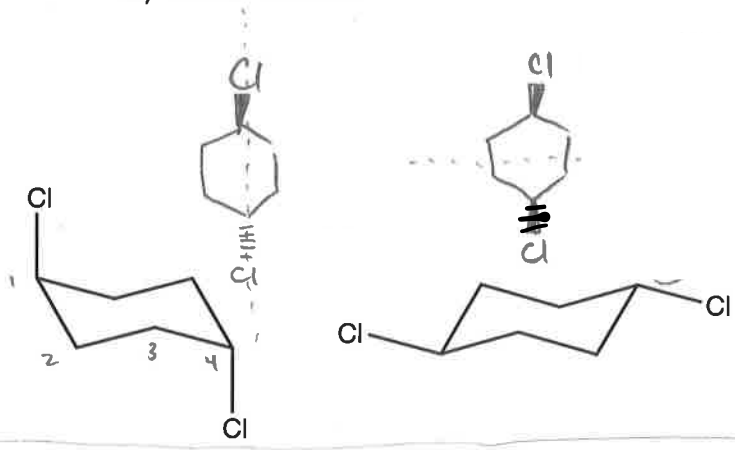
(T) F

a.) Racemic mixtures exhibit a **net** optical activity.

T (F)

With equal amounts of each enantiomer, no optical activity is seen.

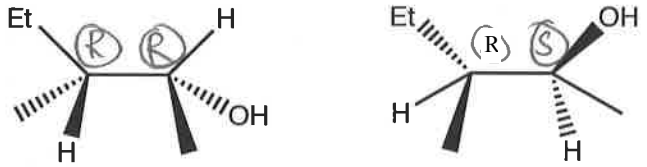
3.) For the following molecules pairs below, identify relationship between the pair as:
   a.) The same molecule
   b.) Different structures completely
   c.) Structural isomers
   d.) Enantiomers
   e.) Diastereomers



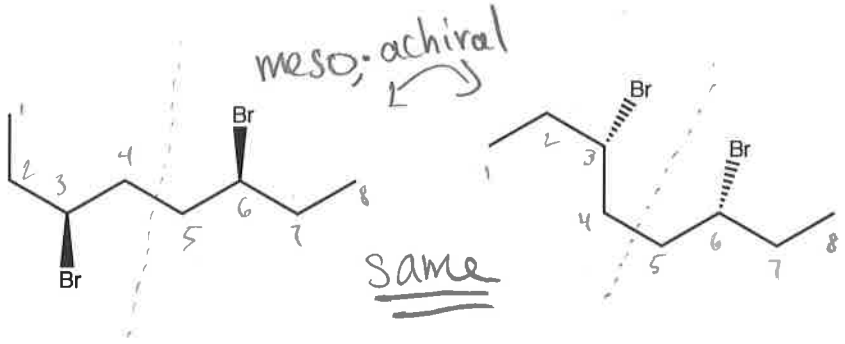
Relationship

Same

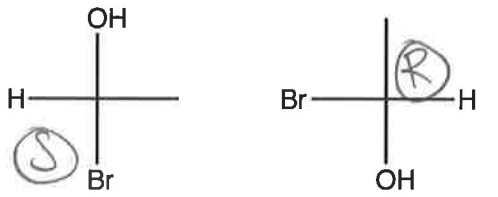
* Do double switches where necessary *



Diastereomers



Same molecule



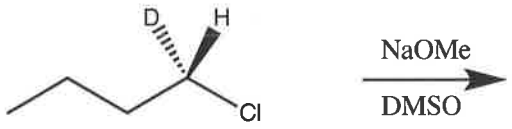
Enantiomers

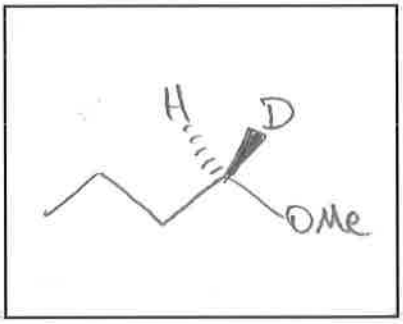
4.) Given the following reactions, **predict the correct product, or NR** if no reaction takes place. If a reaction did occur, on the far left indicate which of the 4 reaction types occurred, either S_N2, E2, S_N1 (ignore E1 since it causes minor products). Take note of stereochemistry where applicable **and/or** indicate if a racemic mixture is produced.

Rxn Type:

SN2

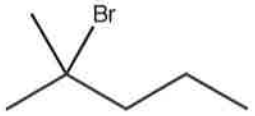
1° substrate, polar-aprotic, ⊖OMe nuc

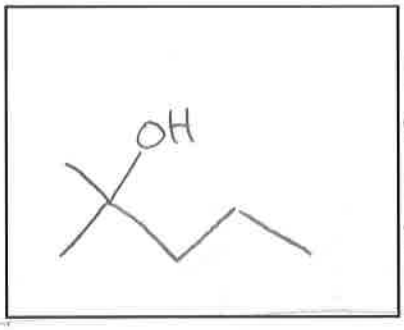




SN1

polar protic solvent, 3° substrate

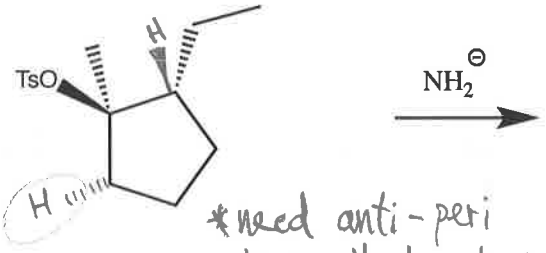




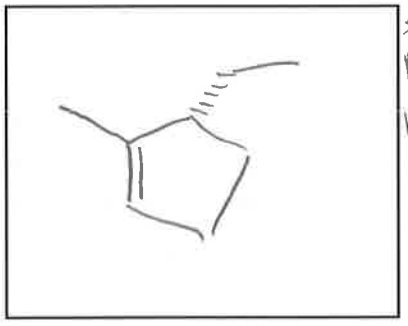
No stereochem, but would be racemic

E2

3°, strong base

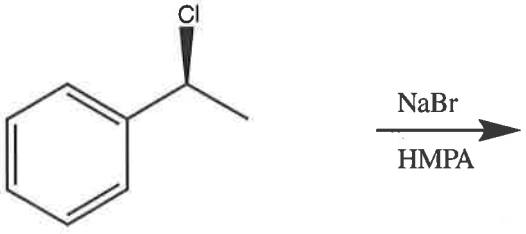


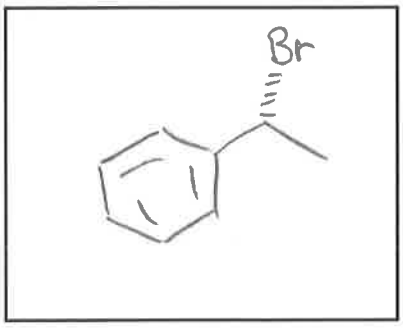
*need anti-peri planar H to eliminate



*make methyl planar

SN2





2°, polar-aprotic, weak base nuc

(:Br:⊖)

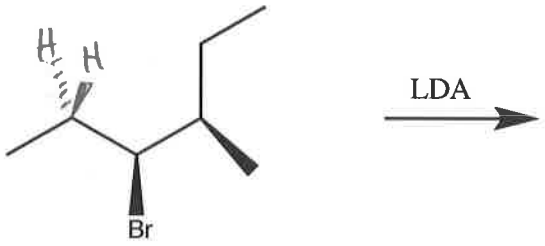
4.) (continued)

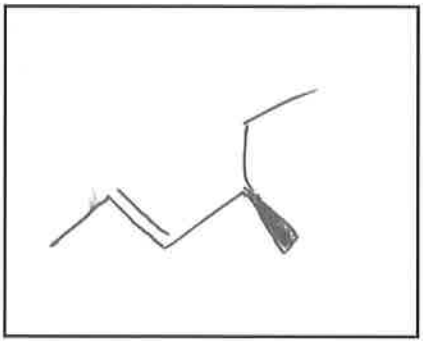
Rxn Type:

E2

(Hoffmann elimination)

2° big bulky base





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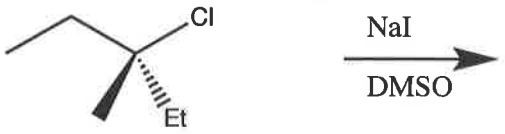
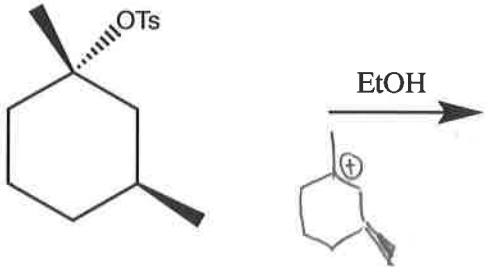
would be SN2, but substrate is 3°

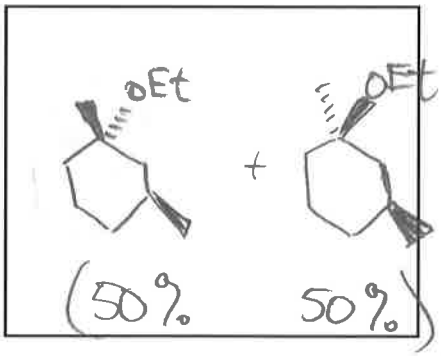


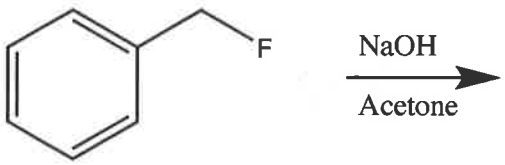
NR

SN1

polar protic, 3°





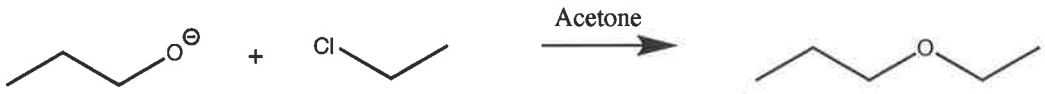


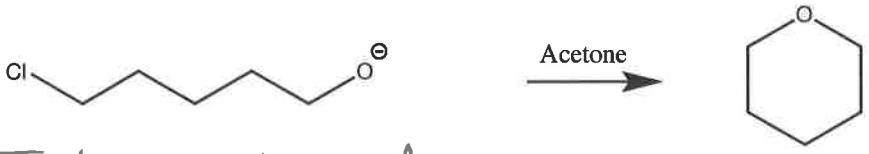
NR

Bad leaving group

($:\ddot{F}:^{\ominus}$ not weak, stable)

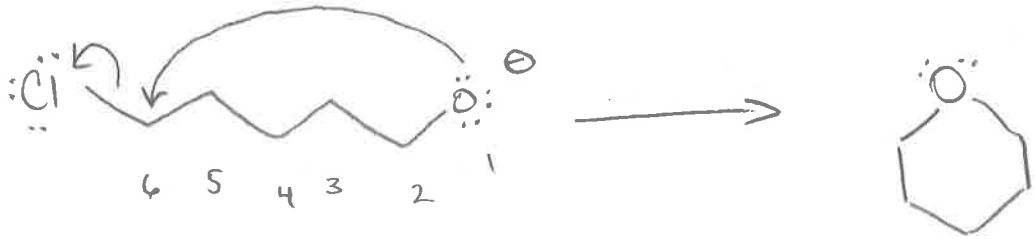
5.) Below, two S_N2 reactions are shown, Rxn A and Rxn B. Of the two, pick the ***faster*** reaction, and draw its mechanism. Then **briefly** explain why the reaction you picked is faster than the other.

Rxn A 

Rxn B 

B Faster than A

Mechanism and Explanation:



Rxn A: 2 reactants → 1 product | less disorder

Rxn B: 1 reactant → 1 product | more disorder

Rxn B has better entropy than A and therefore more favorable/faster by being intramolecular