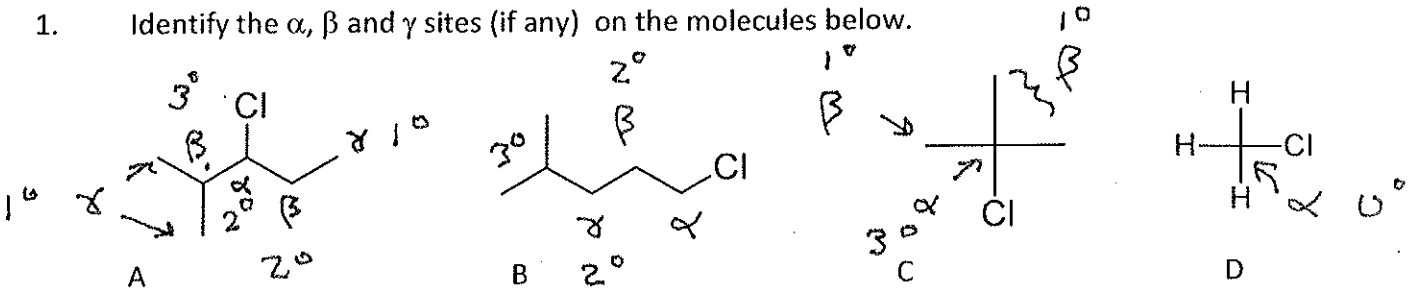
Organic Chem 3514 Alfred State

S_N2 Mechanism Exercises

1. Identify the α, β and γ sites (if any) on the molecules below.



2. Identify the 0° , 1° (primary), 2°(secondary) and 3° (tertiary carbons) (if any) on the molecules above.

3. Alkyl halides undergo two basic kinds of reactions: substitutions and eliminations

4. Define what the acronym S_N2 stands for

5. The SN2 mechanism involves (circle all that apply):

3 coordinated carbocation	5 coordinated complex	stepwise mechanism
concerted mechanism	leaving group	proton transfer
electron transfer	racemization	inversion

6. What motivates the halide to R-X align itself on a line opposite the attacking nucleophile? Negative lone pairs on X repel nucleophile

7. There are 5 factors governing the rate of an SN2 reaction. Name them.

1) nucleophile strength 2) α°

3) β° 4) solvent

5) leaving group

8. Order the 4 alkyl halides in problem 1 in order from fastest to slowest S_N2 rate

D > B > A > C

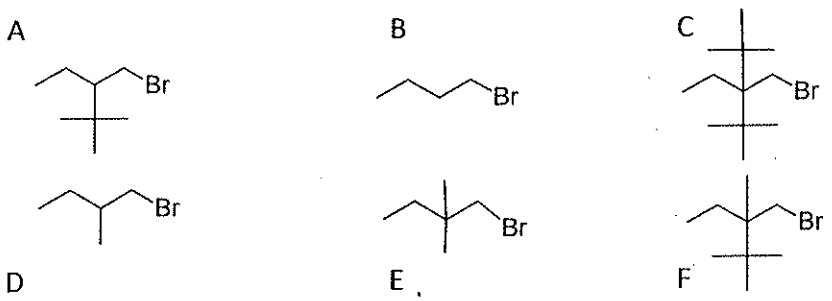
9. Using the pKa below, order the leaving groups from best to worst.

Compound	$H\text{-}OC_2H_5$	$H\text{-}NH_2$	H-Cl	H-F	H-I	H-Br
pK_a	16	36	-7	3	-11	-9

$I^- > Br^- > Cl^- > F^- > {}^-OC_2H_5 > NH_2^-$

10. Order the alkyl halides below from fastest to slowest S_N2 reaction rates.

B > D > E > A > F > C



11. Circle the true statements about SN2 below.

a) S_N2 reactions run best in polar, aprotic solvents because the solvent does not solvate the nucleophile.

b) A good nucleophile for S_N2 is a strong base.

c) A good nucleophile for S_N2 is very polarizable.

d) Steric effects are unimportant in S_N2.

e) A good leaving group is one where the conjugate acid pKa of the group is negative (-).

f) S_N2 rates follow the order $0° < 1° < 2° < 3°$ with respect to the α carbon in RX.

g) β carbon crowding is not as important as α-carbon crowding in lowering S_N2 rates

h) The ranking of I, Br, Cl and F as nucleophiles in an S_N2 follows the order: I>Br>Cl>F in polar aprotic solvents

12. From the list below, pick the substrate, nucleophile and solvent that would run fastest via SN2

Substrate	**nucleophile**	**solvent**
2-chlorobutane	F^-	H_2O
1-chloro-2-methylpentane	CH_3CH_2OH	CH_3OH
2-chloro-3-methylpropane	I^-	CH_3CN
1-chloropentane	NH_3	NH_3

13. Which is the better nucleophile ?

CH_3OH or CH_3O^-

CH_3O^- or $C_2H_5S^-$

$COOH^-$ or $C_2H_5O^-$

$CH_3\text{-}O^-$ or $CH_2Cl\text{-}O^-$

14. Any day doing Organic chemistry is a _____day.