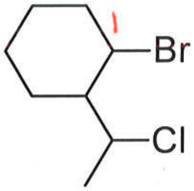
HOMEWORK ASSIGNMENT #7 ORGANIC CHEMISTRY I (30 pts): **Naming RX; S_N2 and S_N1**

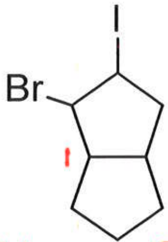
due Wednesday 8 November 2017

Your name: Answers

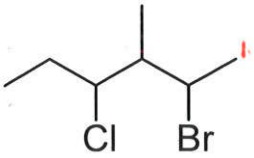
1. Provide IUPAC names or the structures for alkyl halides below: (2 pts each/10 pts)



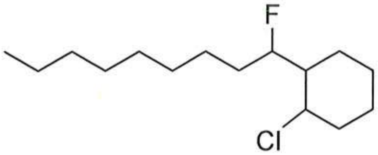
1-bromo-2-(1-chloroethyl)-1-fluoracyclohexane



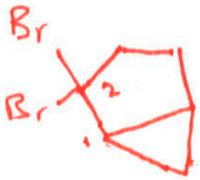
2-bromo-3-iodo bicyclo[3.3.0]octane



2-bromo-4-chloro-3-methylhexane



1-(2-chlorocyclohexyl)-1-fluorononane



2,2-dibromobicyclo[3.1.0]hexane

2.) Order the reactions below in order from fastest to slowest for S_N2 substitution: (2 pts)

E > C > D > B > A

reaction	Substrate	solvent	nucleophile
A	2-fluoro-2-methyl propane	Methanol	Cl^-
B	1-iodopropane	ethanol	methoxide (CH_3O^-)
C	1-iodoethane	CH_3CN	cyanide (CN^-)
D	bromomethane	methanol	I^-
E	bromomethane	DMF	F^-

3) Name 2 factors influencing the strength of a nucleophile (2 pts)

a) (-) charge

b) high polarizability in polar protic solvents
lower " " polar aprotic "

c) Smaller Nu⁻

d) no resonance e.) no e⁻ withdrawing groups

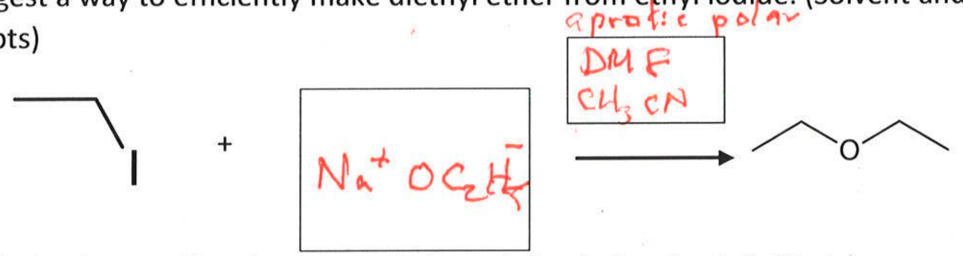
4) Order the reactions below in order from fastest to slowest for S_N1 substitution: (2 pts)

C > A or D > D or A > B > E

Reaction	Substrate	solvent
A	t-butyl-chloride	acetone
B	ethyl iodide	DMF
C	t-butyl iodide	ethanol
D	2-iodopropane	ethanol
E	methyl bromide	CH_3CN

5) Why aren't the nucleophiles substituting the halides listed above ? (1 pt)

6) Suggest a way to efficiently make diethyl ether from ethyl iodide. (Solvent and nucleophile) (2 pts)



aprotic polar

DMF
CH_3CN

$Na^+ OC_2H_5^-$

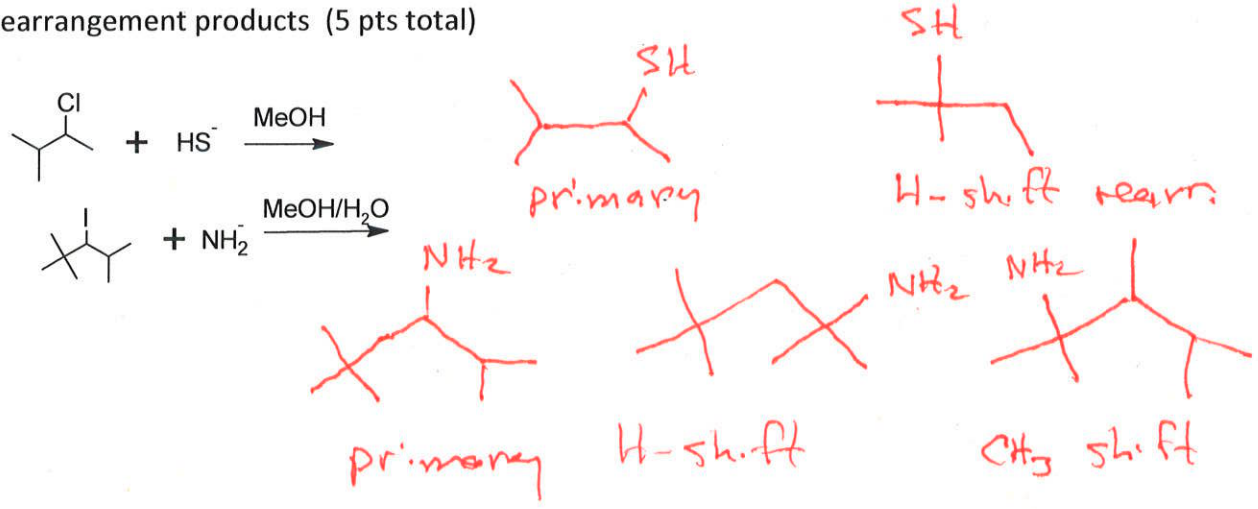
7) Circle the feature that doesn't apply in each line below for S_N2 (3 pts)

a) inversion occurs	favors 1° and 0° α carbons	[✓ features intermediate]	likes aprotic polar solvents
b) best leaving group's source acid has $pK_a<0$	works best with low steric hindrance	has 5-coordinated transition state	[✓ rate independent of of nucleophile]
[✓ c) $I^->Br^->Cl^->F^-$ as Nuc^- in aprotic polar solvent]	favors 1° and 2° β carbons	CH_3CN favored over CH_3OH as solvent	strong base is often a good Nuc^- for S_N2

8) Circle the feature below that doesn't apply in each line below for S_N1 (3 pts)

a) racemization occurs	[✓ runs best with aprotic, polar solvents]	rate independent of Nuc−	has intermediate
b) solvolysis happens if no Nuc−	rate limit is formation of carbocation	favors 3° α carbons	[✓ I^- faster than F^- as Nuc^-]
c) rearrangement possible	works best in polar, protic solvents	[✓ retention of configuration]	best leaving group's source acid's $pK_a<0$

9) Determine the products of the proposed S_N1 reactions below. Make sure to include likely rearrangement products (5 pts total)



primary

H-shift rearr.

primary

H-shift

CH_3 shift