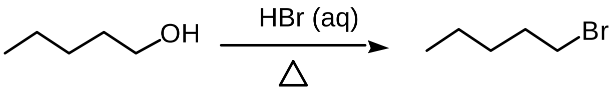
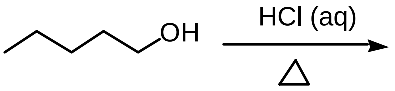
Answer Key for Problem Set 3

1. a)

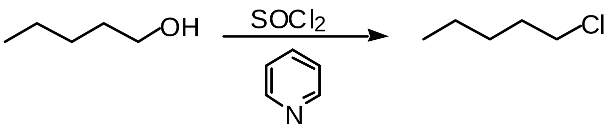


b)

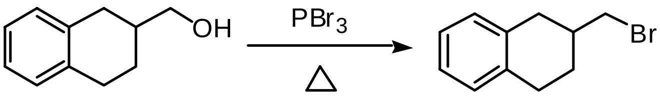


no reaction (needs Lewis Acid)

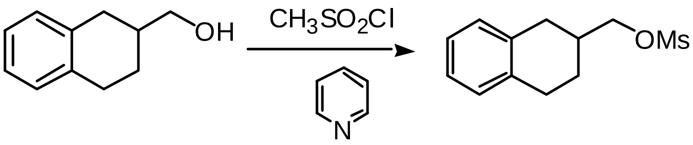
c)



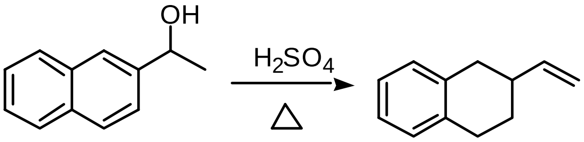
d)



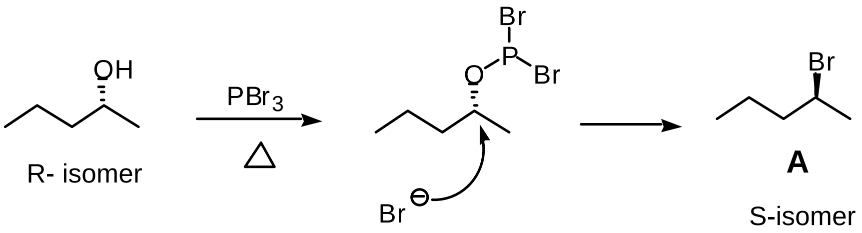
e)



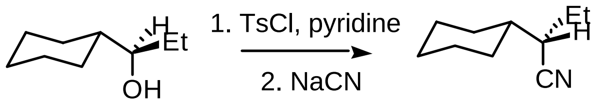
f)



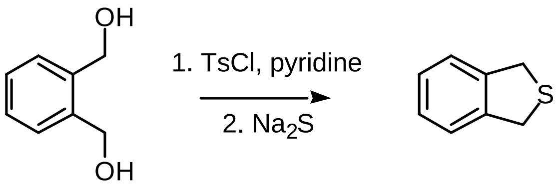
2.



3.

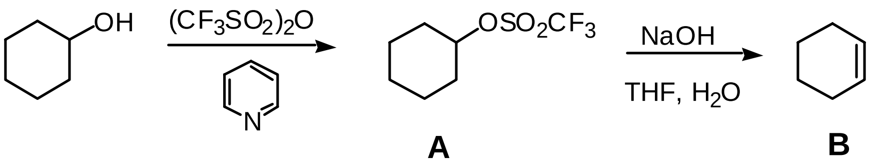


1 **3**



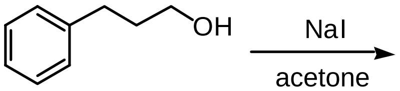
2 **4**

4. a)



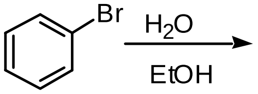
A **B**

b)



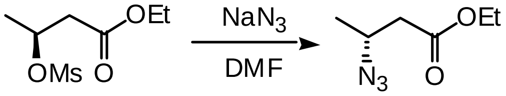
no reaction

c)



no reaction

d)

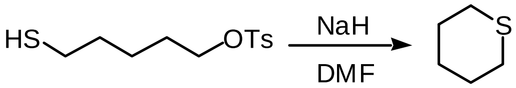


E

e)

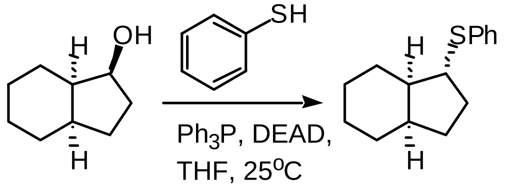
F

f)



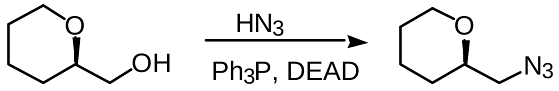
G

5. a)


H
OH
H
SH
Ph$_3$P, DEAD,
THF, 25^{0}C
H
SPh
H

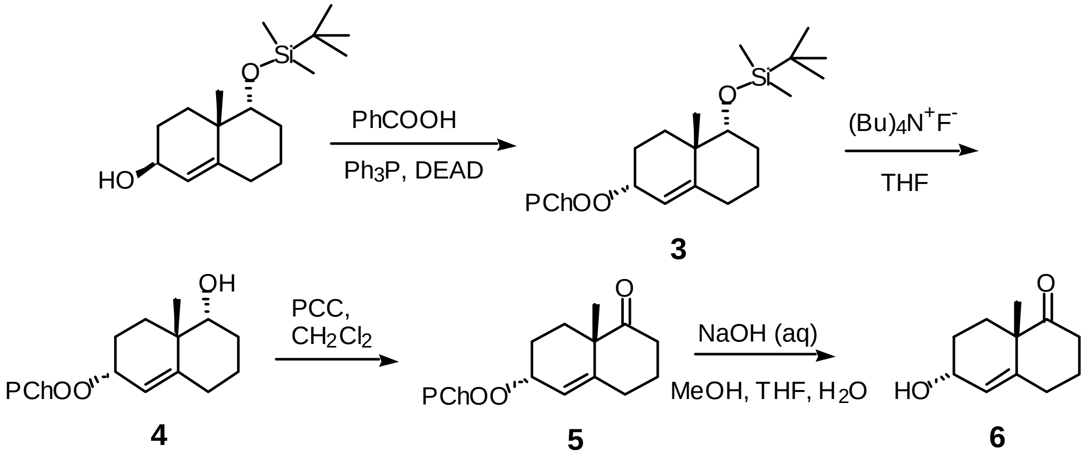
1

b)

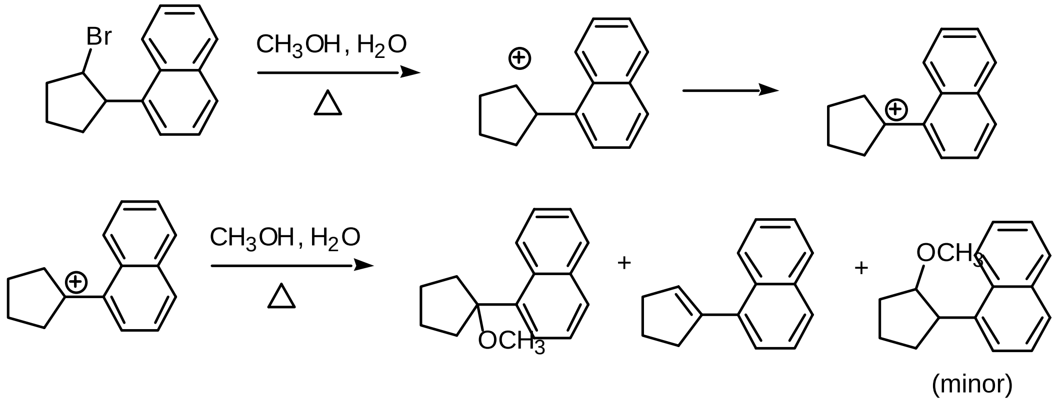

O
OH
HN$_3$
Ph$_3$P, DEAD
O
N$_3$

2

c)

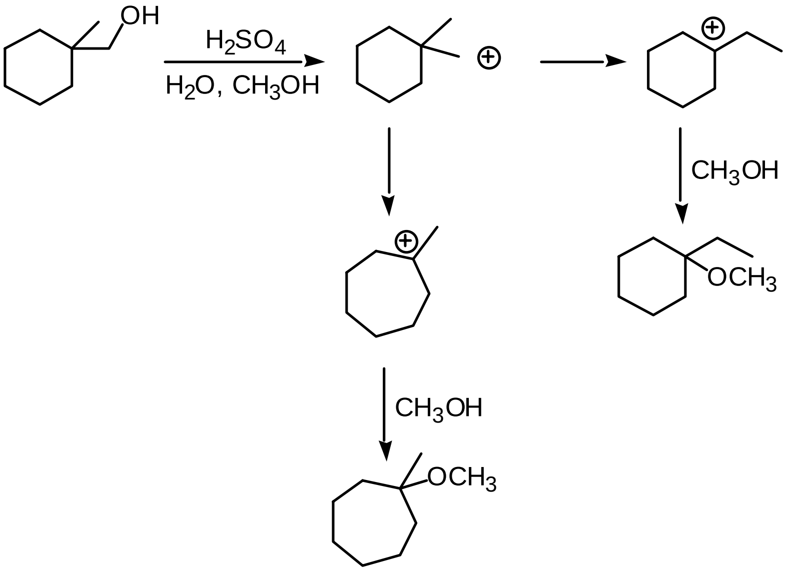

O
Si
HO
PhCOOH
Ph$_3$P, DEAD
O
Si
PChOO
3
(Bu)$_4$N$^+$F$^-$
THF
OH
PChOO
4
PCC,
CH$_2$Cl$_2$
O
PChOO
5
NaOH (aq)
MeOH, THF, H$_2$O
O
HO
6

6. a)

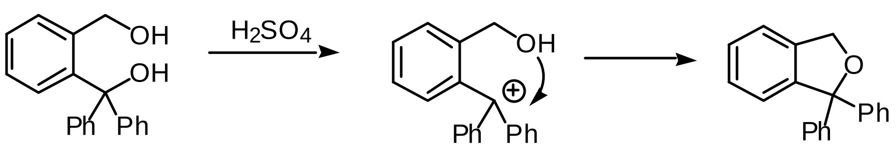

Br
CH$_3$OH, H$_2$O
△
⊕
⊕
⊕
CH$_3$OH, H$_2$O
△
OCH$_3$
+
+
OCH$_3$
(minor)

7

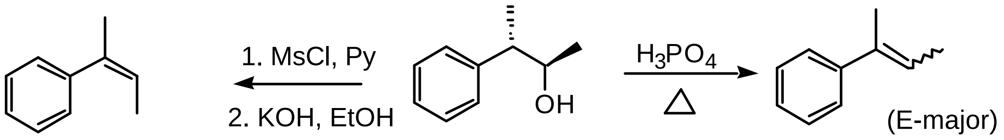
b)



7.

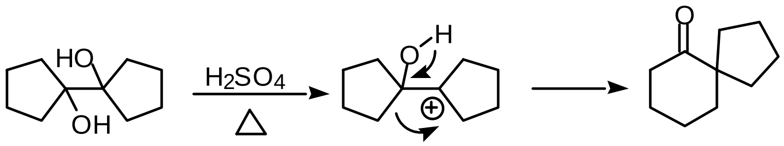


8.

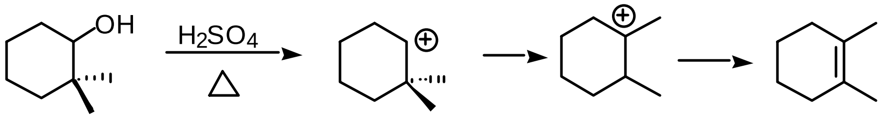


9 **10**

9.

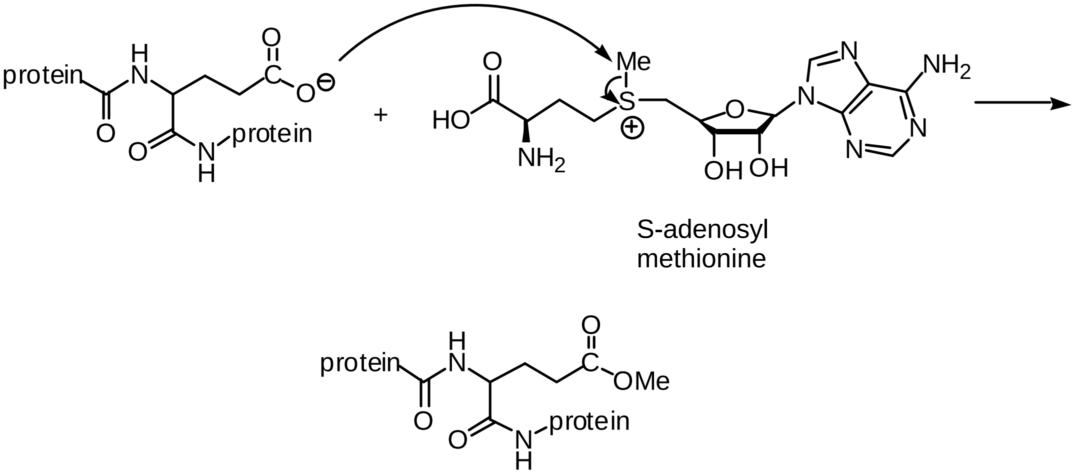


11

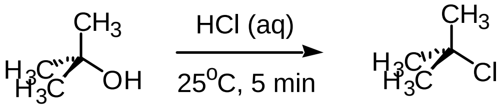


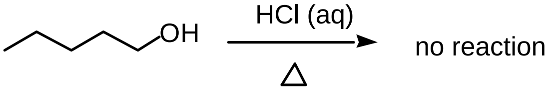
12

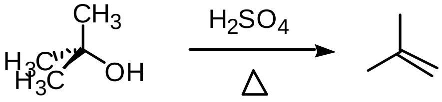
10.



11.



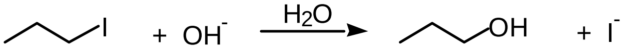


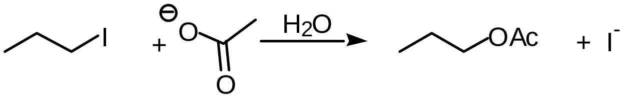


Cl$^-$ is not a good nucleophile enough to undergo S$_N$2 type substitution reactions with primary alcohols, but can form an alkyl halide in an S$_N$1 manner after a carbocation is formed from a tertiary alcohol.

HSO$_4^-$ is not a good nucleophile, so when tertiary alcohol is heated in H$_2$SO$_4$ solution, only elimination is observed.

12. a)





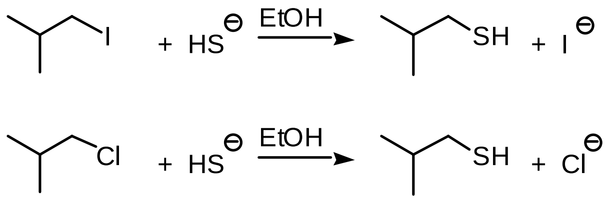
Since OH$^-$ is a better nucleophile, first reaction is faster.

b) $(CH_3)_3CBr + H_2O \longrightarrow (CH_3)_3COH + HBr$

$(CH_3)_2CHBr + H_2O \longrightarrow (CH_3)_2CHOH + HBr$

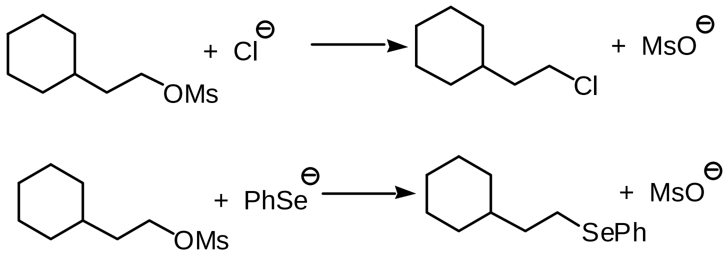
Since $(CH_3)_3^+$ is more stable than secondary carbocation, first reaction is faster.

c)



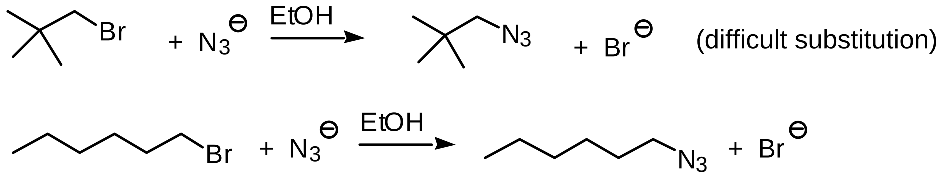
Since I⁻ is a better leaving group, first reaction is faster.

d)



Since Se is a better nucleophile, second reaction is faster.

e)



(difficult substitution)

Since second alkyl halide is less hindered, in the S_N2 type reaction second one is faster.