Homework - Chapter 23
Chem 2320

Name _____

1. Draw structures for the following compounds.

a) diethyl amine

b) benzyl ethyl methyl amine

c) dicyclohexyl amine

d) o-chloroaniline

e) 2-aminoacetophenone

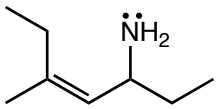
f) N,N-dimethylcyclobutanamine

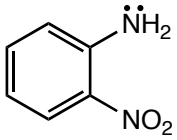
g) 3-amino-2-hexanol

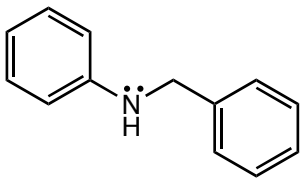
h) N-methyl-3-amino-1-cyclopentanone

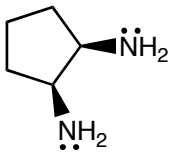
i) 2-buten-1,4-diamine

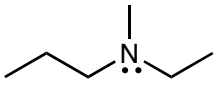
2. Name the following compounds.

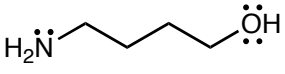
a) 

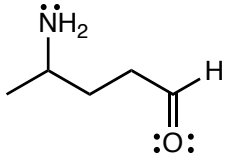
e) 

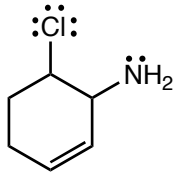
b) 

f) 

c) 

g) 

d) 

h) 

3. Explain how you could distinguish between the following functional groups by IR. Be specific!

a) amide and amine

b) 1° and 2° amine

c) alcohol and 2° amine

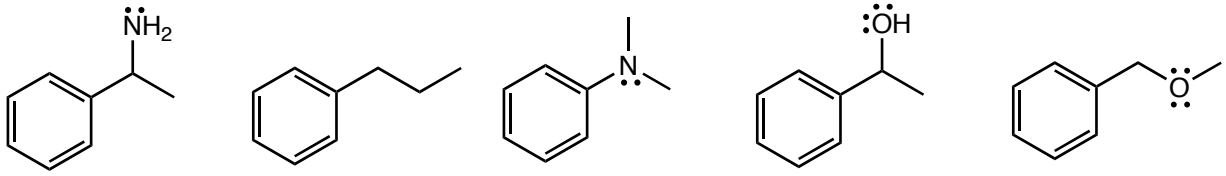
4. Sketch the ^{1}H NMR of the following amines.

a) sec-butylmethylamine

b) p-ethylaniline

c) cyclobutylamine

5. Put the following compounds in order of their boiling points - 1 is lowest, 5 is highest.

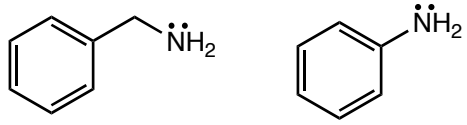


6. Circle the compound which is the most basic in each pair. Briefly explain your reasoning.

a)

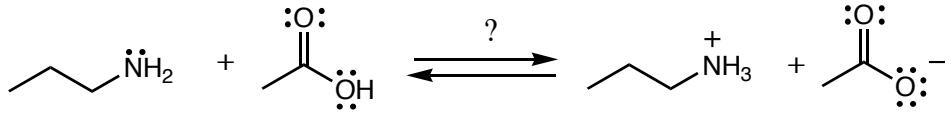
b)

c)

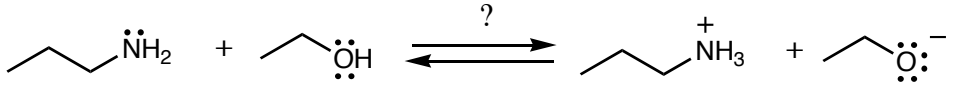


7. Each of the following is an acid/base reaction with an amine or protonated amine. Write the pK_a of each of the acids and conjugate acids below them (for amines, some are in your notes, not on your chart). Then predict the direction in which the equilibrium lie.

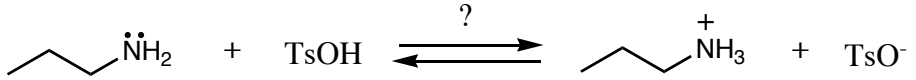
a)



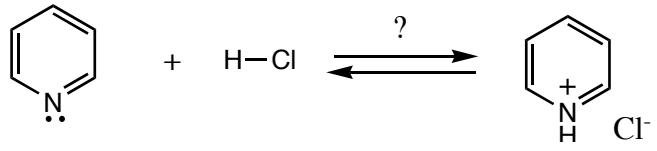
b)

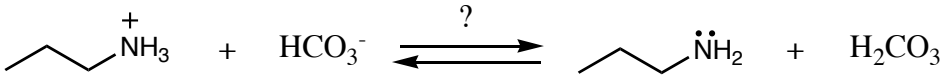


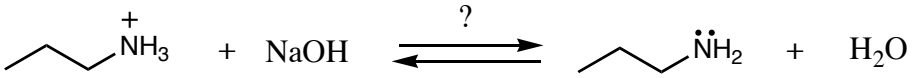
c)

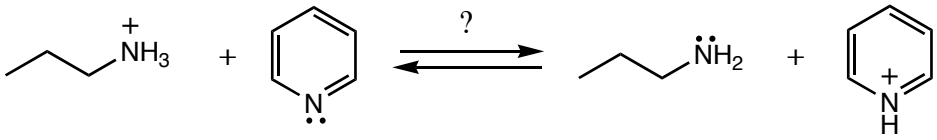


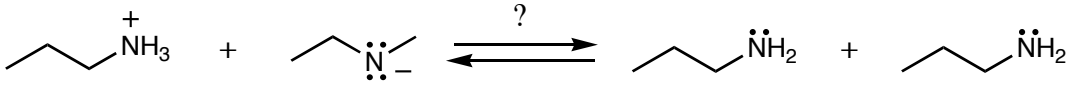
d)

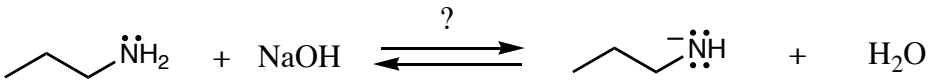


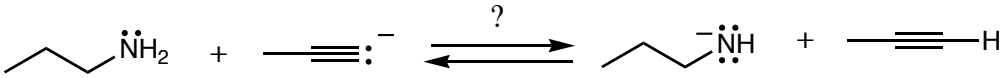
e) 

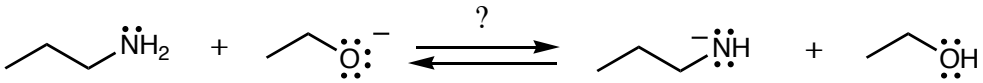
f) 

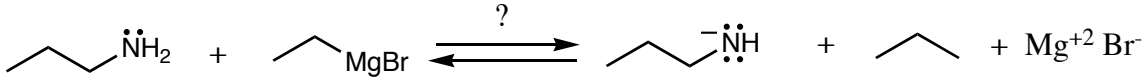
g) 

h) 

i) 

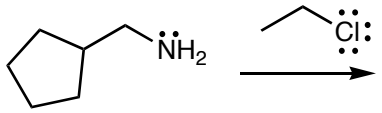
j) 

k) 

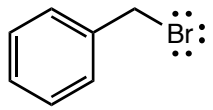
l) 

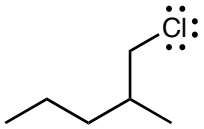
8. Explain in your own words how t-butyl ammonium bromide functioned as a phase transfer catalyst in the Williamson ether synthesis from last semester's lab. What compounds could it have carried from the water layer to the organic layer, and which could it have carried back?

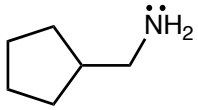
9. Give all of the products which could be obtained from the following reaction.

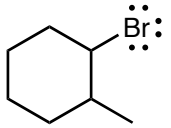
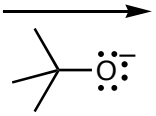


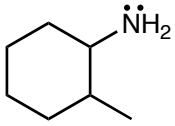
10. Give the products which would be obtained from the following reactions. If an elimination occurs, circle any alkenes which will be favored.

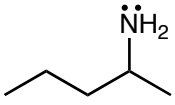
a)  $\xrightarrow[\text{excess}]{NH_3}$

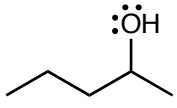
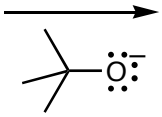
b)  $\xrightarrow[\text{excess}]{NH_3}$

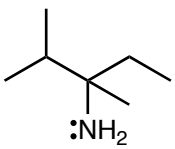
c)  $\xrightarrow[\text{excess}]{CH_3I}$

d)  

e)  $\xrightarrow[CH_3Br]{\text{excess}}$ $\xrightarrow[\text{water, heat}]{Ag_2O}$

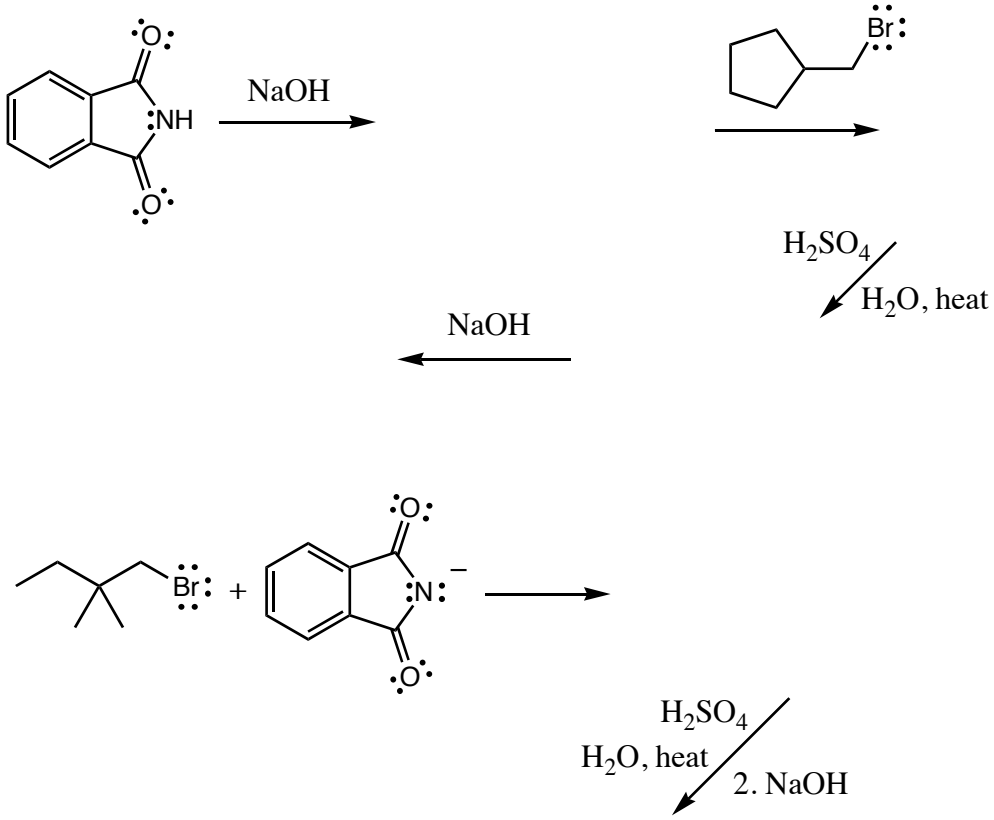
f)  $\xrightarrow[CH_3Cl]{\text{excess}}$ $\xrightarrow[\text{water, heat}]{Ag_2O}$

g)  $\xrightarrow[\text{pyridine}]{TsCl}$ 

h)  $\xrightarrow[CH_3I]{\text{excess}}$ $\xrightarrow[\text{water, heat}]{Ag_2O}$

11. Give the products of the following reactions.

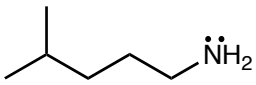
a)



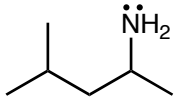
b)

12. Synthesize the following amines using the Gabriel synthesis, or explain why it can't be done.

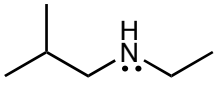
a)



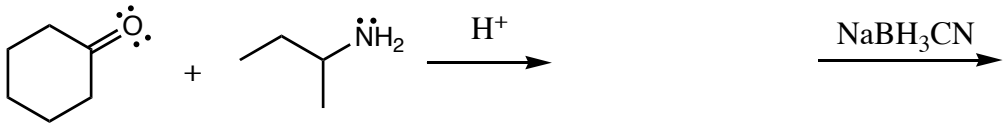
b)

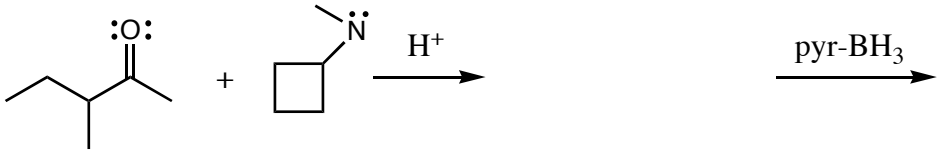


c)

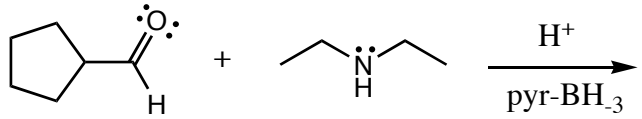


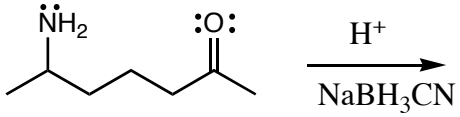
12. Give the products of the following reactions.

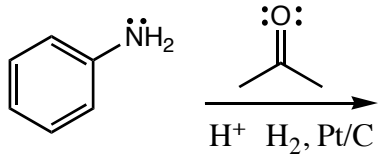
a) 

b) 

c) 

d) 

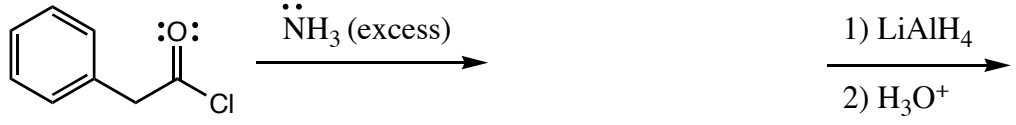
e) 

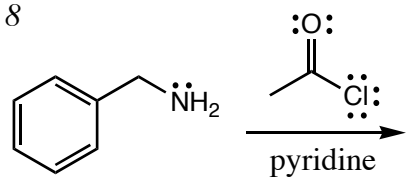
f) 

13. Give the products of the following reactions.

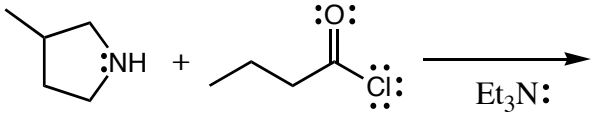
a) 

b) 

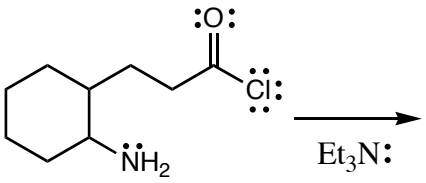
c) 

d) 

1) $LiAlH_4$
2) H_2O

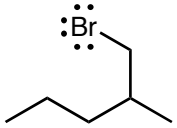
e) 

1) $LiAlH_4$
2) H_2O

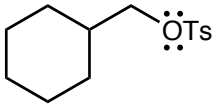
f) 

1) $LiAlH_4$
2) H_2O

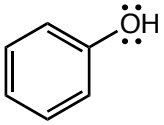
14. Give the products of each of the following reactions.

a) 

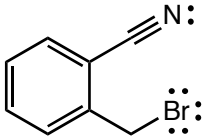
NaCN
H_2, Pt/C

b) 

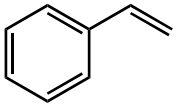
NaN_3
1) $LiAlH_4$
2) H_2O

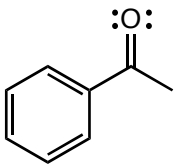
c) 

H_2SO_4
HNO_3
Sn, HCl
2) NaOH

d) 

NaN_3
1) $LiAlH_4$
2) H_2O

e) 
H_2SO_4
HNO_3
H_2, Pd/C

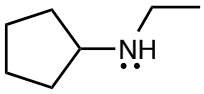
f) 

H_2SO_4
HNO_3
H_2, Pd/C

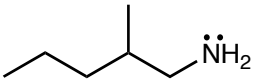
g) 

h) 

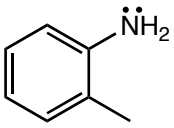
14. Draw a reaction or reaction sequence showing starting materials and reagents by which the following amines could be synthesized using the type of reaction and starting materials given.

a) 

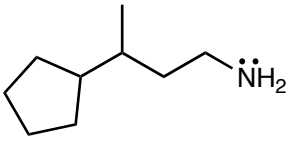
reductive amination; ketone and amine

b) 

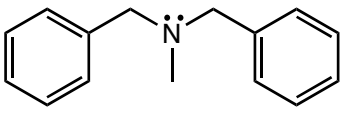
Gabriel synthesis; alcohol and phthalimide

c) 

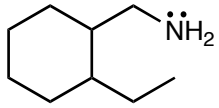
reduction of a nitro group; toluene

d) 

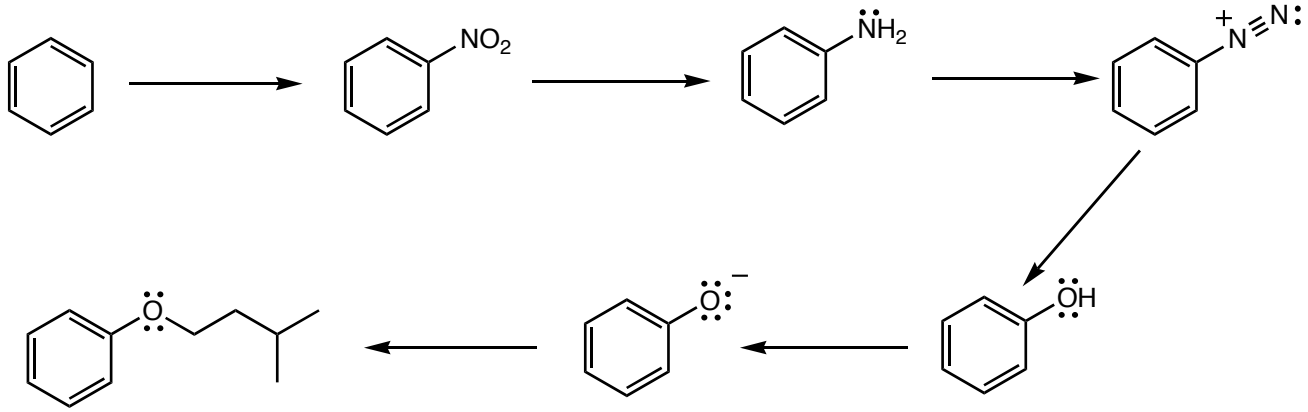
reduction of a nitrile; alkyl halide

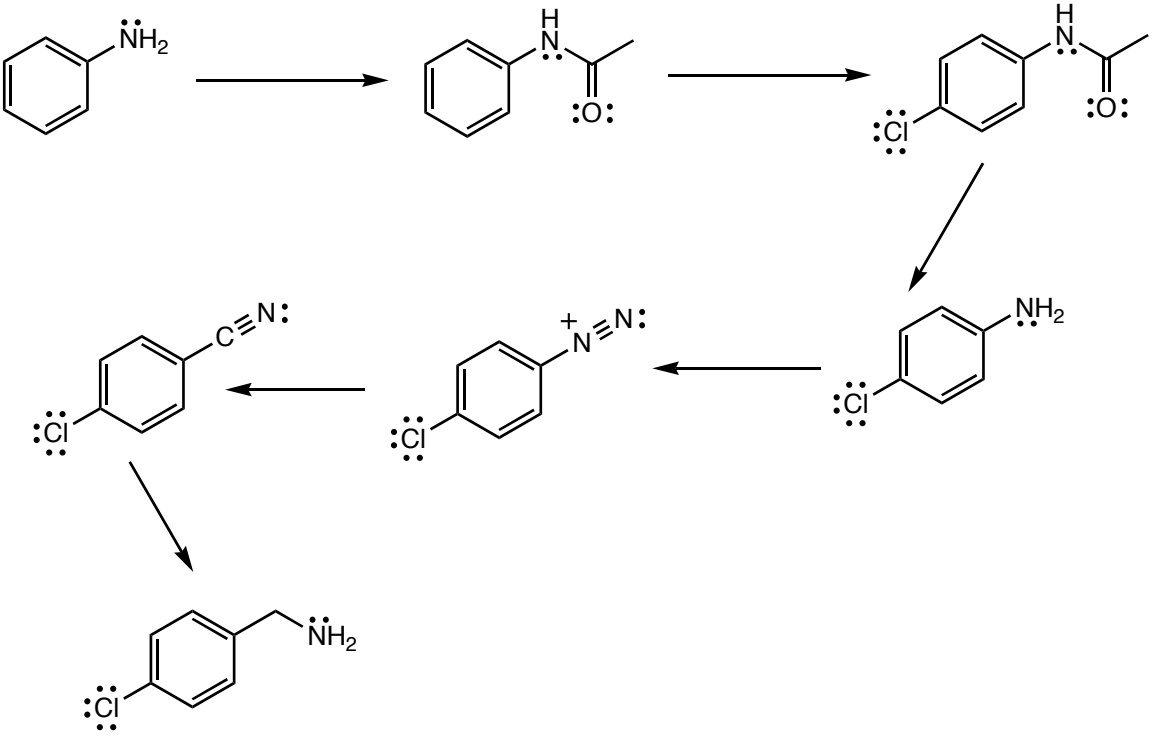
e) 

reduction of an amide; amine and acid chloride

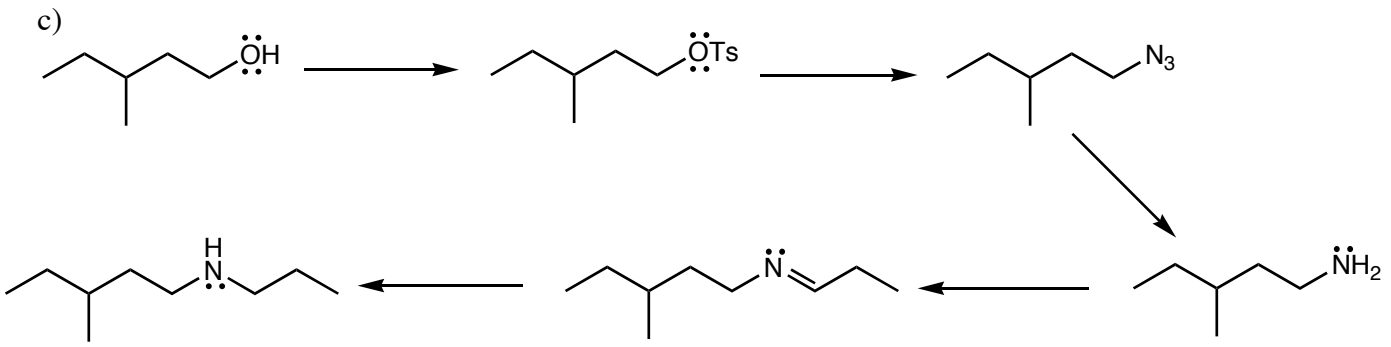
f)  reduction of an azide; alkyl halide

15. Fill in the reagents and intermediate products needed to complete the following syntheses.

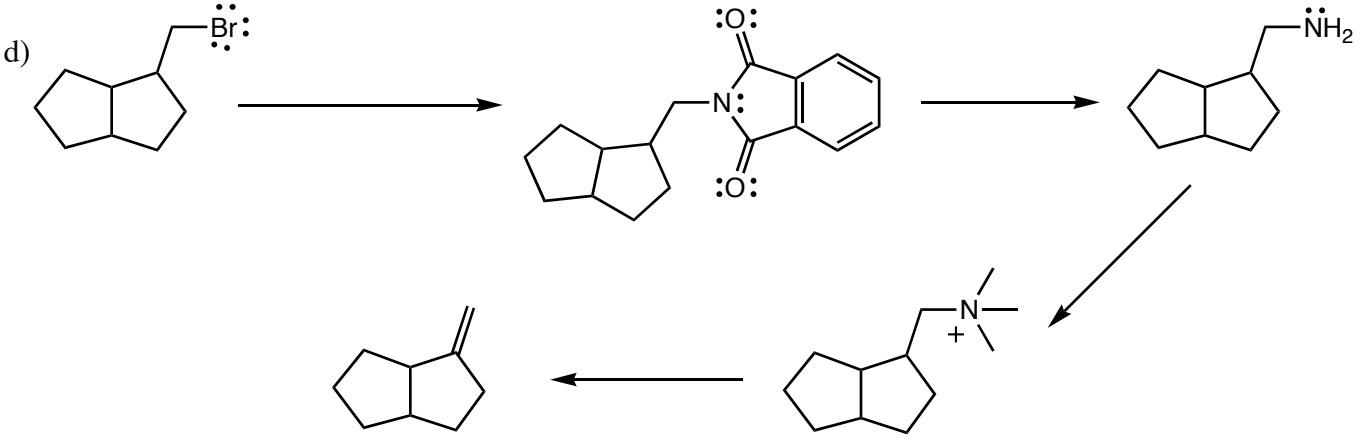
a) 

b) 

c)



d)



e)