Massachusetts Institute of Technology

5.13: Organic Chemistry II *May 20, 2002*

FINAL EXAM

Question 1	_____/08 points
Question 2	_____/06 points
Question 3	_____/30 points
Question 4	_____/05 points
Question 5	_____/15 points
Question 6	_____/15 points
Question 7	_____/25 points
Question 8	_____/06 points
Question 9	_____/10 points
Question 10	_____/42 points
Question 11	_____/12 points
Question 12	_____/12 points
Question 13	_____/12 points
Question 14	_____/12 points
Question 15	_____/14 points
Question 16	_____/14 points
Question 17	_____/20 points
Question 18	_____/14 points
Question 19	_____/14 points
Question 20	_____/14 points
TOTAL	_____/300 points

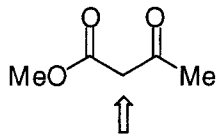
There are nineteen pages (2-20) of questions in this exam.

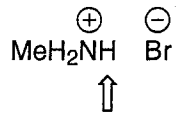
Name _____

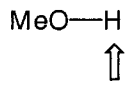
T.A. _____

HAVE A GREAT SUMMER!!

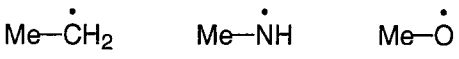
(10) (2 points each, 42 points total) Please provide the requested answer/data/reagents. If no reaction is expected, write "NR".

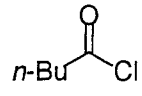
(a) pK_a of: 

(b) pK_a of: 

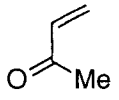
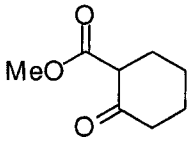
(c) pK_a of: 

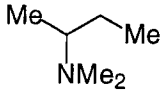
(d) Inversion barrier of NMe_3, in kcal/mol (circle one): 5 20 50 100

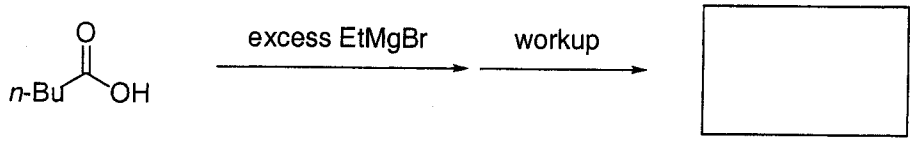
(e) The most stable radical (circle one): 

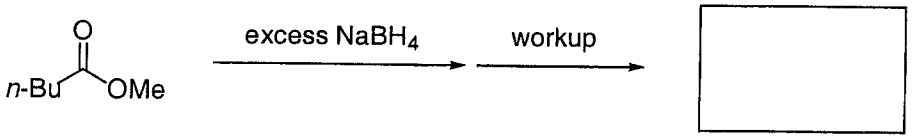
(f)  $Li(t\text{-}BuO)_3AlH$ → workup →

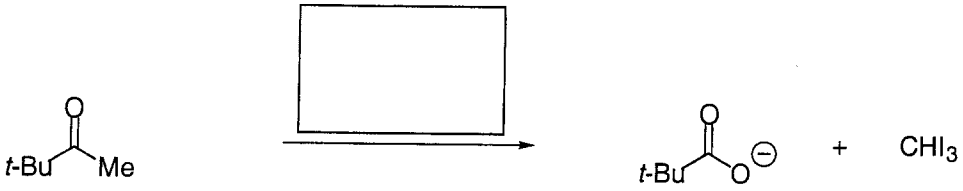
(g) *n*-Bu–CN $LiAlH_4$ → workup →

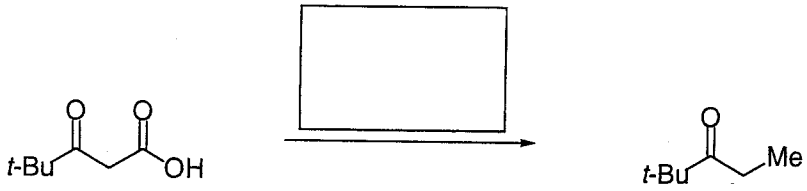
(h)  +  base catalyst →

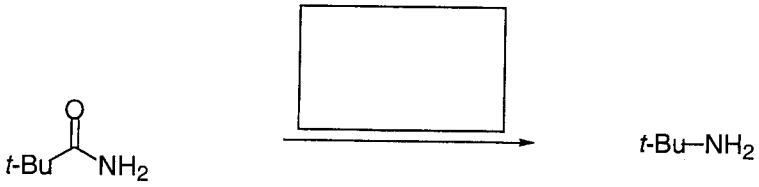
(i)  1) MeI, $NaHCO_3$ 2) Ag_2O →

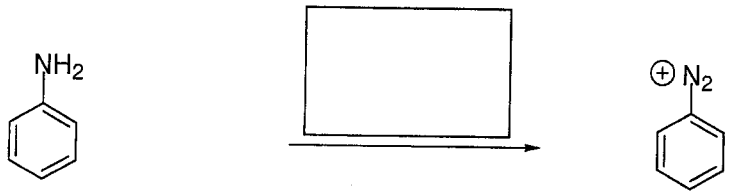
(j) 
n-Bu
OH
excess EtMgBr
workup

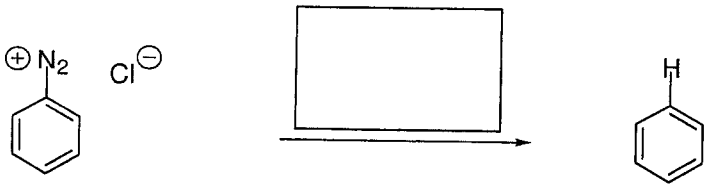
(k) 
n-Bu
OMe
excess NaBH4
workup

(l) 
t-Bu
Me
t-Bu
O
+
CHI3

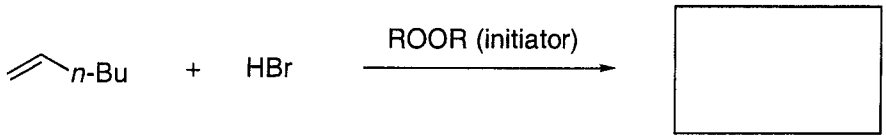
(m) 
t-Bu
OH
t-Bu
Me

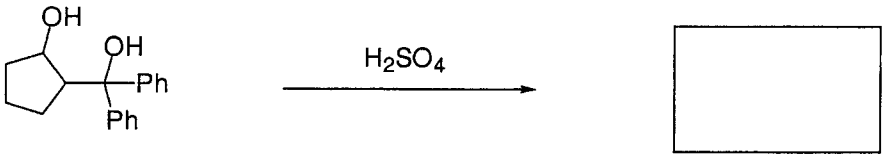
(n) 
t-Bu
NH2
t-Bu–NH2

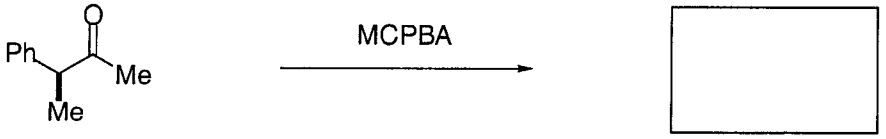
(o) 
NH2
N2

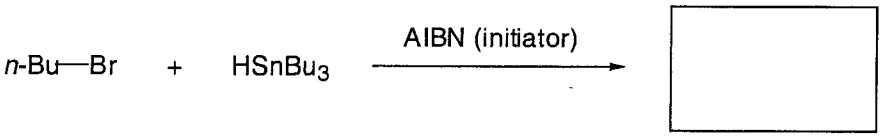
(p) 
N2
Cl
H

(q) 

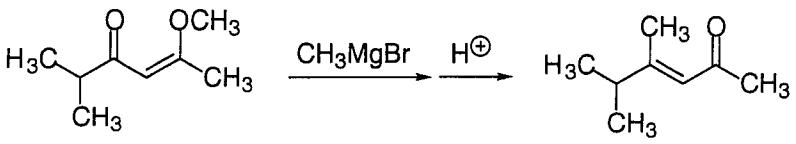
(r) 

(s) 

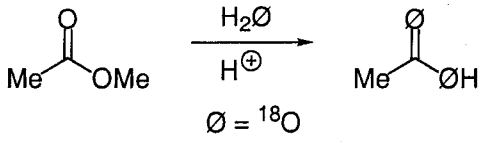
(t) 

(u) 

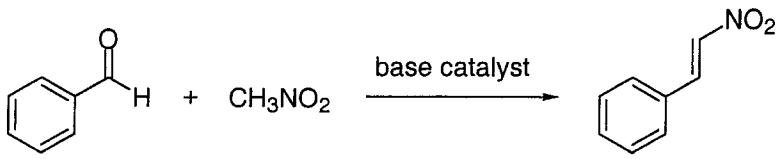
(11) (12 points) Provide the best mechanism. Please show all arrow pushing.



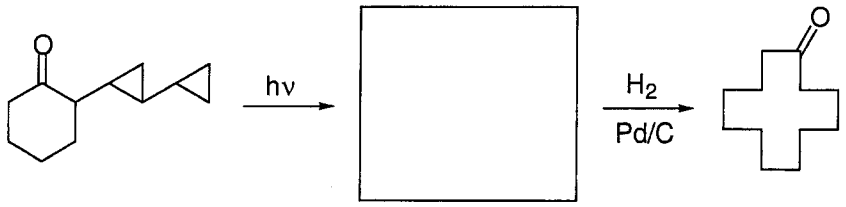
(12) (12 points) Provide a mechanism for the illustrated transformation. Please show all arrow pushing.



(13) (12 points) The Henry reaction is a variant of the aldol condensation in which the conjugate base of a nitroalkane is the nucleophile. Provide the best mechanism for this reaction. Please show all arrow pushing.

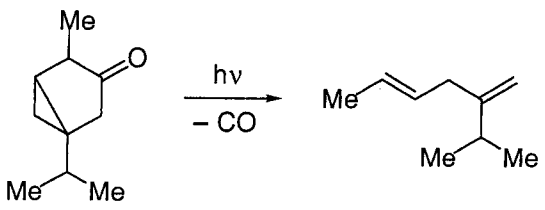


(14) (12 points). Provide a structure for **M** and a mechanism for its formation. Please show all arrow pushing.

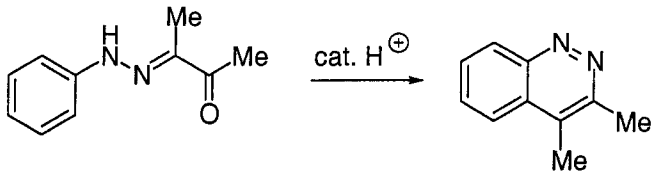


M

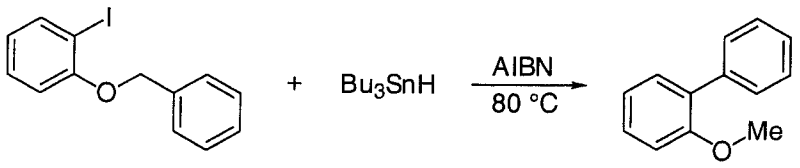
(15) (14 points) Provide a mechanistic rationale for the reaction illustrated below. Please show arrow pushing.



(16) (14 points) Provide the best mechanism. Please show all arrow pushing.



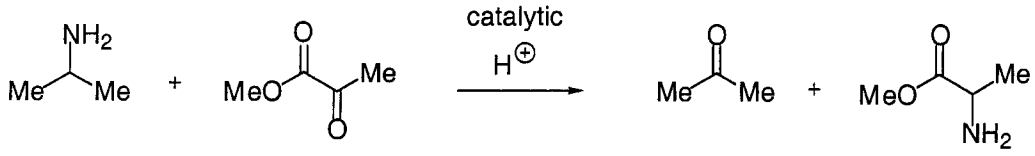
(17) (20 points total) For the following reaction:



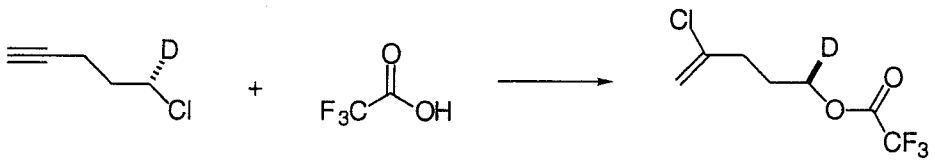
(a) (6 points) Draw the initiation sequence. Please show arrow pushing.

(b) (14 points) Draw the propagation sequence. Please show arrow pushing.

(18) (14 points) Provide the best mechanism. Please show all arrow pushing.



(19) (14 points) Provide a mechanism for the illustrated reaction that relies upon Cl serving as a neighboring group. Please show all arrow pushing.



enantiopure a strong acid enantiopure

(20) (14 points) Provide the best mechanism. Please show all arrow pushing.