CHEM 2311
E3 practice-iv (answers *not* provided)

1. (32 points) Circle the letter *on the right* that corresponds to the answer to each question. There is only one correct answer for each question.

(i) Which of the following is the correct order of increasing acidity (less acidic < more acidic)?

A. $NH_4^+ < CH_3COOH < HBr$ **C.** $HBr < H_3O^+ < HCl$
B. $H_3O^+ < CH_3COOH < CH_3OH$ **D.** $H_2CCH_2 < NH_3 < CH_4$

A
B
C
D

(ii) Which of the following reactions corresponds to a *substitution*?

E. propene → 1,2-dibromopropane
F. 1-iodopropane → propene
G. propene → propane
H. 1-iodopropane →1-bromopropane

E
F
G
H

(iii) Which of the following is the weakest base?

I. NH_3 **J.** CH_3COO^- **K.** Br^- **L.** HO^-

I
J
K
L

(iv) Which of the following statements is *not* true regarding S_N1 reactions?

I. A carbocation intermediate is formed.
J. The mechanism has only one step.
K. Polar, protic solvents are good choices for S_N1 reactions.
L. The stereochemical outcome is racemization at the carbon bearing the leaving group.

M
N
O
P

(v) The following reaction has a $\Delta G°$ value of +2 kcal/mole. What is the ratio of A to B?

$$A \rightleftharpoons B$$

Q. 0.01:99.99 **R.** 14:86 **S.** 1:1 **T.** 97:3

Q
R
S
T

(vi) Which of the following is best set of conditions for the preparation of *tert*-butanol?

U. *tert*-butyl fluoride in water
V. *tert*-butyl bromide in water
W. *tert*-butyl fluoride and NaOH in DMSO
X *tert*-butyl bromide and NaOH in DMSO

U
V
W
X

(vii) Which of the following is the best leaving group in an S_N2 reaction?

Y. F^- **Z.** H_3C^- **AA.** $CH_3O_2SO^-$ **BB.** HO^-

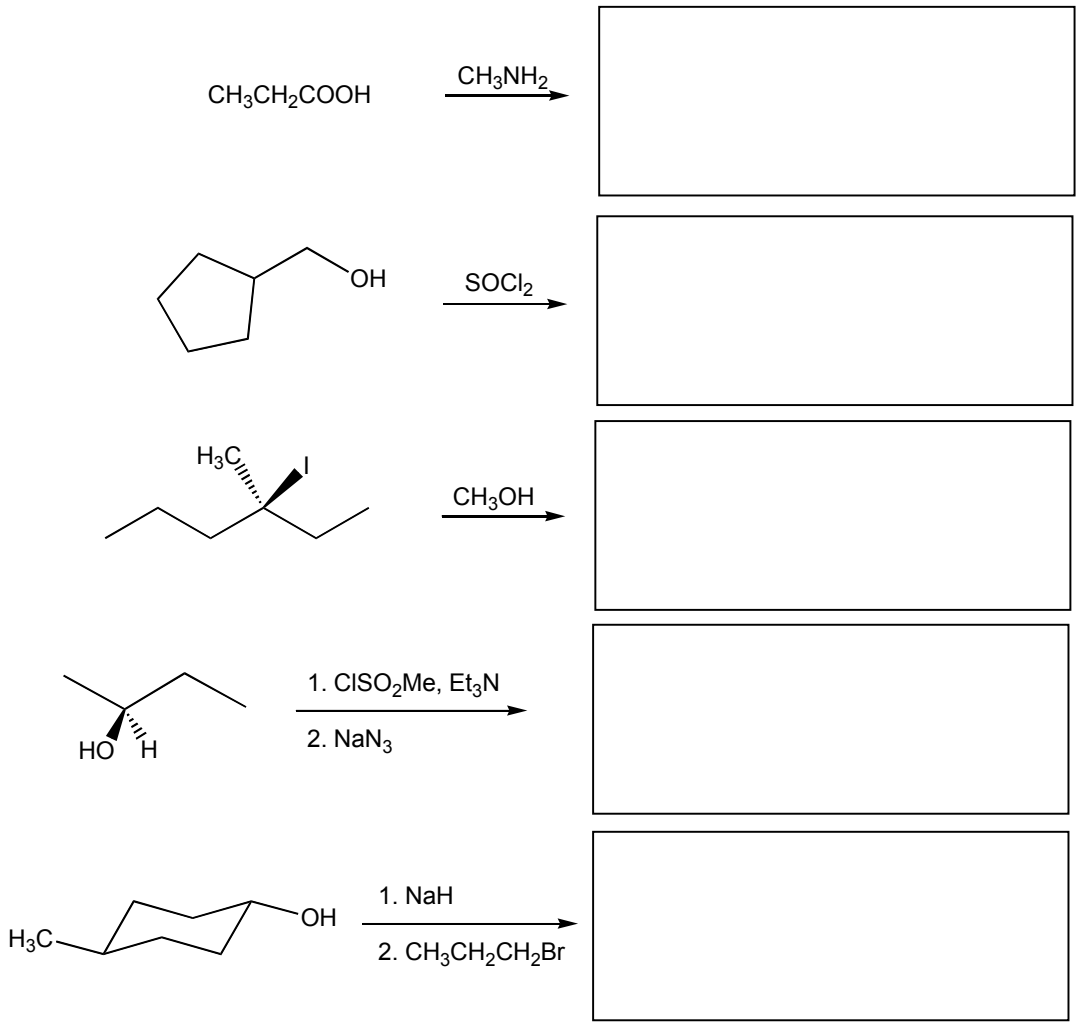
Y
Z
AA
BB

(viii) Which of the following is the least reactive nucleophile?

CC. CH_3OCH_3 **DD.** HO^- **EE.** Br^- **FF.** NH_3

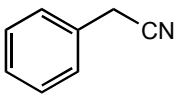
CC
DD
EE
FF

2. (30 points). Provide the structure of products for each of the following reactions (draw a specific stereoisomer if only one is formed)

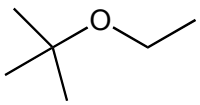


3. (12 points) Suggest syntheses of the following molecules from the indicated molecules and any other starting materials. *[Both of these can be completed in a single synthetic step. Show starting materials and reagents, NOT the mechanism]*

a.

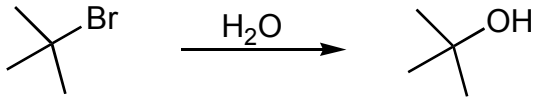


b.



4. (26 points)

(a) Provide a *stepwise* mechanism for the reaction shown below. Use curved arrows to indicate the movement of electrons and <u>show all intermediates</u>.



(b) *With reference to structur*e, explain why propyne ($CH_3C{\equiv}CH$) is a stronger acid than propane ($CH_3CH_2CH_3$).

(c) The following reaction mechanism was suggested by a student on an organic final at UGA. Circle and <u>provide brief comment</u> on two mistakes in this mechanism.