Time: 2 hours

Chem. 208
Final Exam

June 24, 1999
Mrs. Deeb
Mrs. Jaber

Family Name: _____

First Name: _____

I.D. #: _____

Section: _____

Grading:

I. _____ / 40

II. _____ / 24

III. _____ / 40

IV. _____ / 12

V. _____ / 40

VI. _____/24

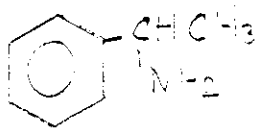
VII. _____/20

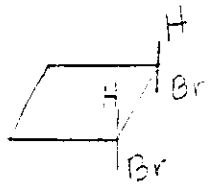
Total _____/ 200

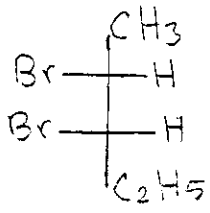
GOOD LUCK

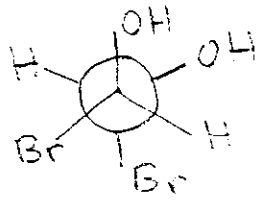
I (40%) Circle the letter preceding the right answer in each of the following. (Note: no double penalty).

- **Which of the following does not represent an optically active compounds?**

a. 

b. 

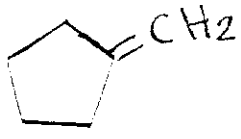
c. 

d. 

- **Which of the following has a bond formed by the overlap of an $sp^2$ hybrid orbital with an sp hybrid orbital?**

a. $CH_2=C=CH_2$

b. $CH_3-C\equiv C-CH_2CH_3$

c. 

d. $H_2NCH_3$

- **Which of the following has the highest resonance stabilization?**

a. $CH_3-\overset{\overset{O}{\|}}{C}-OC_2H_5$

b. $CH_3-\overset{\overset{O}{\|}}{C}-NHCH_3$

c. $CH_3-\overset{\overset{O}{\|}}{C}-O^-Na^+$

d. $CH_3-CH=CH-\overset{\ominus}{C}H_2$

- **Which of the following has the lowest boiling point?**

a. $H-\overset{\overset{O}{\|}}{C}-N(CH_3)_2$

b. $CH_3-\overset{\overset{O}{\|}}{C}-NH_2$

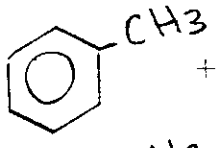
c. $CH_3-\overset{CH_3}{\underset{|}{C}}HCH_3$

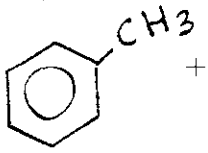
d. $CH_3-CH_2-OCH_3$

- **Which of the following reactions will not take place?**

a.  $+ CH_3-\overset{CH_3}{\underset{|}{C}}=CH_2 \xrightarrow{HF}$

b.  $+ CH_3-\overset{\overset{O}{\|}}{C}-Cl \xrightarrow{AlCl_3}$

c.  $+ Br_2 \longrightarrow$

d.  $+ Cl_2 \xrightarrow{h\nu}$

- **Which is the most acidic of the following compounds?**

a. $C_6H_5OH$

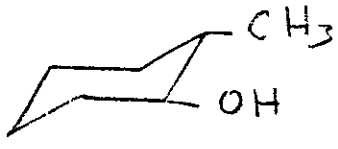
b. $C_6H_{11}OH$

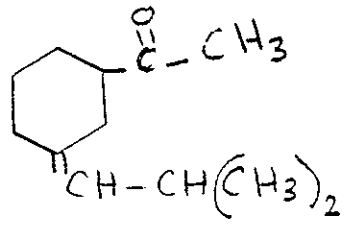
c. $(CH_3)_3COH$

d. p–Nitrophenol

- **Which of the following compounds has the highest number of stereogenic centers?**

a. 


b. 


c. 


d. $(CH_3)_3C–CH_2–CH_2Cl$

- **Which of the following can form more than one product in significant yield upon nitration?**

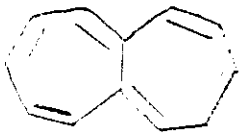
a. p–nitrotoluene

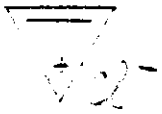
b. p–dichlorobenzene

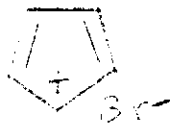
c. o–methoxytoluene

d. m–dibromobenzene

- **Which of the following molecules are aromatic?**







**(A)** , **(B)** , **(C)** , **(D)** , **(E)**

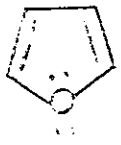
a. A, B, D

b. B, D, E

c. B, C, D

d. A, D

- **Which of the following molecules are not aromatic?**





**(A)** , **(B)** , **(C)** , **(D)** , **(E)**

a. B, C, E

b. B, C, D

c. A, C, E

d. C, D

**II (24%) 1)**

**1-** a. Draw the structure of 2 – O – (α – D – glucopyranosyl) – β – D – fructofuranoside.

b. Give the common name of the above sugar. _____

c. Will the above sugar give a +ve Fehling's test? Will it mutarotate? Explain briefly.

d. Hydrolysis of the above sugar yields _____ and _____.

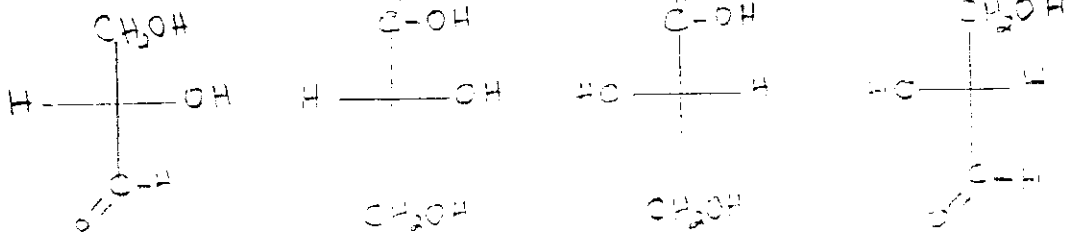
**2)** a. Draw the Haworth projection of D–(+)–Allose, knowing that it is an epimer of D–(+)–glucose at C # 3.

b. Draw the structure of the reduction product of D–(+)–allose with $NaBH_4$.

c. Is the product optically active? _____

**III (40%) Answer the following questions after careful examination of the given structures.**

1)

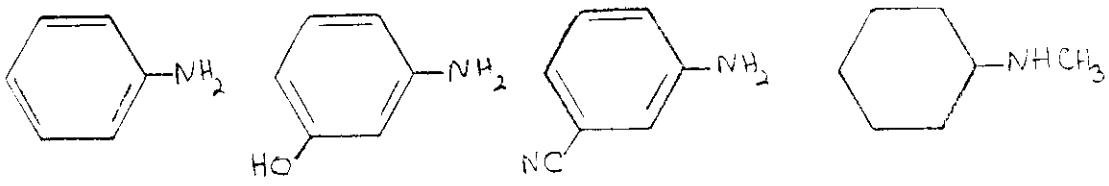


-A- -B- -C- -D-

The structure of D–glyceraldehyde is _____

The structure of L–glyceraldehyde is _____

2)

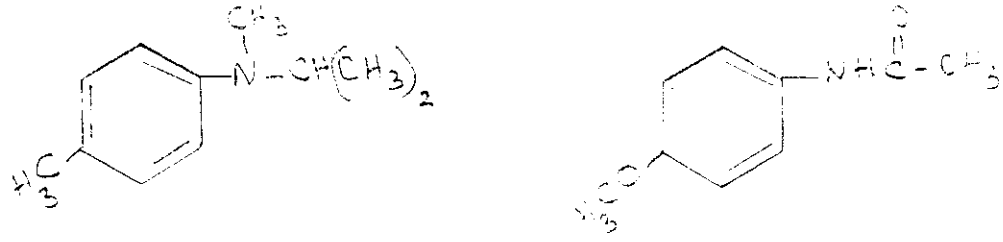


-A- -B- -C- -D-

Compound _____ is the most basic

Compound _____ is the least basic

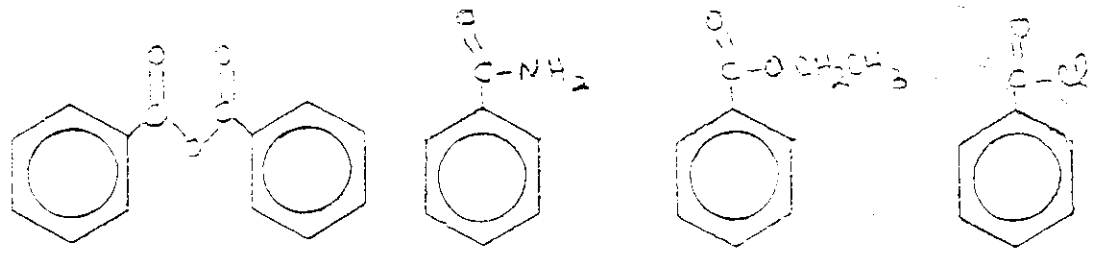
3)



-A- -B-

Compound _____ is an amide

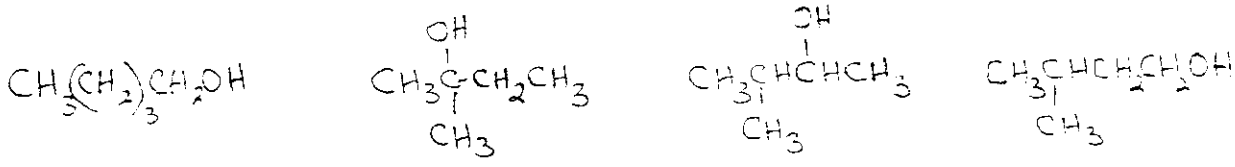
The IUPAC name of this amide is _____

4- 

-A- -B- -C- -D-

Compound _____ is the most reactive towards nucleophilic acyl substitution.

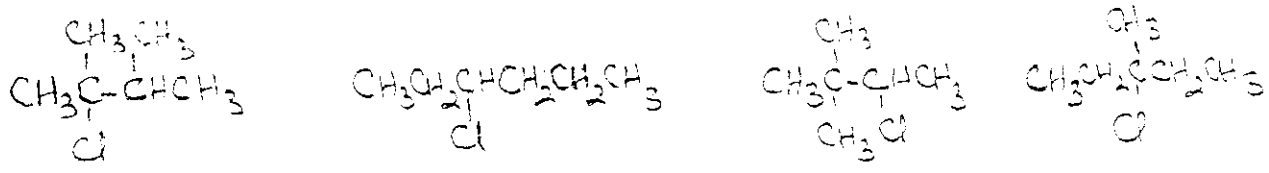
Compound _____ is the least reactive towards nucleophilic acyl substitution.

5) 

-A- -B- -C- -D-

Compound _____ is the most reactive towards acid catalyzed dehydration.

Compound _____ is the least reactive towards acid catalyzed dehydration.

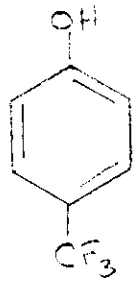
6) 

-A- -B- -C- -D-

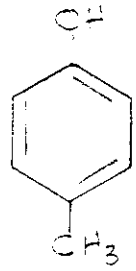
Compound _____ is the most reactive towards dehydrohalogenation.

Compound _____ is the least reactive towards dehydrohalogenation.

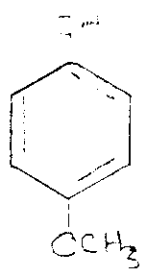
7)



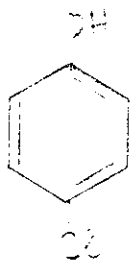
-A-



-B-



-C-

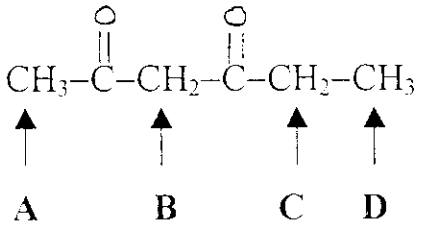


-D-

Compound _____ is the most reactive towards electrophilic aromatic substitution.

Compound _____ is the least reactive towards electrophilic aromatic substitution.

8)




The most acidic H's are _____

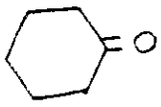
The least acidic H's are _____

**IV (12%) Write equations for a simple chemical test to distinguish between.**

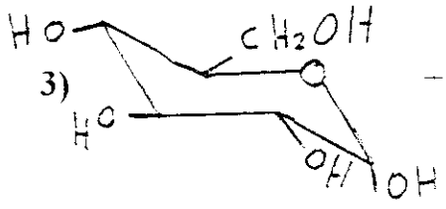
a) - p–toluidine and N–methylaniline.

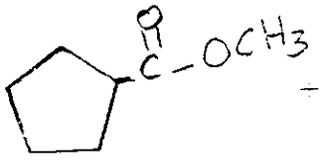
b) - Benzyl alcohol and p–cresol (p–hydroxytoluene)

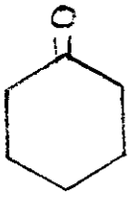
**V (32%)** Predict the structure of the major organic product(s) in each of the following reactions.

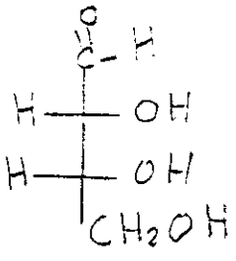
**1)**  + $CH_3CH_2CH_2NH_2$ $\xrightarrow{NaBH_3CN}$

**2)** $CH_3CH_2C{\equiv}CH$ + $\xrightarrow[2.\ CH_3CH_2Br]{1.\ NaNH_2\ liq\ NH_3}$

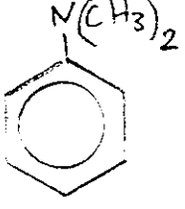
**3)**  + $\xrightarrow[H^+]{CH_3CH_2OH}$

**4)**  + $\xrightarrow[2.\ H_3O^+]{1.\ Excess\ PhMgBr}$

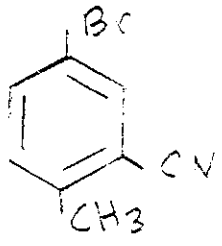
**5)**  $\xrightarrow{HCN}$ $\xrightarrow[2.\ H_2O]{1.\ LiAlH_4}$

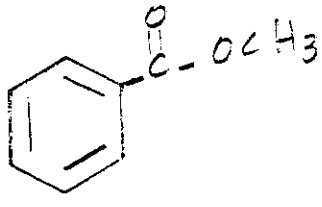
**6)**  $\xrightarrow{Br_2,\ H_2O}$

**7)**  + $CH_3Cl$ $\longrightarrow$

**8)**  + HONO $\xrightarrow[0°C]{H^+}$

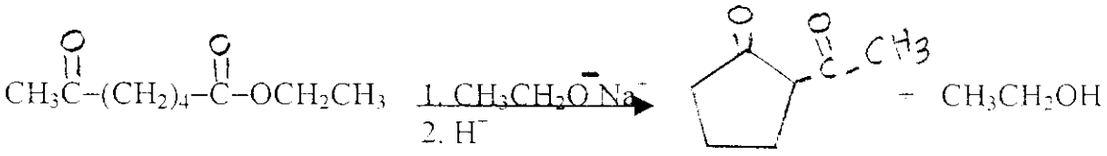
**VI (24%) Outline the steps for the synthesis of the following compounds from the given starting material and any needed organic or inorganic reagents.**

a)  from Benzene

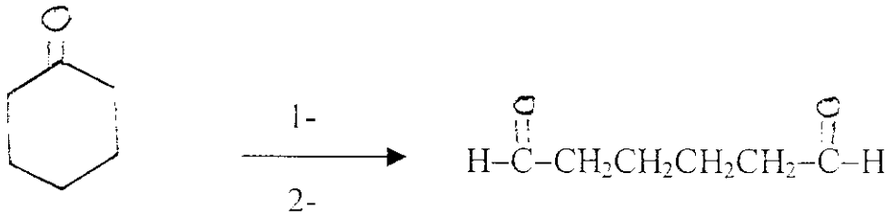
b)  from Bromobenzene

## VII (20%)

**1) Write a detailed step by step mechanism for the following reaction.**




**2) Fill in the missing reagents needed in each of the three steps required to carry out the following trans-formation.**




1 _____

2 _____

3 _____