



# CHE 322 Organic Chemistry II

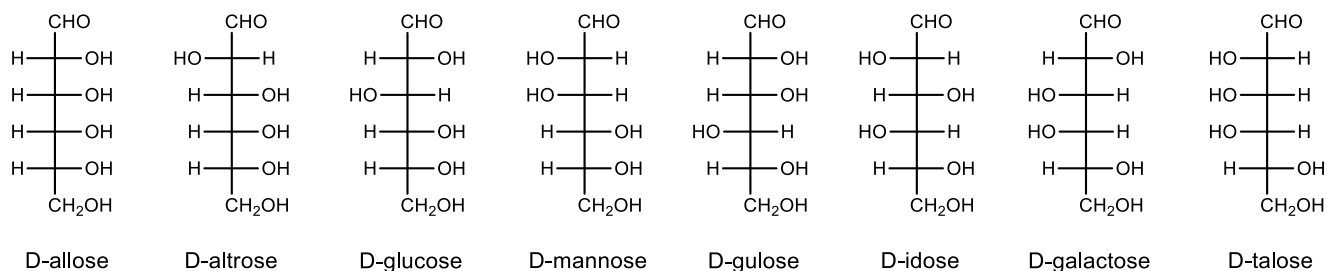
Exam 3 Form 1

Thursday April 20, 2023

8:15 PM – 9:35 PM

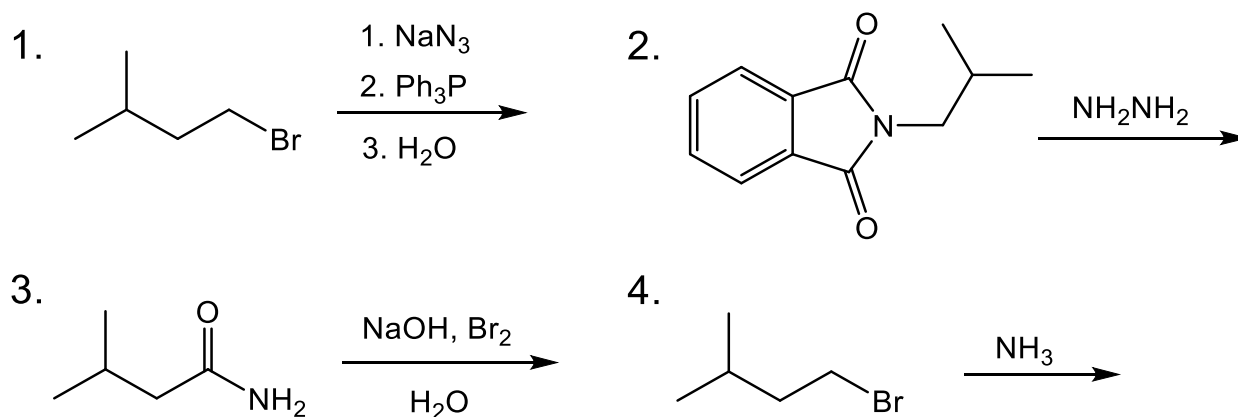
Write your nine digit University ID number in the nine boxes provided and then bubble in each of the nine digits. Print your name and sign your answer form using the spaces provided.

Questions 1 to 10 are multiple choice questions worth 5 points. Bubble your answers on the answer form. Questions 11-17 are short answer questions with points as indicated. Write out your answers in the indicated place on the answer form.



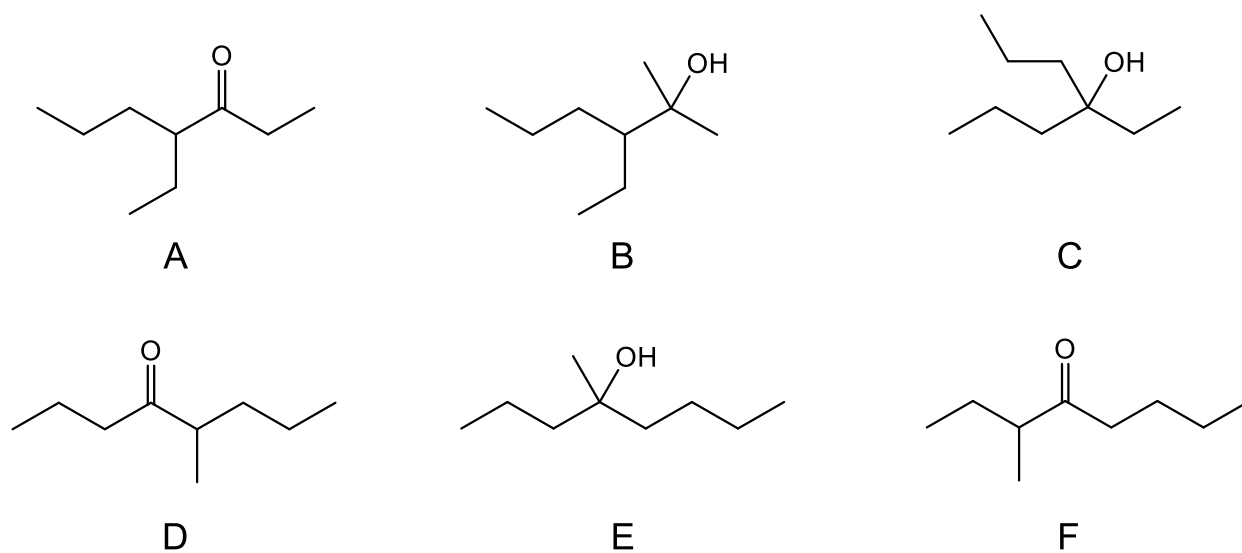
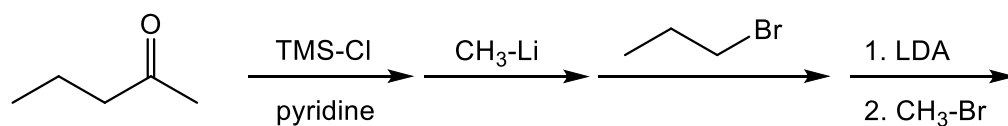
		Group																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Period	1	H																	He
	2	Li	Be											B	C	N	O	F	Ne
	3	Na	Mg											Al	Si	P	S	Cl	Ar
	4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
	5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
	6	Cs	Ba		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
	7	Fr	Ra		Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og

1. Which reactions/reaction sequences will give the same major product?

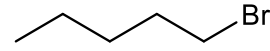
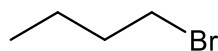
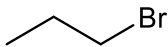
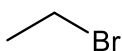
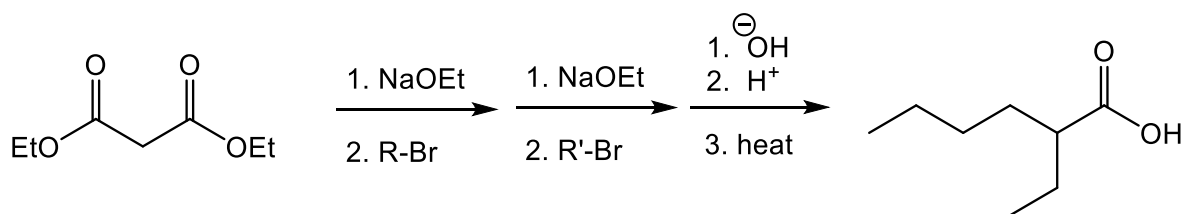


- A. 1 and 2    B. 1 and 3    C. 1 and 4    D. 2 and 3    E. 2 and 4    F. 3 and 4

2. Choose the major product of the following sequence of reactions.

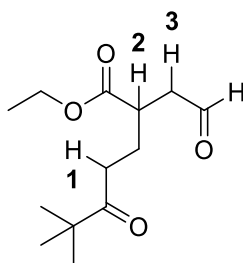


3. Which two reagents (R-Br and R'-Br) could be used to complete the following malonic acid synthesis?



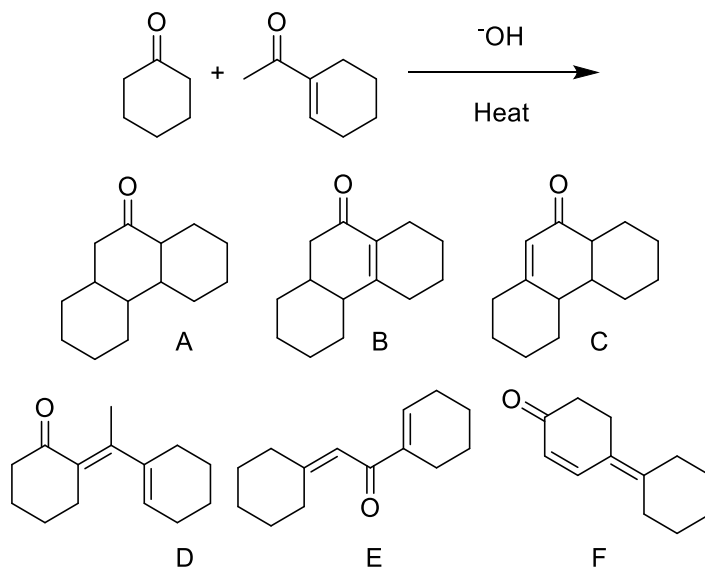
- A. 1 and 2    B. 1 and 3    C. 1 and 4    D. 2 and 3    E. 2 and 4    F. 3 and 4

4. Select the order that has the following labeled protons correctly arranged with respect to **increasing** acidity.

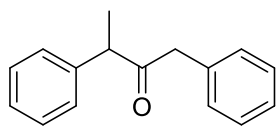
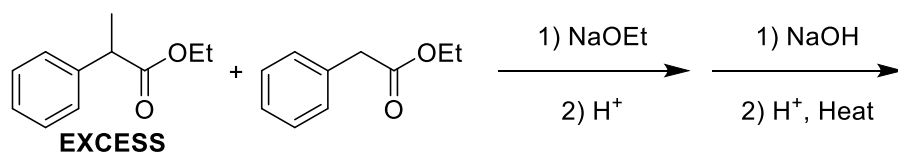


- A 1 < 2 < 3    B 1 < 3 < 2    C 2 < 1 < 3    D 2 < 3 < 1    E 3 < 1 < 2    F 3 < 2 < 1

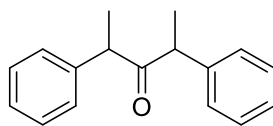
5. Select the major product of the following intermolecular Robinson Annulation.



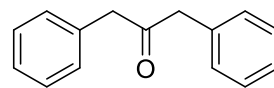
6. Select the major product of the following intermolecular Claisen Condensation sequence.



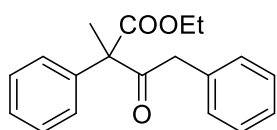
A



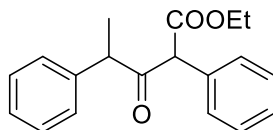
B



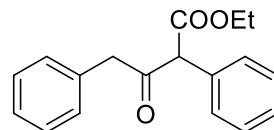
C



D

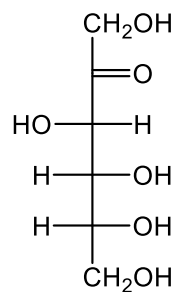


E

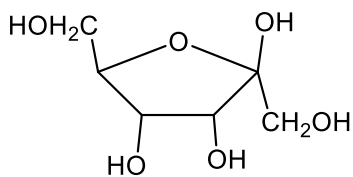


F

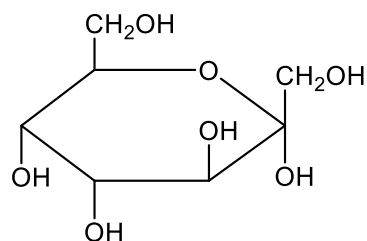
7. Which of the following is a correct Haworth projection of D-fructose?



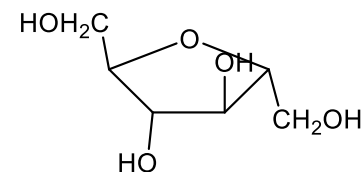
D-fructose



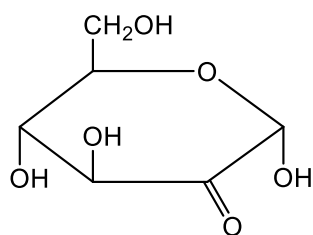
A



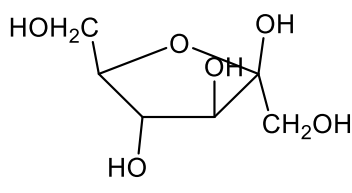
B



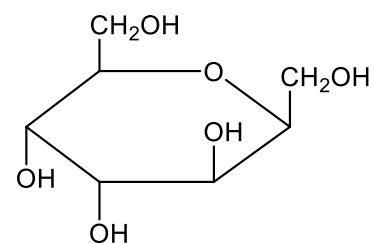
C



D

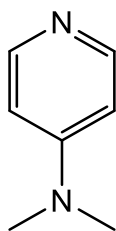


E

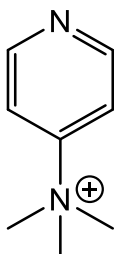


F

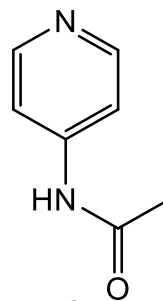
8. Select the order that has the following amines correctly arranged with respect to **increasing** basicity.



1



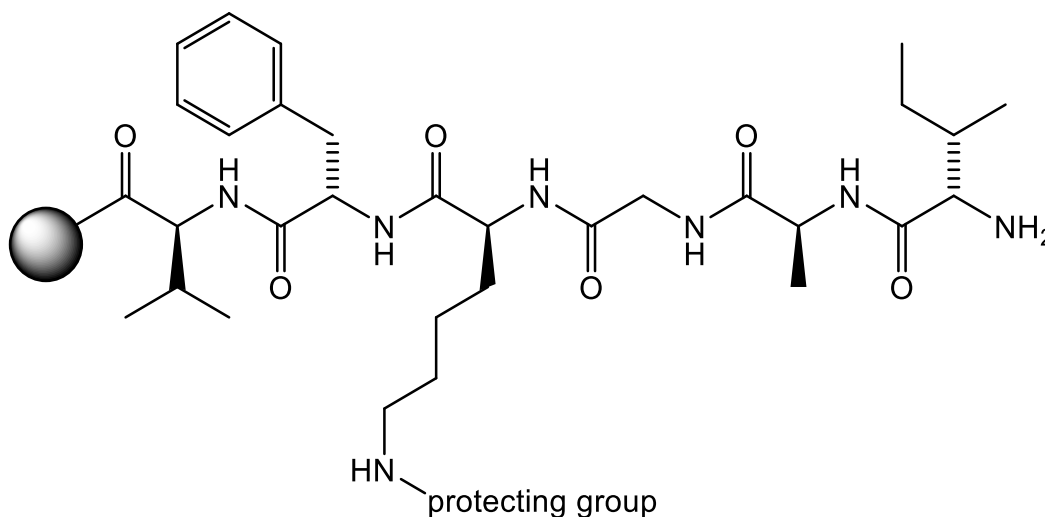
2



3

- A 1 < 2 < 3    B 1 < 3 < 2    C 2 < 1 < 3    D 2 < 3 < 1    E 3 < 1 < 2    F 3 < 2 < 1

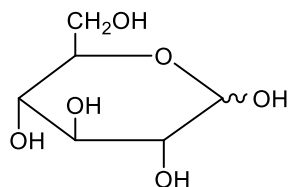
9. The peptide shown was synthesized using Fmoc based solid phase synthesis. You will recall that Fmoc groups protect the  $\alpha$ -amine of the activated amino acid, which are removed prior to coupling the next amino acid via treatment with base (piperidine). As a result of using the Fmoc strategy the peptide will be cleaved from the resin via acid (trifluoroacetic acid (TFA)). Given this, what is the most appropriate type of protecting group for lysine?



- A. cleaved via oxidation with Jones reagent  
 B. non cleavable  
 C. cleaved with intense UV light  
 D. cleaved using a Pd(0) catalyst  
 E. cleaved under basic conditions  
 F. cleaved under acidic conditions

10. Trehalose is a disaccharide that can be obtained from fungi and algae. Choose the correct structure of trehalose based on the following information.

I. Acid hydrolysis of trehalose yields only D-glucose.

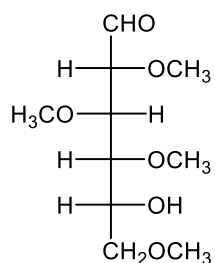


**D-glucopyranose**

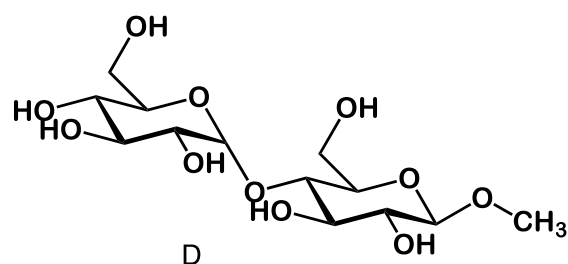
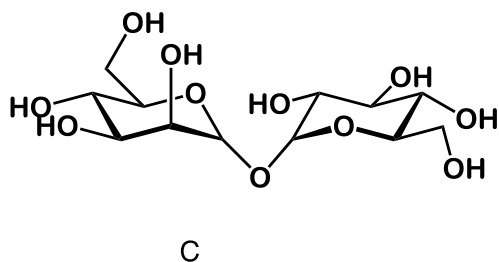
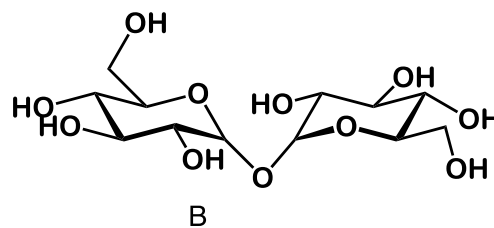
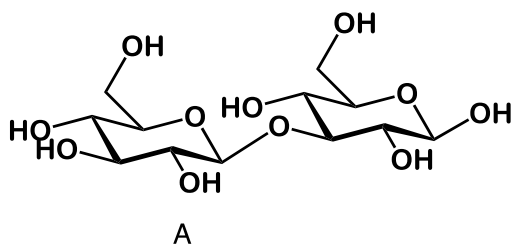
II. Trehalose is hydrolyzed by  $\alpha$ -glucosidase but not by  $\beta$ -glucosidase enzymes.

III. Trehalose does not react with  $\text{NaBH}_4$ .

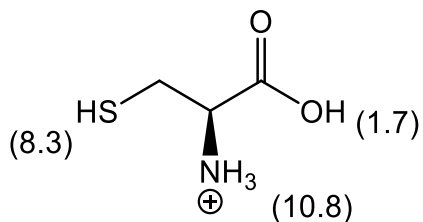
IV. Methylation of trehalose followed by hydrolysis yields two equivalents of 2,3,4,6-tetra-O-methyl-D-glucose.



**2,3,4,6-tetra-O-methyl-D-glucose**

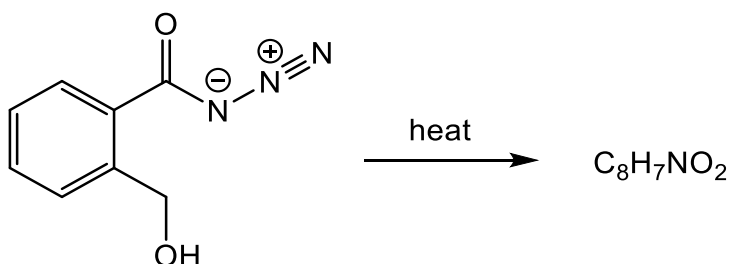


11. The structure below is the amino acid cysteine as it exists in highly acidic solution. The  $pK_a$  value of each acidic group is given in parenthesis.

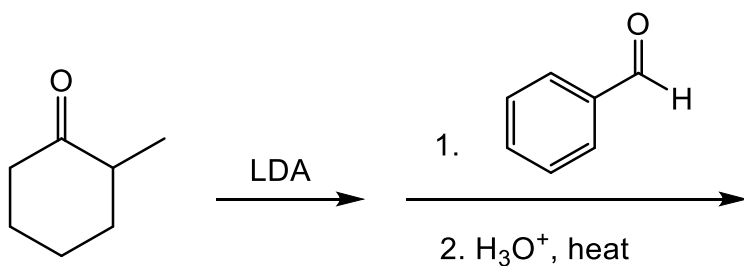


Draw the most predominant form of cysteine in a solution of  $pH = 7$ . (5 points)

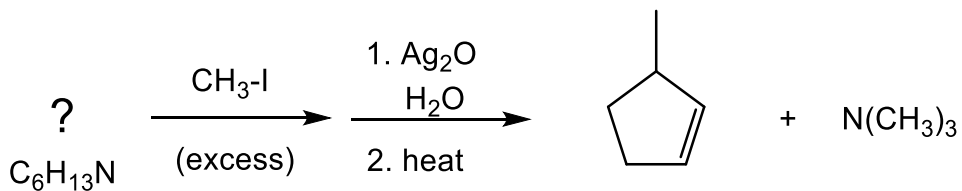
12. Draw the major product of the following Curtius rearrangement. (5 points)



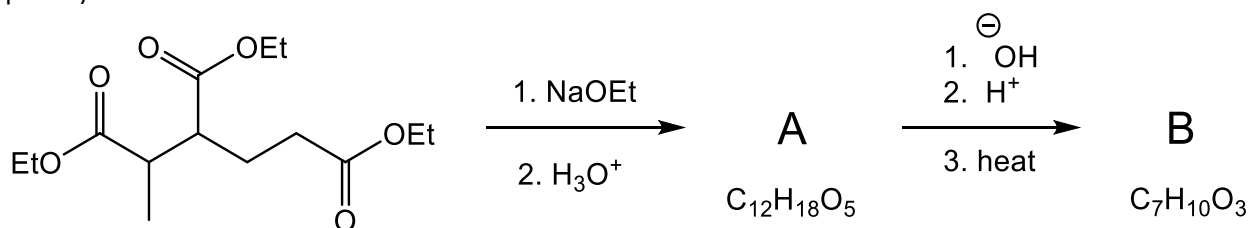
13. Draw the major product of the following reaction sequence. (5 points)



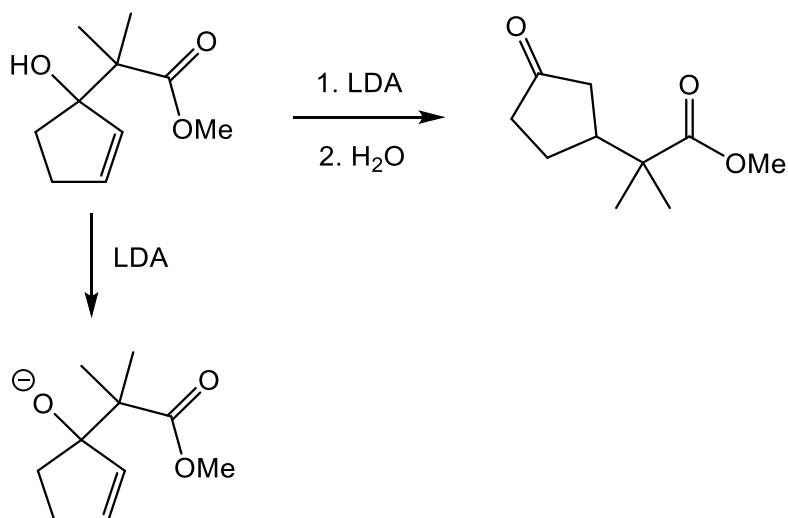
14. Draw the structure of the reactant (with formula  $C_6H_{13}N$ ) of the following Hofmann elimination. (5 points)



15. Based on the following scheme, determine, and draw the structures of compounds **A** and **B**. (10 points)

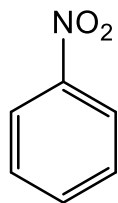


16. Draw a curved arrow mechanism for the following reaction. The reaction begins with deprotonation of the alcohol by LDA. Begin your mechanism from the anion shown. Hint: start with a retro type of reaction to form an enolate that will then perform a conjugate addition. (10 points)

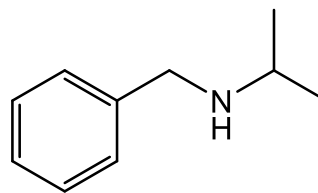




17. Starting with nitrobenzene, prepare the target compound shown below. You may use any other reagents/reactants. (10 points)



starting material



target compound



