

臺北醫學大學 102 學年度碩士班暨碩士在職專班入學考試

有機化學試題

本試題第 1 頁；共 7 頁

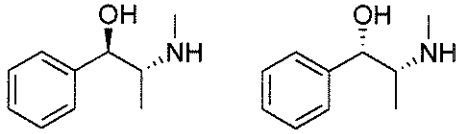
(如有缺頁或毀損，應立即請監試人員補發)

注意事項

- 一、本試題共二大題，共計 100 分。
- 二、請將最適當的答案依題號作答於考試答案卷上。
- 三、試題答錯者不倒扣；題次號碼錯誤或不按順序或鉛筆作答，不予計分。

I. Multiple choice. (每題2%，共90%)

1. What is the relationship between the following two structures?



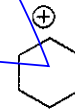
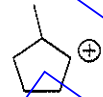
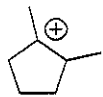
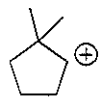
Enantiomers

Diastereomers

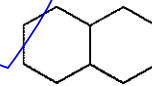
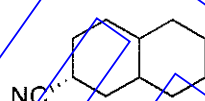
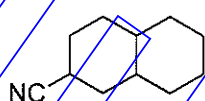
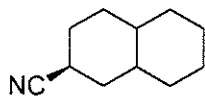
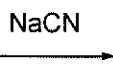
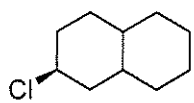
Constitutional Isomers

Identical

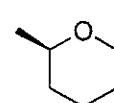
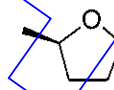
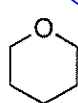
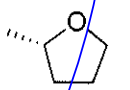
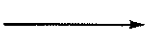
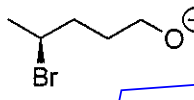
2. Which of the following structures is the following cation after rearrangement?



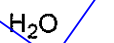
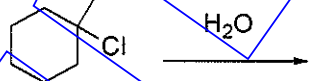
3. Which of the following chemicals is the product of the following S_N2 reaction?



4. Which of the following chemicals is the product of the following S_N2 reaction?



5. Which of the following is the rate law for the following reaction?



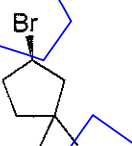
Rate = $k[\text{H}_2\text{O}]$

Rate = $k[1\text{-chloro-1-methylcyclohexane}]$

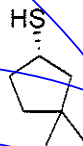
Rate = $k[\text{H}_2\text{O}][1\text{-chloro-1-methylcyclohexane}]$

Rate = $k[\text{chloride ion}]$

6. Which of the following reagents could make the following reaction happened?



H₂S in water



H₂S in DMSO

NaSH in water

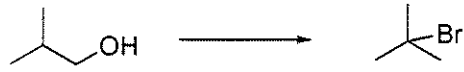
NaSH in DMSO

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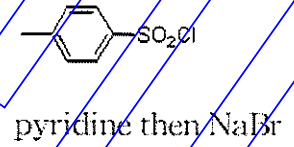
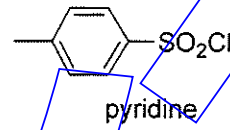
本試題第 2 頁；共 7 頁
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7. Which of the following reagents would best accomplish the following transformation?

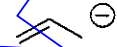
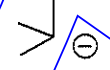
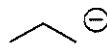


HBr

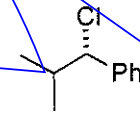
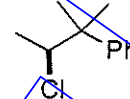
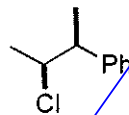
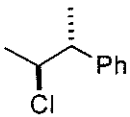
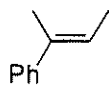
NaBr



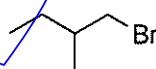
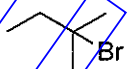
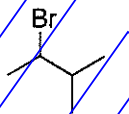
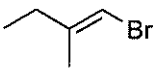
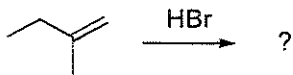
8. Which of the following is most likely to act as a base rather than a nucleophile?



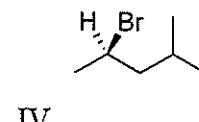
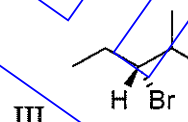
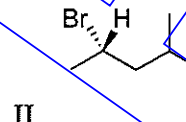
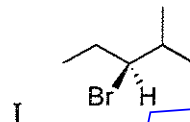
9. Which of the following alkyl halides would afford the indicated product upon reaction with sodium ethoxide?



10. The expected major product of the following reaction is:



11. Which of the molecules below are enantiomers, formed as products upon reaction of HBr with 4-methylpent-1-ene?



I and II

II and III

III and IV

II and IV

12. The regioselectivity and stereospecificity in the oxymercuration-demercuration of an alkene is best described as:

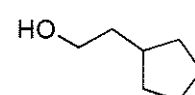
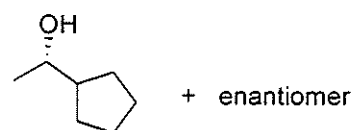
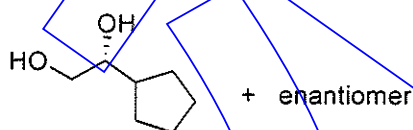
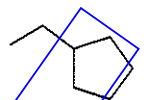
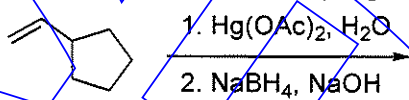
Markovnikov orientation with syn-addition

Markovnikov orientation with anti-addition

anti-Markovnikov orientation with syn-addition

anti-Markovnikov orientation with anti-addition

13. What is the expected major product for the following reaction?

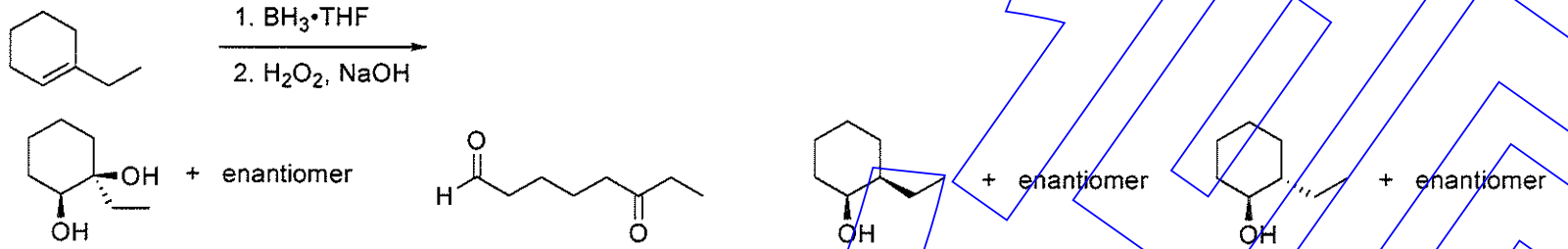


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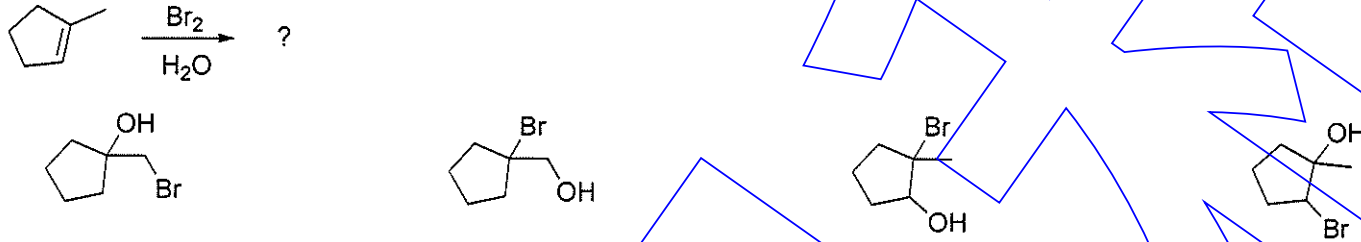
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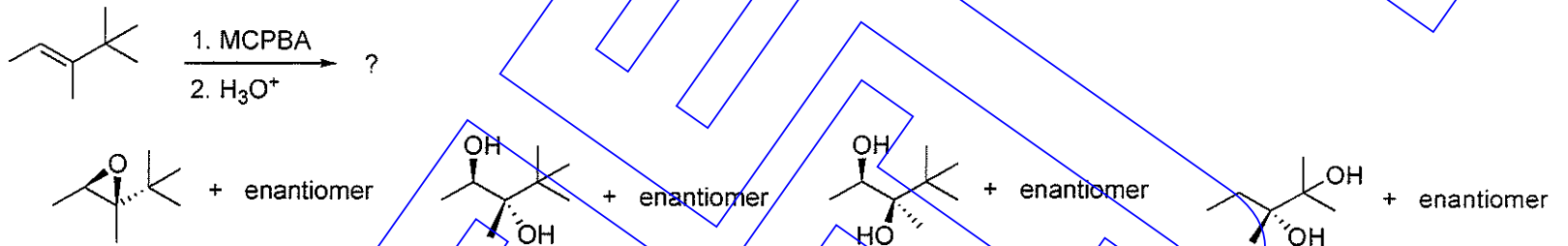
14. What is the expected major product for the following reaction?



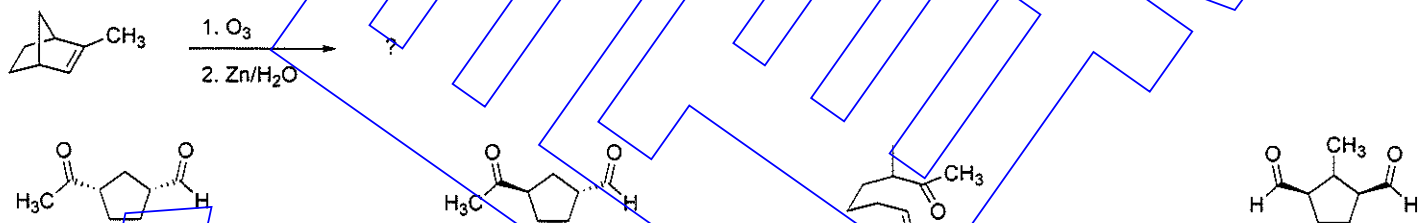
15. What major product is expected from the following reaction?



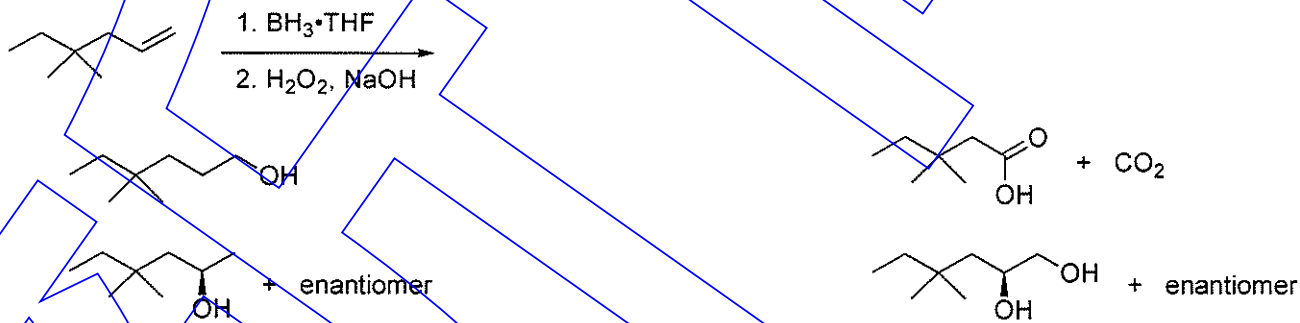
16. For the reaction sequence below, identify the expected major products.



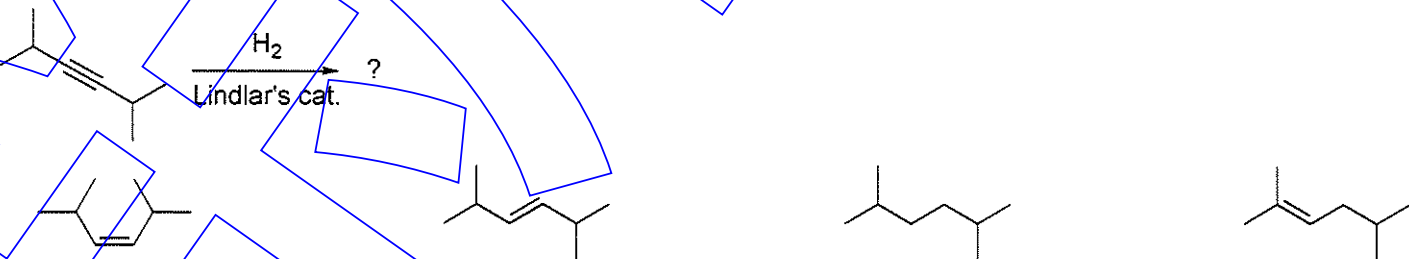
17. What is the expected major product of the reaction shown below?



18. What is the expected major product for the following reaction?



19. For the reaction shown, select the expected major organic product.

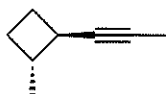
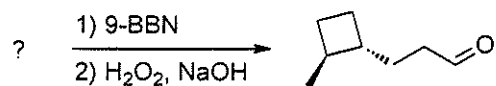


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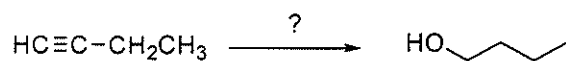
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20. For the reaction below, which of the alkynes listed would be expected to produce the product under the conditions shown?



21. Which sequence of reagents would be expected to accomplish the transformation of 1-butyne shown below?



1) $\text{H}_2\text{O}/\text{H}_2\text{SO}_4, \text{HgSO}_4 \text{ cat.}$

2) H_2, Pt

1) HBr

2) H_2, Pt

3) NaOH

1) $\text{H}_2, \text{Lindlar catalyst}$

2) $\text{BH}_3 \cdot \text{THF}$

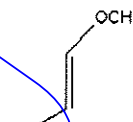
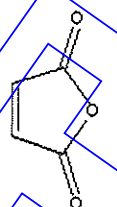
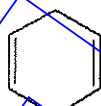
3) $\text{H}_2\text{O}_2, \text{NaOH}$

1) $\text{HBr}, \text{peroxides}$

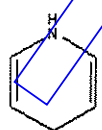
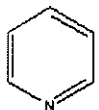
2) NaOH

3) H_2, Pt

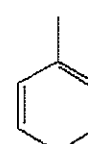
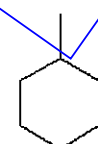
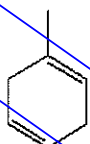
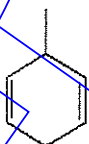
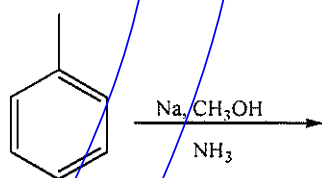
22. Which one of the following dienophiles is most reactive in the Diels-Alder reaction?



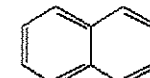
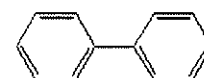
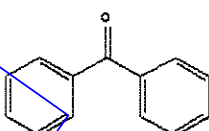
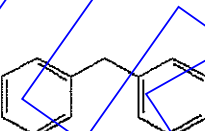
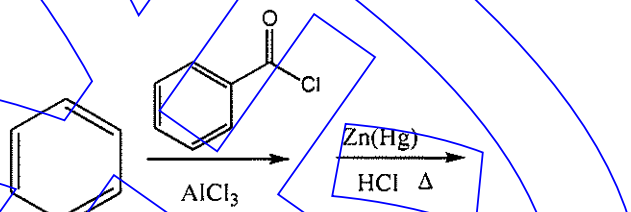
23. Which one of the following compounds is nonaromatic?



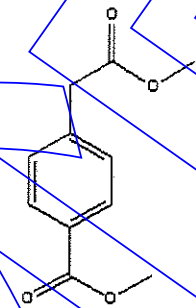
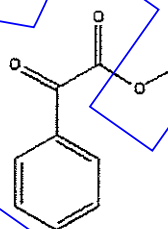
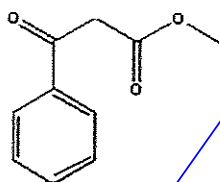
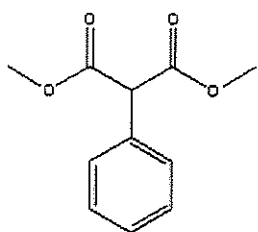
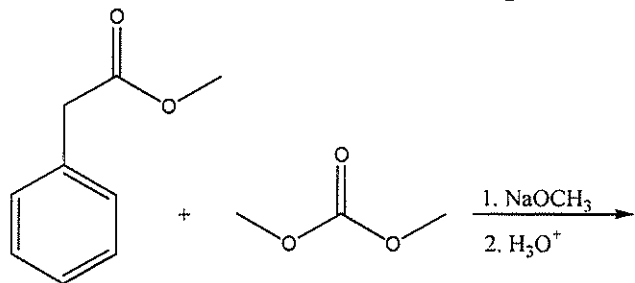
24. Predict the product for the following reaction.



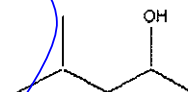
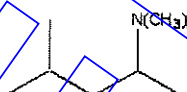
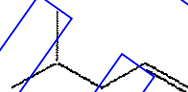
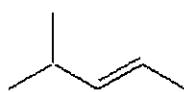
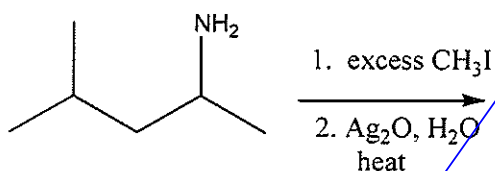
25. Predict the structure of the product for the following reaction.



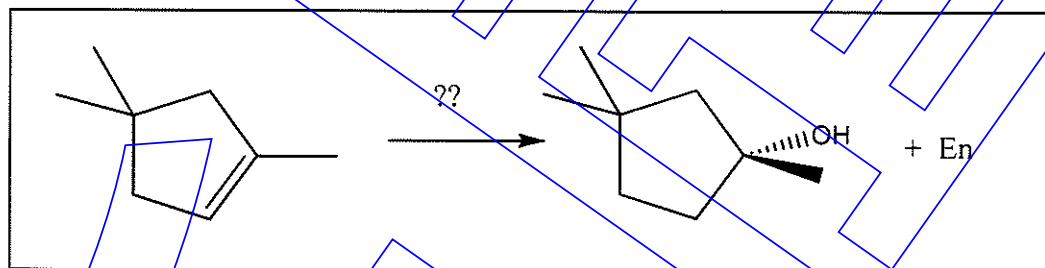
26. Predict the product for the following reaction.



27. Predict the major product for the following reaction.



28. Predict the reagent(s) required to complete the following transformation:



1) OsO_4 ; 2) $\text{NaHSO}_3, \text{H}_2\text{O}$

1) $\text{Hg}(\text{OAc})_2, \text{H}_2\text{O}$; 2) NaBH_4

1) RCO_3H ; 2) H_2O

1) $\text{BH}_3\text{-THF}$; 2) $\text{H}_2\text{O}_2, \text{NaOH}$

29. Given that glucose has a specific rotation of $+52.8^\circ$. Predict the concentration of a glucose aqueous solution contained in a 10 cm long polarimetry tube if a rotation of $+15.8^\circ$ was observed.

0.334 g/mL

0.299 g/mL

3.34 g/mL

0.0299 g/mL

30. Which of the following chemicals is a geminal dihalide?

isobutyl chloride

trans-1,4-diiodocyclohexane

cis-1,2-dibromocyclopentane

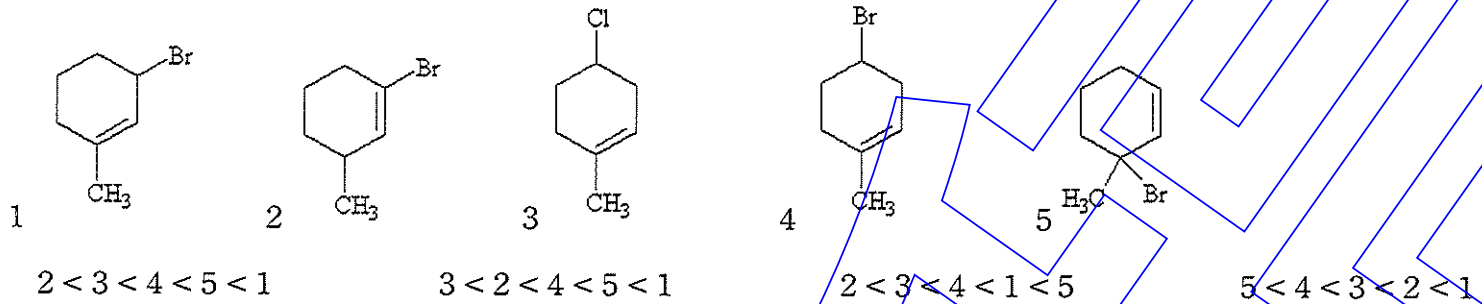
3,3-dichloropentane

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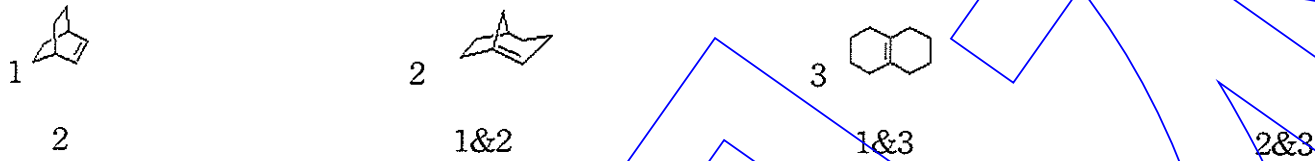
有機化學試題

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(如有缺頁或毀損，應立即請監試人員補發)

31. Rank the following molecules in order of increasing relative rate of S_N1 solvolysis with methanol and heat (slowest to fastest reacting).



32. Which of the following cycloalkenes would be expected to be stable?



33. Which of the following reagents should be used to convert hex-3-yne to (Z)-hex-3-ene?



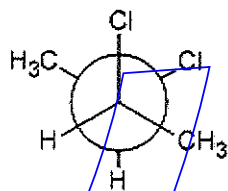
34. Which of the following reagents or sequences do not produce an alcohol or diol from an alkene starting material?



35. Which of the following reagents is the best choice for oxidizing a primary alcohol to an aldehyde?



36. For the compound represented by the Newman projection below, what is the dihedral angle between the methyl groups in the conformer that has the smallest molecular dipole moment?



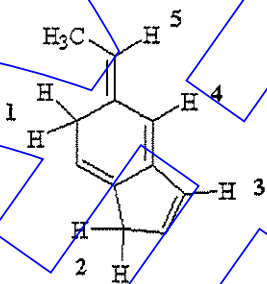
37. Treatment of tetrahydrofuran with excess HBr results in the formation of what major organic product?



38. In biological systems, sulfonium salts such as SAM serve what function?



39. Which of the labeled H atoms (1-5) in the following molecule would be predicted to be the most acidic?

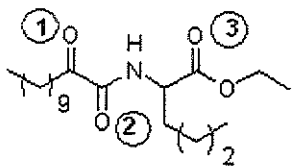


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40. The following compound has been found effective in treating pain and inflammation (J. Med. Chem. 2007, 4222). Which sequence correctly ranks each carbonyl group in order of increasing reactivity toward nucleophilic addition?



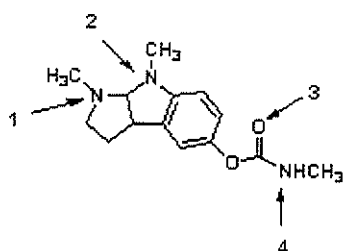
1 < 3 < 2

1 < 2 < 3

2 < 3 < 1

3 < 1 < 2

41. The reagent which converts a carbonyl group of a ketone into a methylene group is _____
 LiAlH₄ NaBH₄, CH₃CH₂OH Zn(Hg), conc. HCl Na, NH₃, CH₃CH₂OH
42. Physostigmine is used in the treatment of glaucoma. Within this structure, the atom indicated by _____ is most basic, while atom _____ is least basic.



1 (most basic), 4 (least basic)

2 (most basic), 3 (least basic)

1 (most basic), 3 (least basic)

2 (most basic), 4 (least basic)

43. Which of the following amines could be formed by reduction of an amide?

1. benzylamine

2. isopropylamine

3. aniline

4. triethylamine

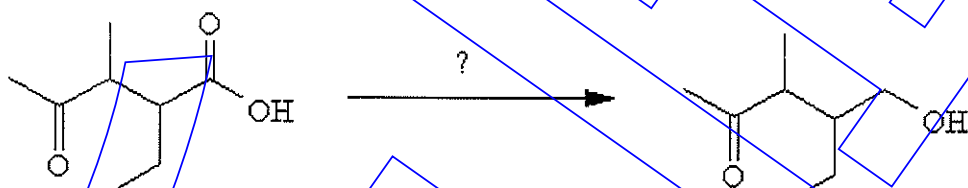
2 & 3

1, 3, & 4

3 & 4

1 & 4

44. Which of the reagents listed below would work best in the following reaction?



NaBH₄

LiAlH₄

LiAl[OC(CH₃)₃]₃H

BH₃ · THF

45. What compound is produced when N,N-dimethylpropanamide is treated with LiAlH₄?

CH₃CH₂CH₂N(CH₃)₂

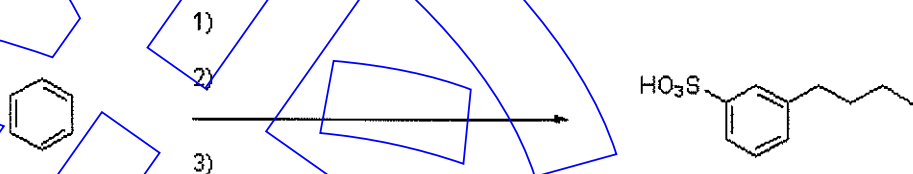
CH₃CH₂CONH₂

CH₃CH₂N(CH₃)₂

CH₃CH₂CH₂NH₂

II. Filling the blank (10%)

1. Complete the following reaction by filling in the necessary reagents. (5%)



2. Provide the structure of the major organic products which result from the reaction below. (5%)

