高雄醫學大學 103 學年度學士後醫學系招生考試試題

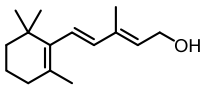
科目:有機化學　　考試時間: 80 分鐘

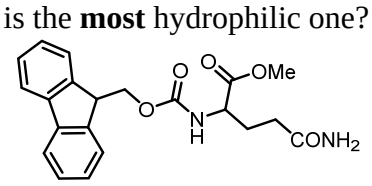
說明:一、選擇題用 2B 鉛筆在「答案卡」上作答，修正時應以橡皮擦擦拭，不得使用修正液(帶)，未遵照正確作答方法而致電腦無法判讀者，考生自行負責。
二、試題及答案卡必須繳回，不得攜出試場。

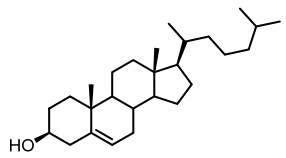
Choose one best answer for the following questions

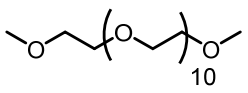
【單選題】每題 1 分，共計 60 分，答錯 1 題倒扣 0.25 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

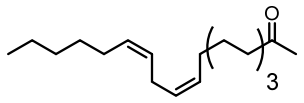
1. Which of the following compounds is the **most** hydrophilic one?

(A) 

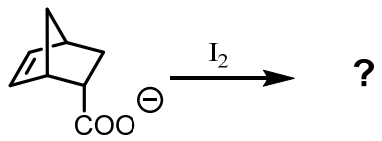
(B) 

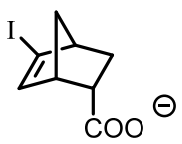
(C) 

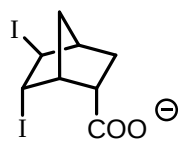
(D) 

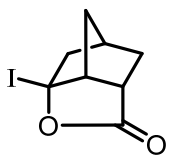
(E) 

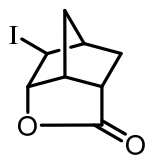
2. Which is the **major** product of the following reaction?



(A) 

(B) 

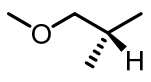
(C) 

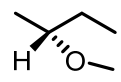
(D) 

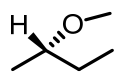
(E) 

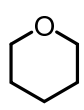
3. What is the **major** product in the following reaction sequence?

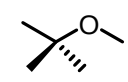
(R) 2-Butanol $\xrightarrow{NaH}$ $\xrightarrow{CH_3I}$?

(A) 

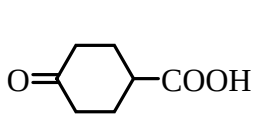
(B) 

(C) 

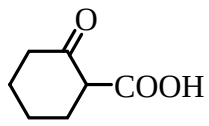
(D) 

(E) 

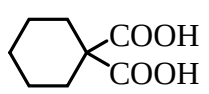
4. Which of the following carboxylic acids would undergo decarboxylation readily when heated?



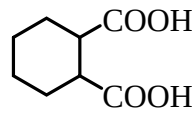
I



II



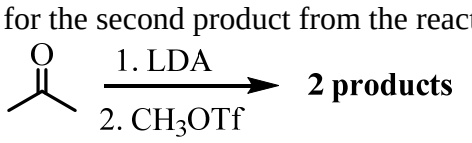
III

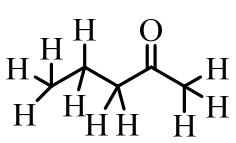


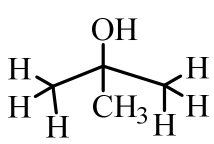
IV

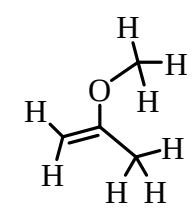
(A) I　(B) II　(C) III　(D) IV　(E) II and III

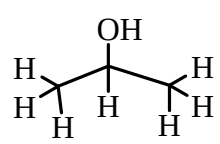
5. Two products can be obtained from the reaction below. One of the product is 2-Butanone. What is the **most** likely structure for the second product from the reaction?

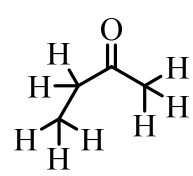


(A) 

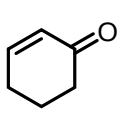
(B) 

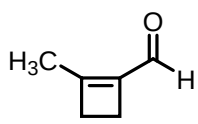
(C) 

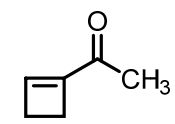
(D) 

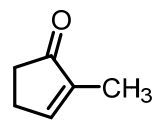
(E) 

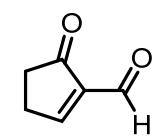
6. The aldol cyclization, followed by dehydration of 5-oxo-hexanal will give which product below.

(A) 

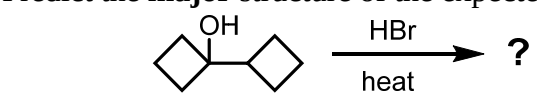
(B) 

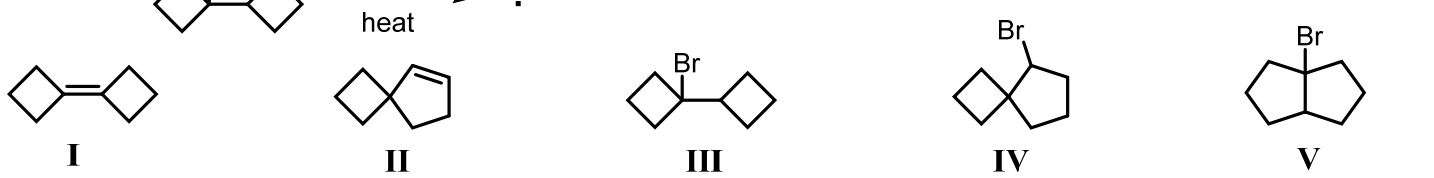
(C) 

(D) 

(E) 

7. Predict the **major** structure of the expected product for the following reaction.

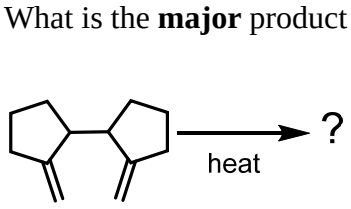


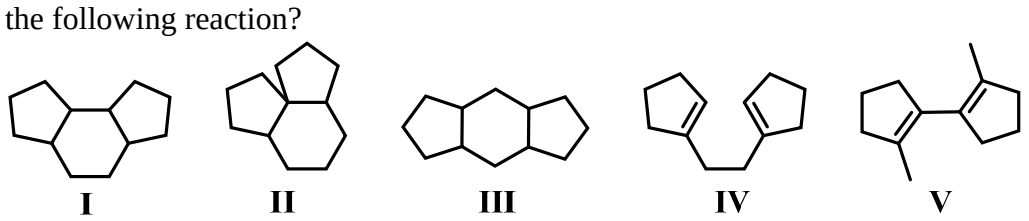


I **II** **III** **IV** **V**

(A) I (B) II (C) III (D) IV (E) V

8. What is the **major** product of the following reaction?





I **II** **III** **IV** **V**

(A) I (B) II (C) III (D) IV (E) V

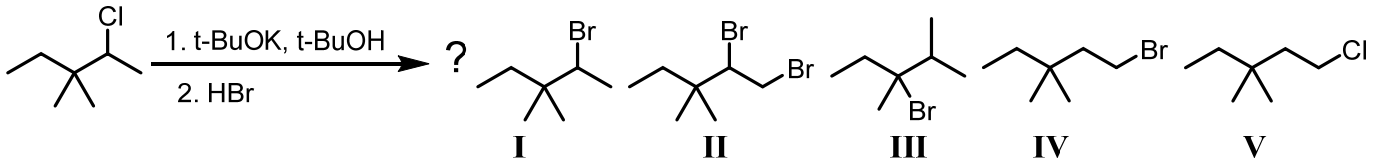
9. Which of the following reaction sequences would convert 2-butanol into 2-deuterobutane?

(A) 1. H_2SO_4, heat 2. BD_3 in THF, then H_2O_2, NaOH
(B) 1. H_2SO_4, heat 2. D_2, Pd/C
(C) 1. PBr_3 2. Mg/ether, then D_2O
(D) 1. PBr_3 2. NaOD, then D_2O
(E) 1. PBr_3 2. NaD in hexane

10. Which of the following factors has **NO** effect on the rate of S_{N1} reactions?

(A) the nature of the alkyl halide
(B) the nature of the leaving group
(C) the concentration of the alkyl halide
(D) the concentration of the nucleophile
(E) the value of the rate constant

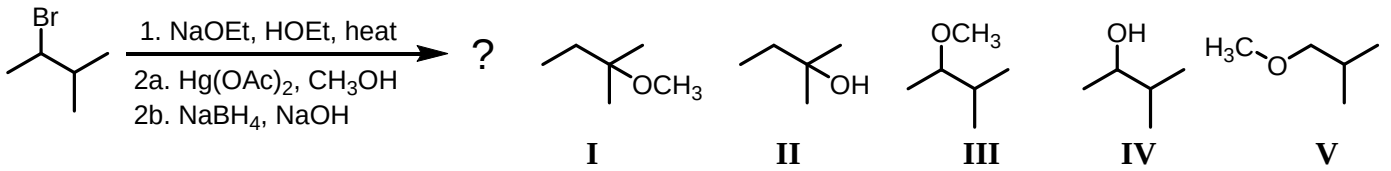
11. What is the expected **major** product of the following reaction sequence?



I **II** **III** **IV** **V**

(A) I (B) II (C) III (D) IV (E) V

12. What is the expected **major** product of the following reaction sequence?



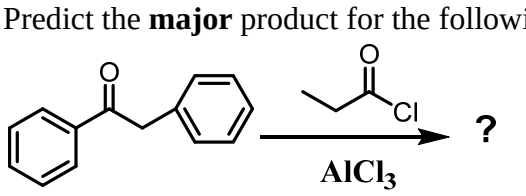
I **II** **III** **IV** **V**

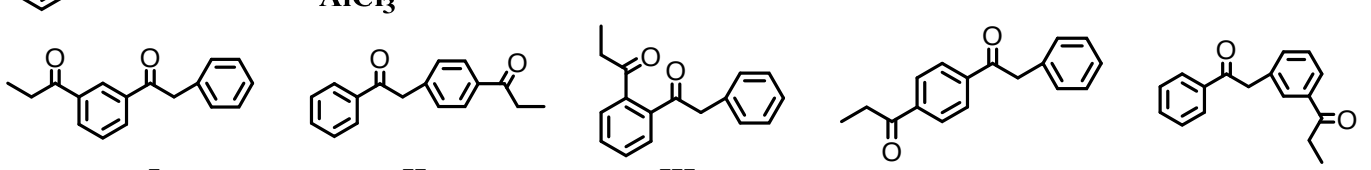
(A) I (B) II (C) III (D) IV (E) V

13. Which one of the following compounds is **NOT** a product of reaction between 1,3-butadiene and HBr?

(A) (S)-3-bromo-1-butene (B) (R)-3-bromo-1-butene (C) (E)-1-bromo-2-butene
(D) (Z)-1-bromo-2-butene (E) (Z)-2-bromo-2-butene

14. Predict the **major** product for the following reaction.

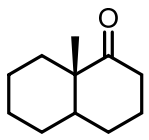




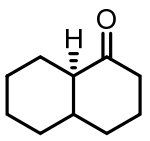
I **II** **III** **IV** **V**

(A) I (B) II (C) III (D) IV (E) V

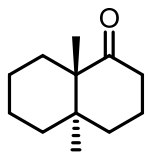
15. Which one of the following compounds would undergo racemization at the α-stereocenter in presence of a base?



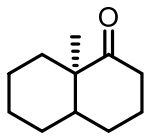
I



II



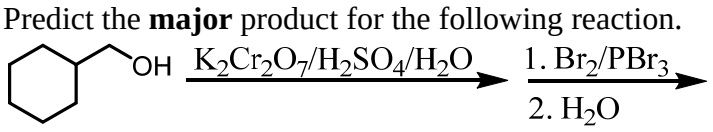
III

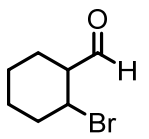


IV

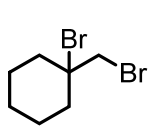
(A) I (B) II (C) III (D) IV (E) None of the above

16. Predict the **major** product for the following reaction.

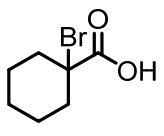




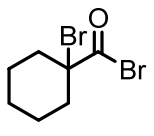
I



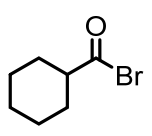
II



III



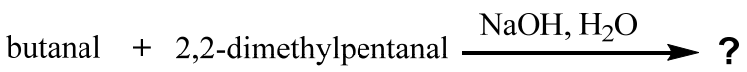
IV

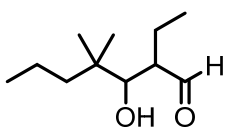


V

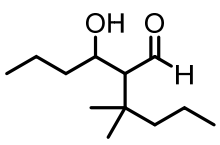
(A) I (B) II (C) III (D) IV (E) V

17. Predict the **major** product for the following reaction.

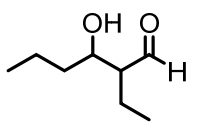




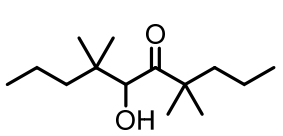
I



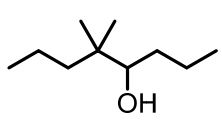
II



III



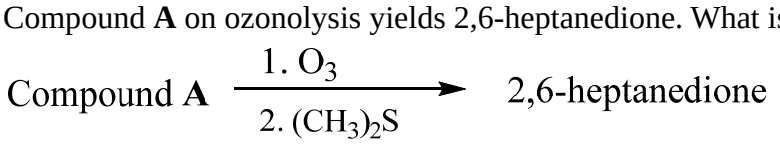
IV



V

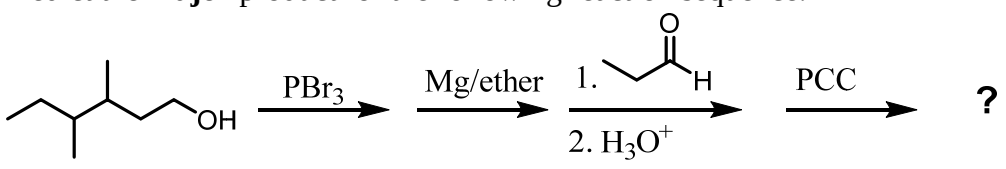
(A) I (B) II (C) III (D) IV (E) V

18. Compound **A** on ozonolysis yields 2,6-heptanedione. What is the structure of compound **A**?



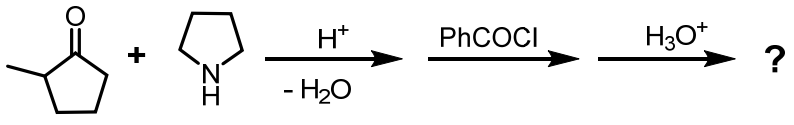
(A) 1,2-dimethylcyclohexene (B) 2,6-dimethylcyclohexene (C) 1,5-dimethylcyclopentene
(D) 1,2-dimethylcyclopentene (E) 2-methyl-1-cyclopentene

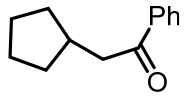
19. Predict the **major** product for the following reaction sequence.

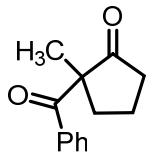


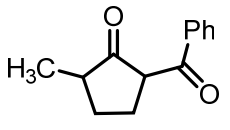
(A) 6,7-dimethyl-3-nonanol (B) 6,7-dimethyl-3-nonanone (C) 6,7-dimethyl-3-nonanal
(D) 3,4-dimethyl-7-nonanol (E) 3,4-dimethyl-7-nonanone

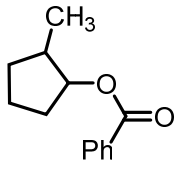
20. What is the **major** product for the reaction sequence below.

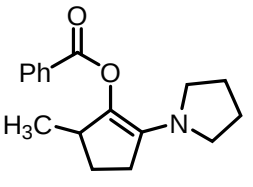


(A) 

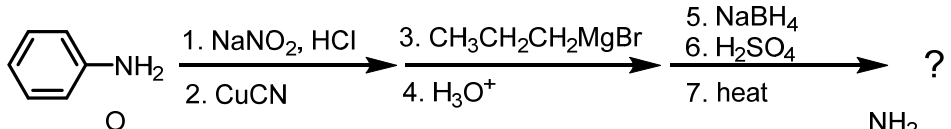
(B) 

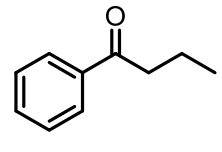
(C) 

(D) 

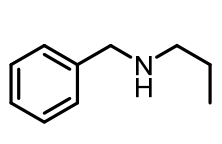
(E) 

21. Provide the structure of the **major** organic product in the reaction below.

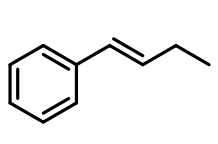




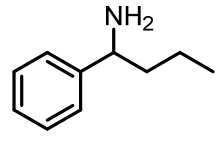
I



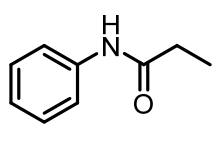
II



III



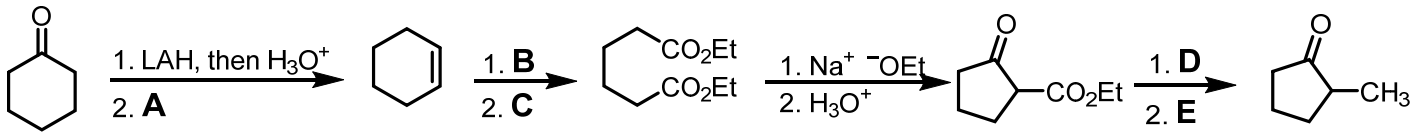
IV



V

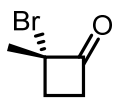
(A) I (B) II (C) III (D) IV (E) V

22. Which reaction condition could **NOT** give the indicated product in the following scheme?



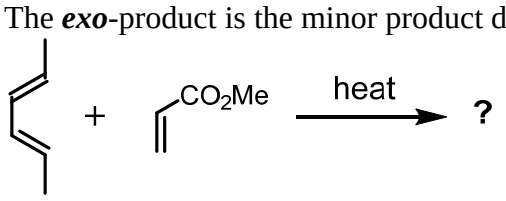
(A) $POCl_3$, pyridine (B) $KMnO_4$, H_3O^+ (C) CH_3CH_2OH, H^+ (D) Na^+ ^-OEt, then CH_3MgBr (E) H_3O^+, heat

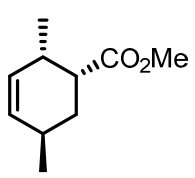
23. What is the **IUPAC** name for the following compound?

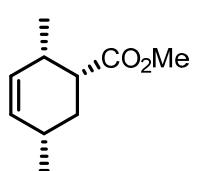


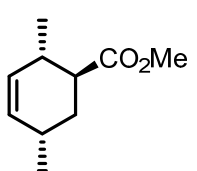
(A) (R)-2-bromo-2-methylcyclobutanone
(B) (S)-2-bromo-2-methylcyclobutanone
(C) (R)-2-methyl-2-bromocyclobutanone
(D) (S)-1-bromo-1-methyl-2-cyclobutanone
(E) (R)-1-bromo-1-methyl-2-cyclobutanone

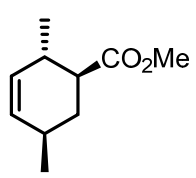
24. The ***exo***-product is the minor product during the 4+2 reaction. Which is the ***exo***-product?

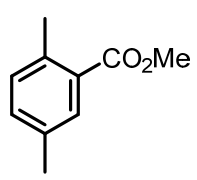


(A) 

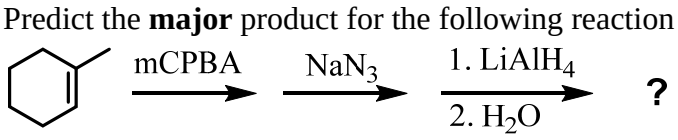
(B) 

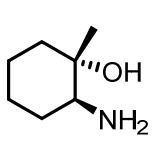
(C) 

(D) 

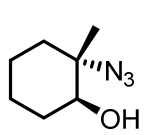
(E) 

25. Predict the **major** product for the following reaction sequence.

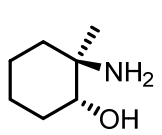




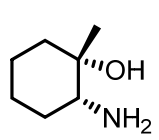
I



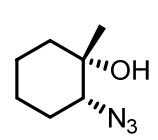
II



III



IV

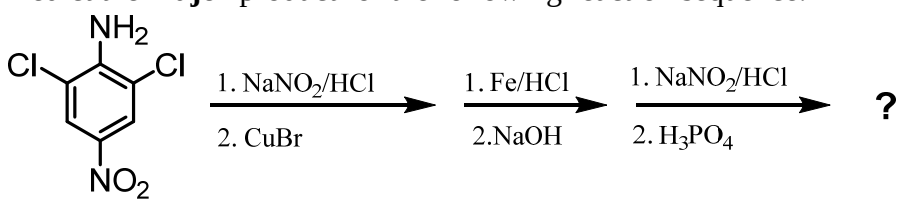


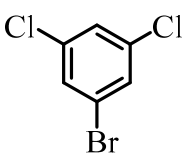
V

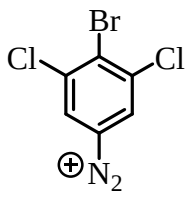
(A) I (B) II (C) III (D) IV (E) V

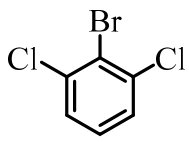
26. Which of these alkyl halides **cannot** be used to prepare amines using Gabriel synthesis?
(A) 1-bromopentane
(B) 1-bromo-3-methylbutane
(C) 2-bromo-3-methylpentane
(D) 1-bromo-2,3-dimethylbutane
(E) 2-bromo-2,3-dimethylbutane

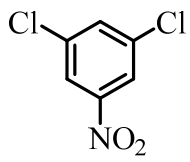
27. Predict the **major** product for the following reaction sequence.

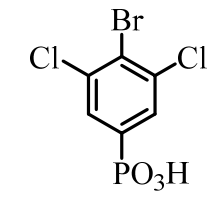


(A) 

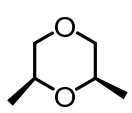
(B) 

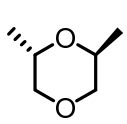
(C) 

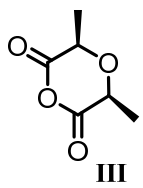
(D) 

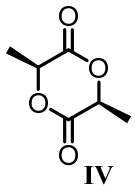
(E) 

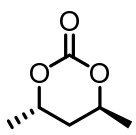
28. Identify which of the structures below are *meso* structures


I


II

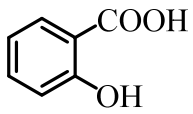

III


IV

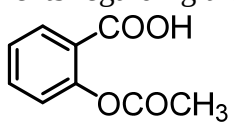

V

(A) I (B) I and III (C) I, III and V (D) I, III and IV (E) II and V

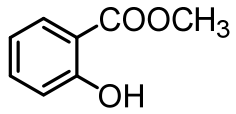
29. Which of the following statements regarding these three compounds is **incorrect**?



I



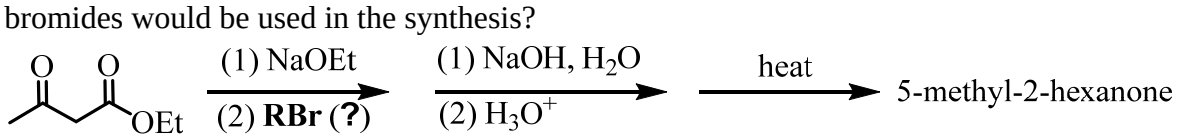
II



III

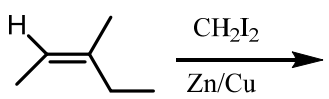
(A) I can be converted to III using methanol and catalytic amounts of H_2SO_4.
(B) I can be converted to II using acetic acid and catalytic amounts of H_2SO_4.
(C) II can be produced from I by reaction with acetic anhydride.
(D) II and I both will react with sodium bicarbonate to evolve carbon dioxide.
(E) II and III are both esters.

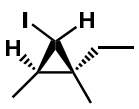
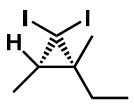
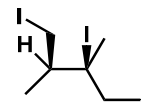
30. The acetoacetic ester synthesis, shown below, can be used to prepare 5-methyl-2-hexanone. Which one of the following alkyl bromides would be used in the synthesis?



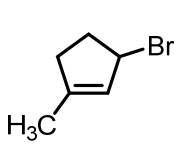
(A) $(CH_3)_2CHBr$ (B) $(CH_3)_2CHCH_2Br$ (C) $(CH_3)_2CHCH_2CH_2Br$
(D) $CH_3CH_2CHBrCH_3$ (E) $(CH_3)_2CBrCH_3$

31. Choose the **major** product of the following reaction.

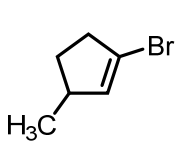


(A) 
(B) 
(C) 
(D) 
(E) 

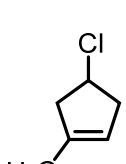
32. Rank the following molecules in order of increasing relative rate of S_N1 solvolysis with methanol and heat (slowest to fastest reacting).



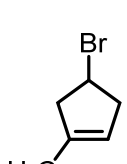
I



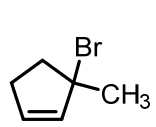
II



III



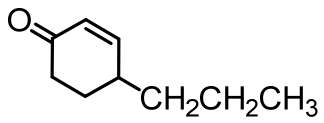
IV



V

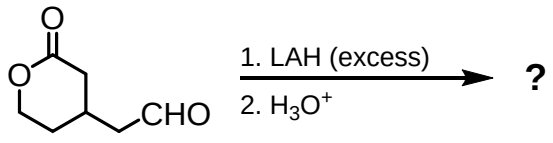
(A) III<II<IV<I<V (B) II<III<IV<I<V (C) I<IV<III<II<V
(D) II<III<IV<V<I (E) I<II<V<IV<III

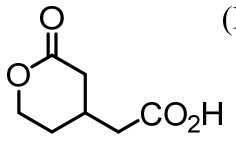
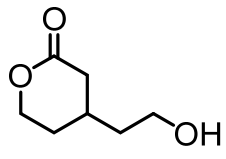
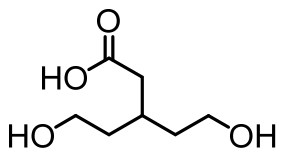
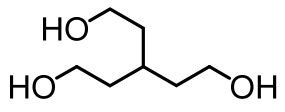
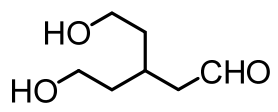
33. Which of the following compounds will react with methyl vinyl ketone in a Robinson annulation to generate the cyclic enone below?



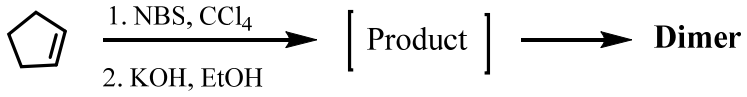
(A) 1-pentene (B) cyclohexanone (C) 2-pentanone
(D) pentanal (E) None of the above

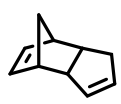
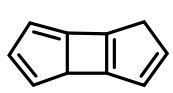
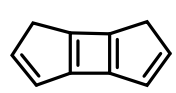
34. Provide the structure of the **major** organic product in the reaction below.



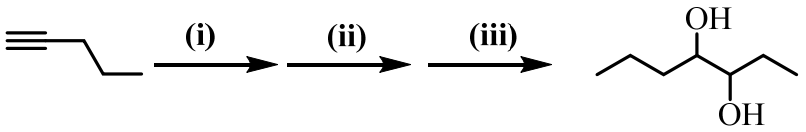
(A) 
(B) 
(C) 
(D) 
(E) 

35. The product of the following reaction immediately undergoes a dimerization at room temperature. What is the structure of the dimer?



(A) 
(B) 
(C) 
(D) 
(E) 

36. For the following multistep synthesis, choose the **best** reaction conditions to give the desired product?



(A) (i) HBr, (ii) O_3 followed by Zn/H^+, (iii) Li/NH_3
(B) (i) $NaNH_2/NH_3$ followed by CH_3CH_2I, (ii) Lindlar's catalyst/H_2, (iii) OsO_4 followed by $NaHSO_3$
(C) (i) H_2/Pd/C (1 equivalent), (ii) $NaNH_2/NH_3$ followed by CH_3CH_2Br, (iii) $KMnO_4/H_2O$
(D) (i) $HgSO_4/H_2O/H_2SO_4$, (ii) Lindlar's catalyst/H_2, (iii) OsO_4 followed by $NaHSO_3$
(E) (i) Lindlar's catalyst/ H_2, (ii) $NaNH_2/NH_3$ followed by CH_3CH_2Br, (iii) OsO_4 followed by $NaHSO_3$

37. Which sequence of steps below describes the best synthesis of 5-oxohexanoic acid starting with 1-methylcyclopentan-1-ol?

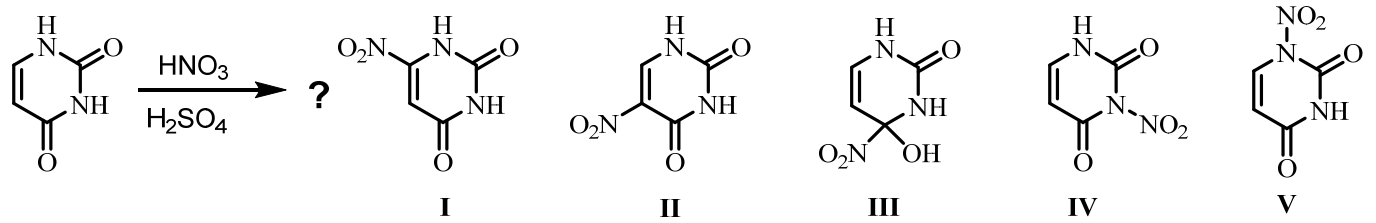
(A) 1. Conc. $KMnO_4$; 2. Dry gaseous HBr; 3. Mg/ether; 4. CO_2
(B) 1. H_2SO_4 and heat; 2. Conc. $KMnO_4$
(C) 1. Conc. $KMnO_4$; 2. CH_3MgBr/ ether; 3. H_3O^+
(D) 1. H_2SO_4 and heat; 2. O_3; 3. $(CH_3)_2S$; 4. PCC
(E) 1. H_2SO_4 and heat; 2. Conc. $KMnO_4$; 3. $LiAlH_4$; 4. H_3O^+

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

(I) benzylamine **(II)** isopropylamine **(III)** aniline **(IV)** triethylamine

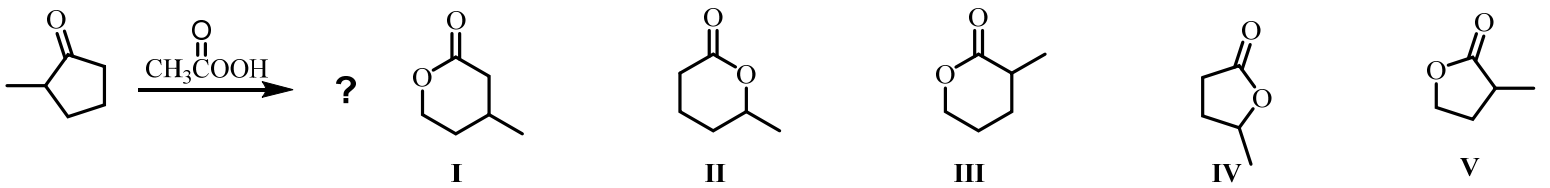
(A) I (B) III & IV (C) I & IV (D) II & III (E) I, III & IV

39. What is the **major** product of the following reaction?



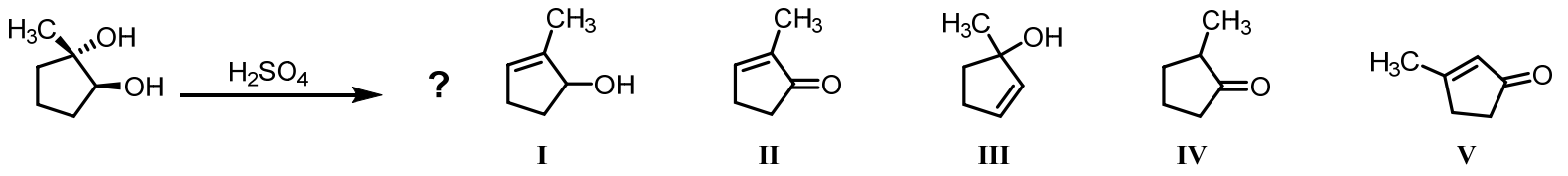
(A) I (B) II (C) III (D) IV (E) V

40. Predict the **major** product of the following reaction sequence.



(A) I (B) II (C) III (D) IV (E) V

41. Predict the **major** product of the following dehydration reaction.



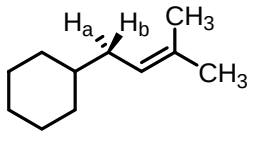
(A) I (B) II (C) III (D) IV (E) V

42. Which of the following oxidants will convert a primary alcohol to an aldehyde?

(**I**) sodium dichromate /sulfuric acid
(**II**) copper oxide
(**III**) pyridinium chlorochromate
(**IV**) dimethylsulfoxide, oxalyl chloride

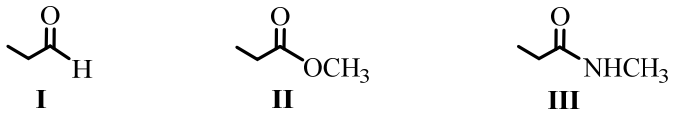
(A) III & IV (B) II, III & IV (C) III (D) I, II, III & IV (E) None of the above

43. Protons H_a and H_b in the following compound are?



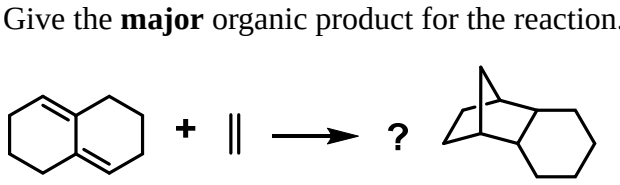
(A) homotopic (B) enantiotopic (C) diastereotopic
(D) mesotopic (E) None of the above

44. Which of the following compounds will **not** display a carbonyl carbon signal in the DEPT-90 and DEPT-135 ^{13}C NMR spectroscopy?

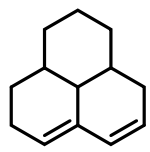


(A) only I (B) only II (C) only III (D) I and II (E) II and III

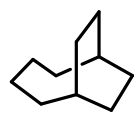
45. Give the **major** organic product for the reaction.



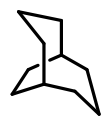
I



II



III



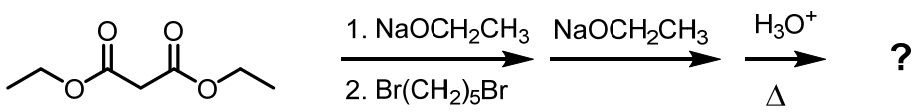
IV

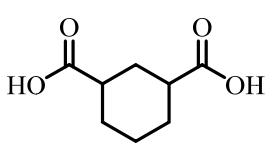
no reaction

V

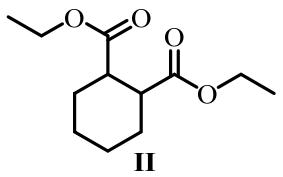
(A) I (B) II (C) III (D) IV (E) V

46. Predict the **major** product for the following reaction sequence.

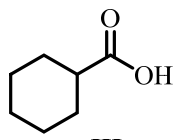




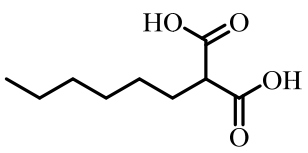
I



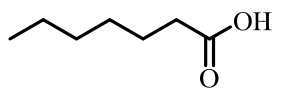
II



III



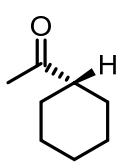
IV



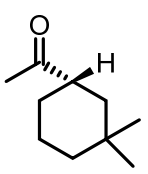
V

(A) I (B) II (C) III (D) IV (E) V

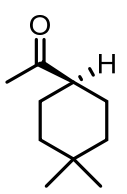
47. Please choose the compound(s) that would undergo racemization in presence of a base?



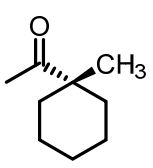
I



II



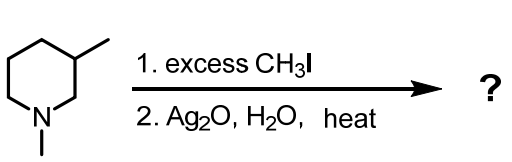
III

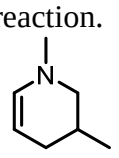


IV

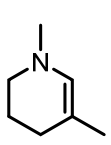
(A) I (B) II (C) III (D) IV (E) II & III

48. Predict the **major** product for the following reaction.

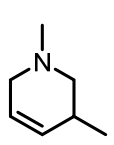




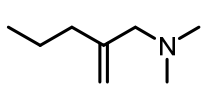
I



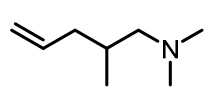
II



III



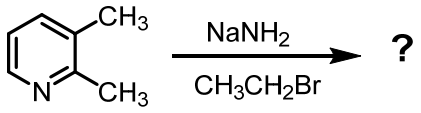
IV



V

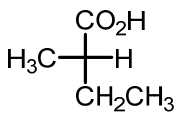
(A) I (B) II (C) III (D) IV (E) V

49. What is the **major** organic product of the following reaction?

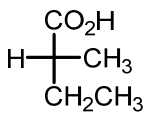


(A) 4-ethyl-2,3-dimethylpyridine (B) 5-ethyl-2,3-dimethylpyridine (C) 6-ethyl-2,3-dimethylpyridine
(D) 2-methyl-3-propylpyridine (E) 3-methyl-2-propylpyridine

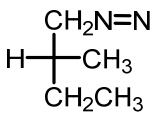
50. Draw a Fischer projection of the product when (*R*)-2-bromobutane is treated with the following sequence of reagents:
1. CN^-, 2. H_3O^+ and 3. CH_2N_2.



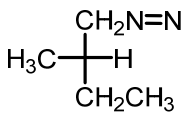
I



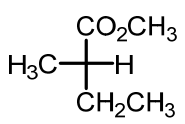
II



III



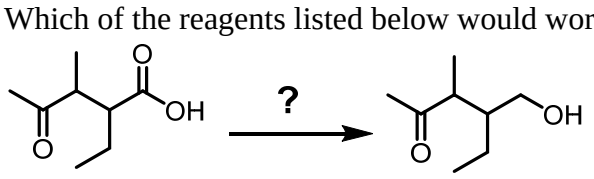
IV



V

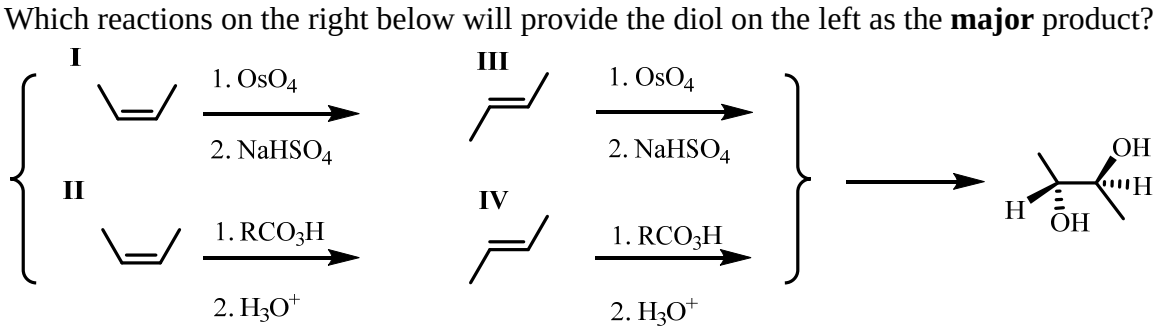
(A) I (B) II (C) III (D) IV (E) V

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



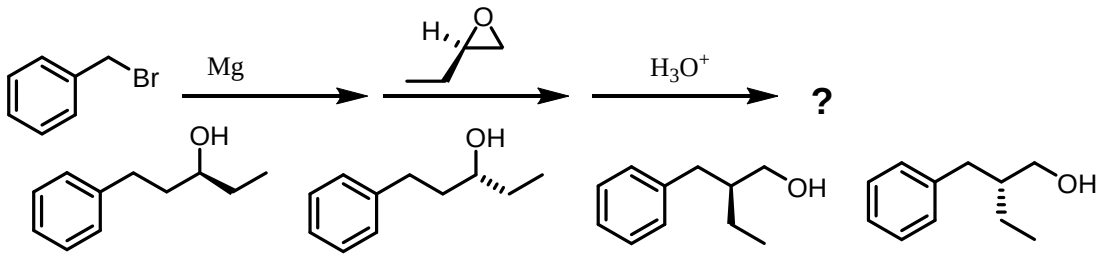
(A) $NaBH_4$ (B) $LiAlH_4$ (C) BH_3 -THF
(D) $LiAl[(OC(CH_3)_3]_3H$ (E) None of the above

52. Which reactions on the right below will provide the diol on the left as the **major** product?



(A) I (B) III (C) IV (D) I and IV (E) II and III

53. Provide a structure for the expected product of the following reaction.



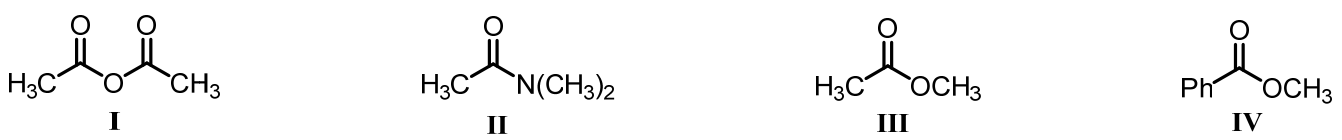
I **II** **III** **IV**

(A) I (B) II (C) III (D) IV (E) None of the above

54. The ^{1}H NMR spectrum of a compound with formula $C_7H_{14}O$ shows two signals. Which one of the followings is a possible structure for this compound?

(A) 2-heptanone (B) 2-methyl-3-heptanone (C) 3-methyl-2-heptanone
(D) 2,2-dimethyl-3-pentanone (E) 2,4-dimethyl-3-pentanone

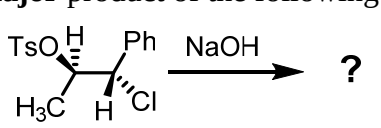
55. What is the order of decreasing reactivity towards nucleophilic acyl substitution for the carboxylic acid derivatives below

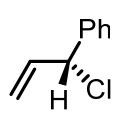


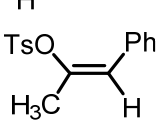
I **II** **III** **IV**

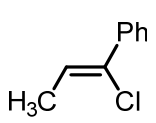
(A) I> II> III> IV (B) I> III> IV> II (C) II> IV> III> I
(D) II> I> III> IV (E) III> IV> I> II

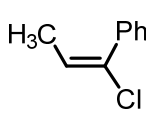
56. Which will be the **major** product of the following E2 reaction?

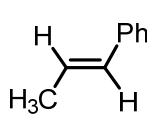


(A) 

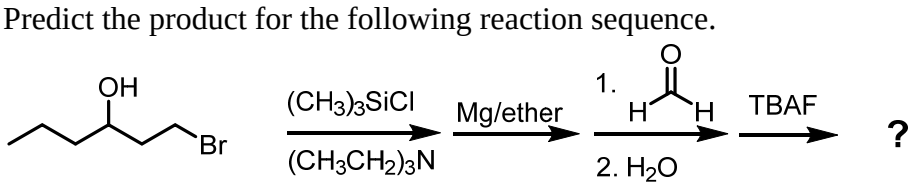
(B) 

(C) 

(D) 

(E) 

57. Predict the product for the following reaction sequence.

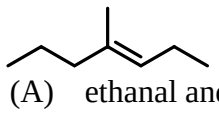


(A) 2,4-heptanediol (B) 1,4-heptanediol (C) 2,5-octanediol
(D) 1,4-octanediol (E) 1,5-octanediol

58. Which of the following compounds will display a singlet, a triplet and a quartet in the ^{1}H NMR spectrum?

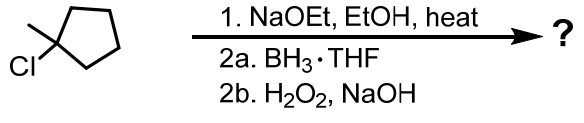
(A) 2-chloro-4-methylpentane (B) 3-chloro-2-methylpentane (C) 3-chloropentane
(D) 1-chloro-2,2-dimethylbutane (E) 3-chloro-3-methylpentane

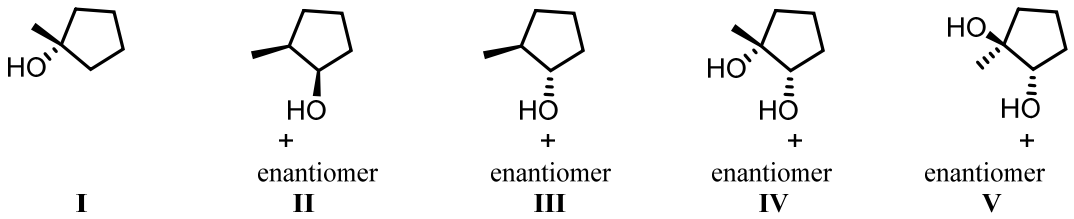
59. Provide the reactants necessary to prepare the following alkene using the Wittig reaction.



(A) ethanal and 2-bromopentane (B) propanal and 2-bromopentane (C) 2-pentanone and 1-bromopropane
(D) 2-pentanone and 2-bromopropane (E) butanal and 2-bromopentane

60. What is the expected **major** product of the following reaction sequence?



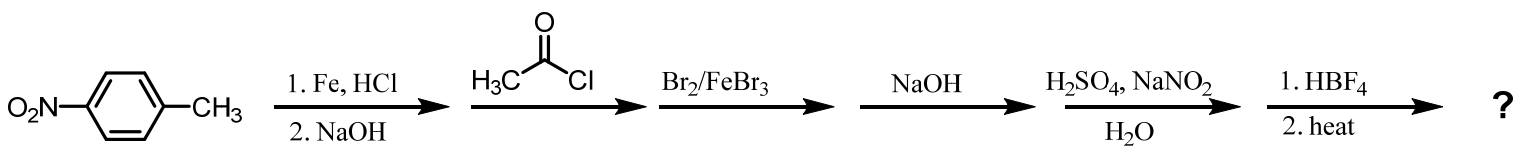


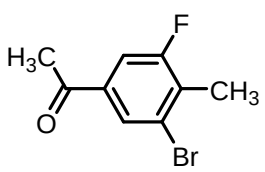
I **II** **III** **IV** **V**

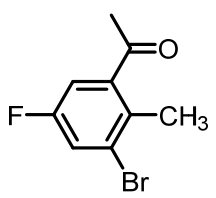
(A) I (B) II (C) III (D) IV (E) V

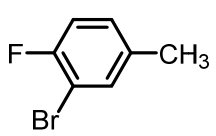
【單選題】每題 2 分，共計 40 分，答錯 1 題倒扣 0.5 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

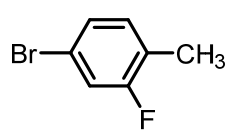
61. Predict the **major** product of the following reaction sequence.

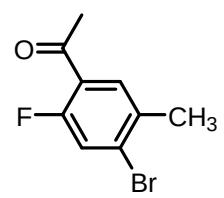


(A) 

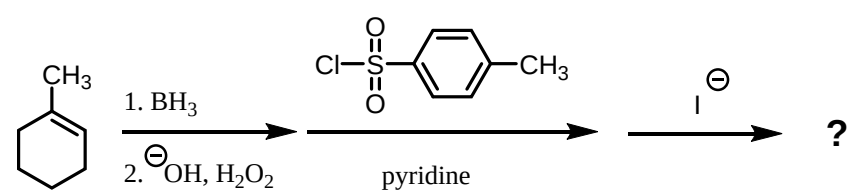
(B) 

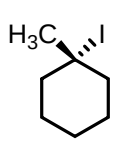
(C) 

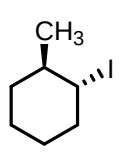
(D) 

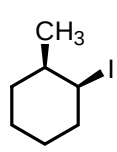
(E) 

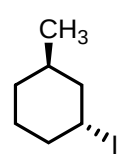
62. Choose the **major** product of the following reaction sequence.

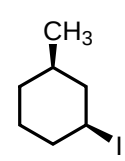


(A) 

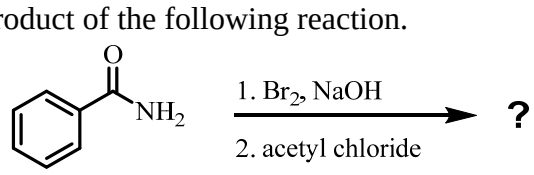
(B) 

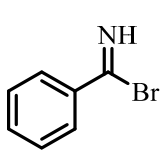
(C) 

(D) 

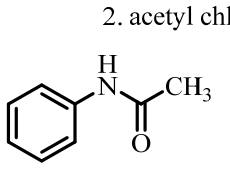
(E) 

63. Predict the product of the following reaction.

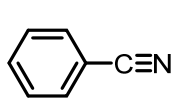




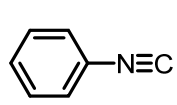
I



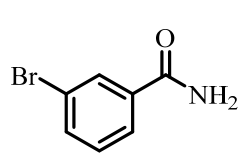
II



III



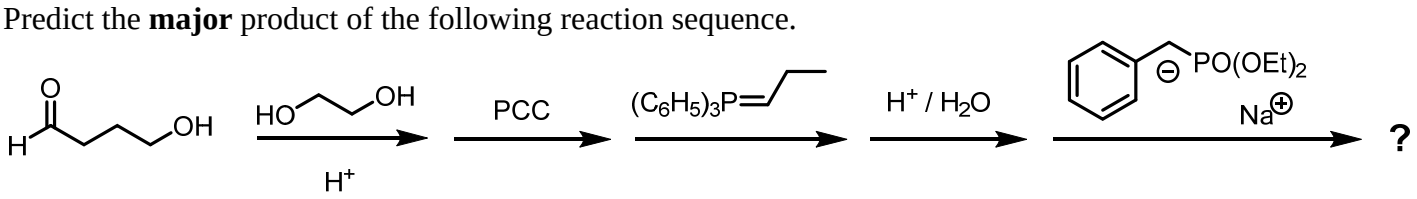
IV

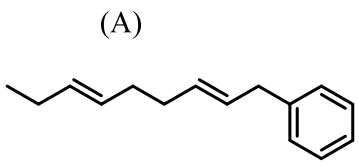
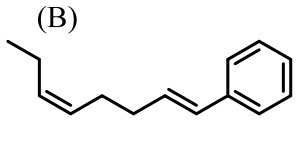
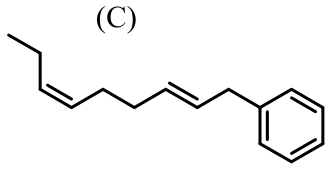
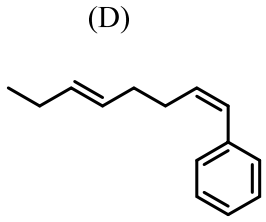
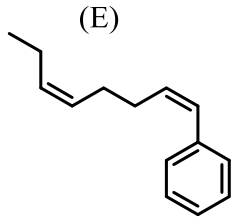


V

(A) I (B) II (C) III (D) IV (E) V

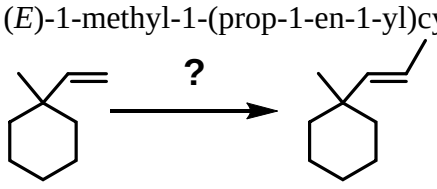
64. Predict the **major** product of the following reaction sequence.



(A) 
(B) 
(C) 
(D) 
(E) 

65. What is the relative reactivity of 2° vs 1° hydrogens in the free radical bromination of *n*-butane if the ratio of 1-bromobutane to 2-bromobutane formed is 7:93?
(A) The 2° hydrogens are 20 times more reactive than the 1° ones.
(B) The 2° hydrogens are 40 times more reactive than the 1° ones.
(C) The 2° hydrogens are 60 times more reactive than the 1° ones.
(D) The 2° hydrogens are 80 times more reactive than the 1° ones.
(E) The 2° hydrogens are 100 times more reactive than the 1° ones.

66. Which sequence of reagents works **best** to convert 1-methyl-1-vinylcyclohexane to (*E*)-1-methyl-1-(prop-1-en-1-yl)cyclohexane?

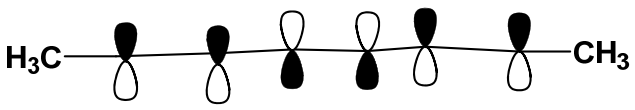


(A) 1. $NaOCH_3$, CH_3OH 2. $NaNH_2$ 3. Br_2 4. H_2 (excess), Pd/C
(B) 1. Br_2 2. $NaNH_2$ 3. $NaNH_2$, then CH_3Br 4. Na, NH_3
(C) 1. BH_3*THF 2. Br_2 3. NaCN 4. Na, NH_3
(D) 1. NaCN 2. HO^-, H_2O_2 3. $NaNH_2$, then CH_3Br 4. Na, NH_3
(E) 1. BH_3*THF 2. Br_2 3. $NaNH_2$, then CH_3Br 4. H_2 (excess), Pd/C

67. How many of these reagents cause **only** *syn* additions to alkenes?
HBr H_2, Pd BH_3 H_2O_2 CH_3CO_3H Br_2 $Hg(OAc)_2$

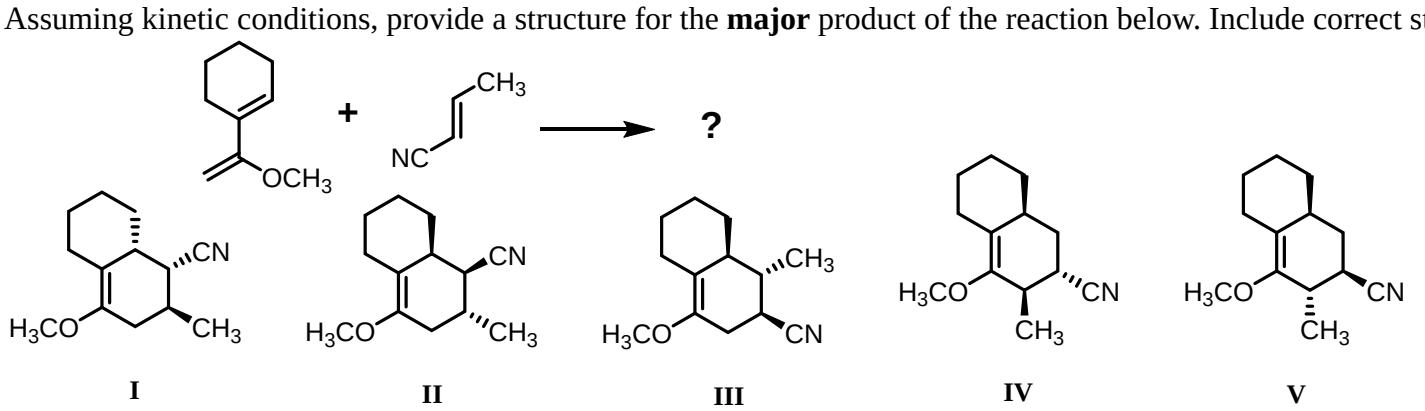
(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

68. The HOMO of (2E,4Z,6E)-octatriene undergo thermal cyclization using which process and which product? (HOMO orbital of pi-electrons of octatriene is given below, not showing the stereochemistry)



(A) disrotatory and cis-product
(B) conrotatory and cis-product
(C) disrotatory and trans-product
(D) conrotatory and trans-product
(E) both disrotatory and conrotatory to give trans and cis product respectively

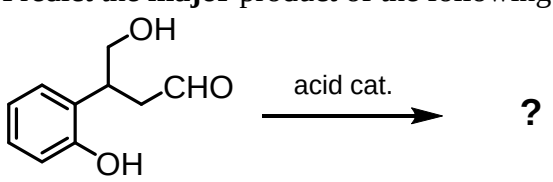
69. Assuming kinetic conditions, provide a structure for the **major** product of the reaction below. Include correct stereochemistry.

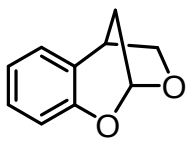


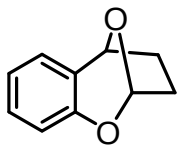
I **II** **III** **IV** **V**

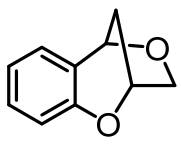
(A) I (B) II (C) III (D) IV (E) V

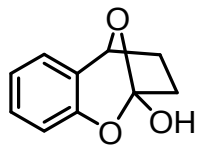
70. Predict the **major** product of the following reaction.

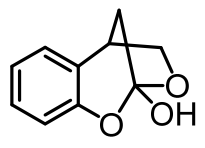


(A) 

(B) 

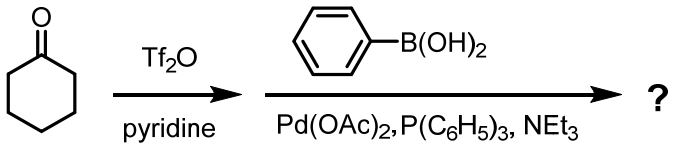
(C) 

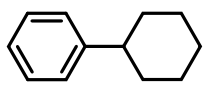
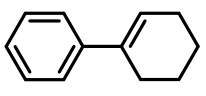
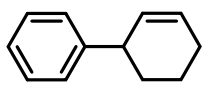
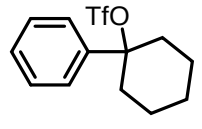
(D) 

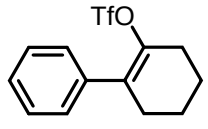
(E) 

71. Identify the monomer(s) which are used to prepare the following segment of polymer:
- $CH_2CH=CHCH_2CH(C_6H_5)CH_2CH_2CH=CHCH_2CH(C_6H_5)CH_2$-
(A) $CH_2=CH_2$ and $CH_2=CHC_6H_5$
(B) $CH_2=CHCH=CH_2$ and $CH_2=CHC_6H_5$
(C) $CH_2=C(C_6H_5)CH=CH_2$
(D) $C_6H_5CH=CHCH=CH_2$
(E) $CH_2=C=CH_2$ and $CH_2=CHC_6H_5$

72. What is the **major** product for the following reaction

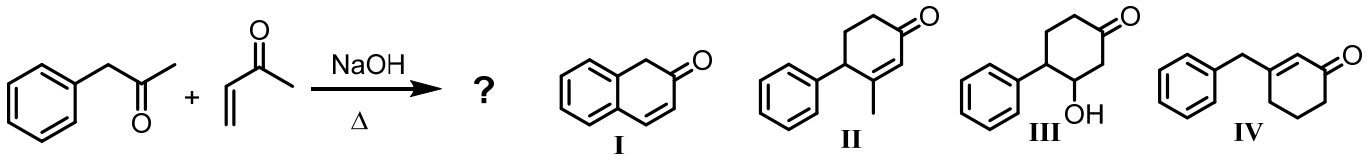


(A)  (B)  (C)  (D) 

(E) 

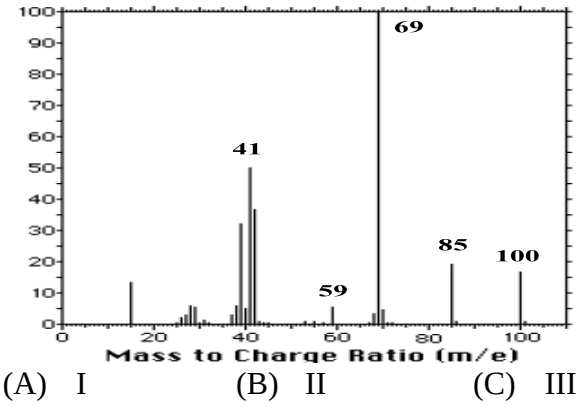
73. Which is the **best** procedure for the preparation of 2,4-dinitrobenzoic acid from benzene?
(A) 1. HNO_3/H_2SO_4 2. $CH_3Br/AlCl_3$ 3. HNO_3/H_2SO_4 4. $KMnO_4/H^+$
(B) 1. $CH_3Br/AlCl_3$ 2. HNO_3/H_2SO_4 3. $KMnO_4/H^+$ 4. HNO_3/H_2SO_4
(C) 1. $CH_3Br/AlCl_3$ 2. $KMnO_4/H^+$ 3. HNO_3/H_2SO_4 (excess)
(D) 1. HNO_3/H_2SO_4 2. $CH_3Br/AlCl_3$ 3. $KMnO_4/H^+$ 4. HNO_3/H_2SO_4
(E) 1. $CH_3Br/AlCl_3$ 2. HNO_3/H_2SO_4 (excess) 3. $KMnO_4/H^+$

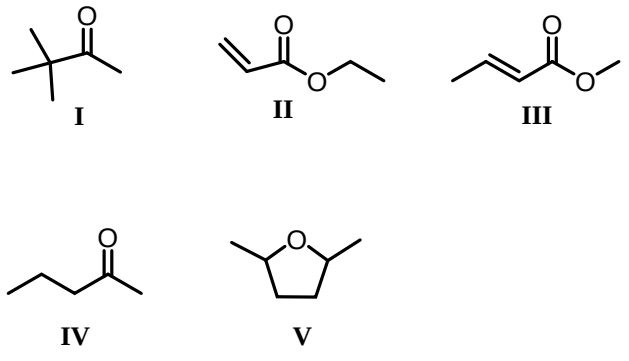
74. Predict the **major** product for the following reaction.



(A) I (B) II (C) III (D) IV (E) II & IV

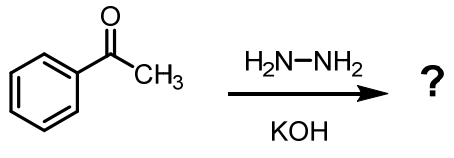
75. Which of the following molecules below **best** fits the fragmentation pattern of the mass spectrum below.

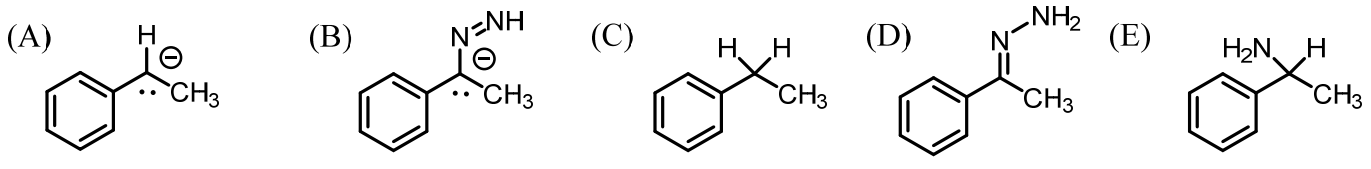




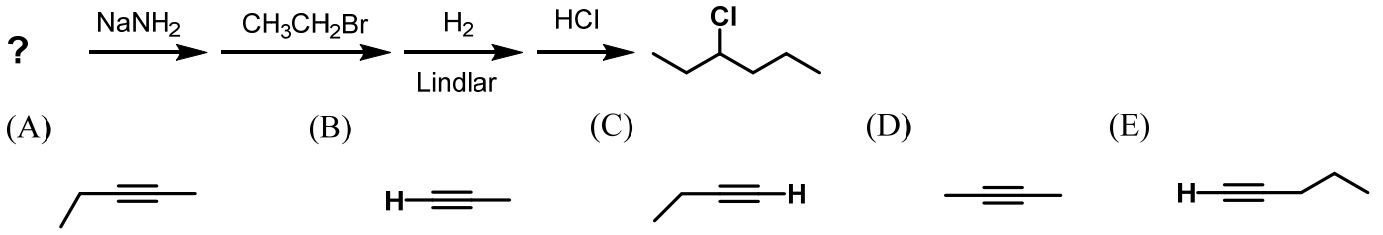
(A) I (B) II (C) III (D) IV (E) V

76. Choose the structure that is **NOT** an intermediate or product in the Wolff-Kischner reduction of acetophenone.

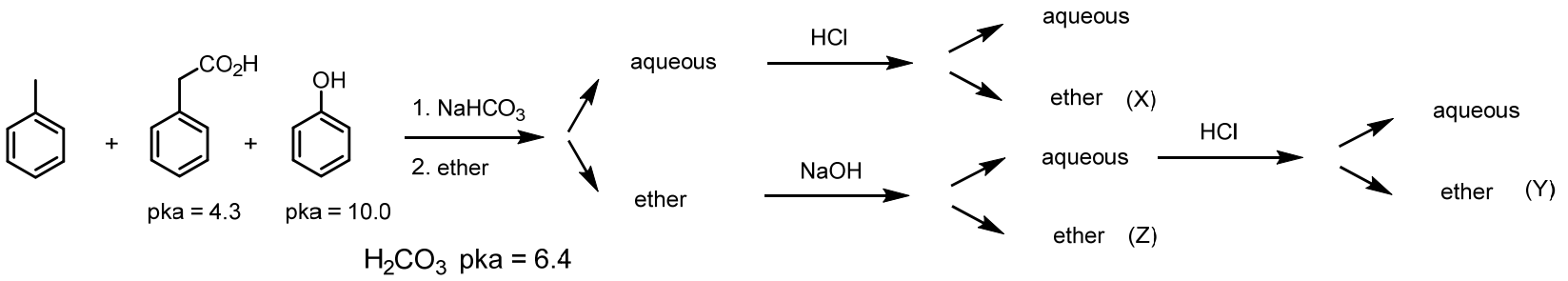




77. Choose the **best** alkyne reactant to complete the following reaction sequence.

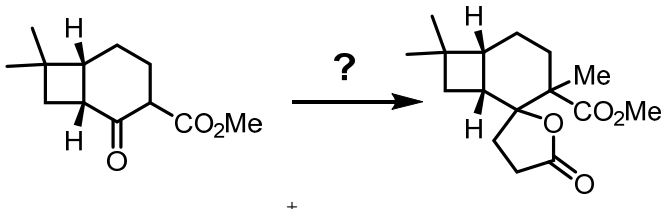


78. Extraction of a mixture of toluene, phenol and phenylacetic acid under various conditions can be used to separate them. What are the correct compound X, Y and Z from the separation scheme.



(A) (X)-toluene; (Y)-phenylacetic acid; (Z)-phenol
(B) (X)-toluene; (Y)-phenol; (Z)-phenylacetic acid
(C) (X)-phenylacetic acid; (Y)-toluene; (Z)-phenol
(D) (X)-phenol; (Y)-toluene; (Z)-phenylacetic acid
(E) (X)-phenylacetic acid; (Y)-phenol; (Z)-toluene

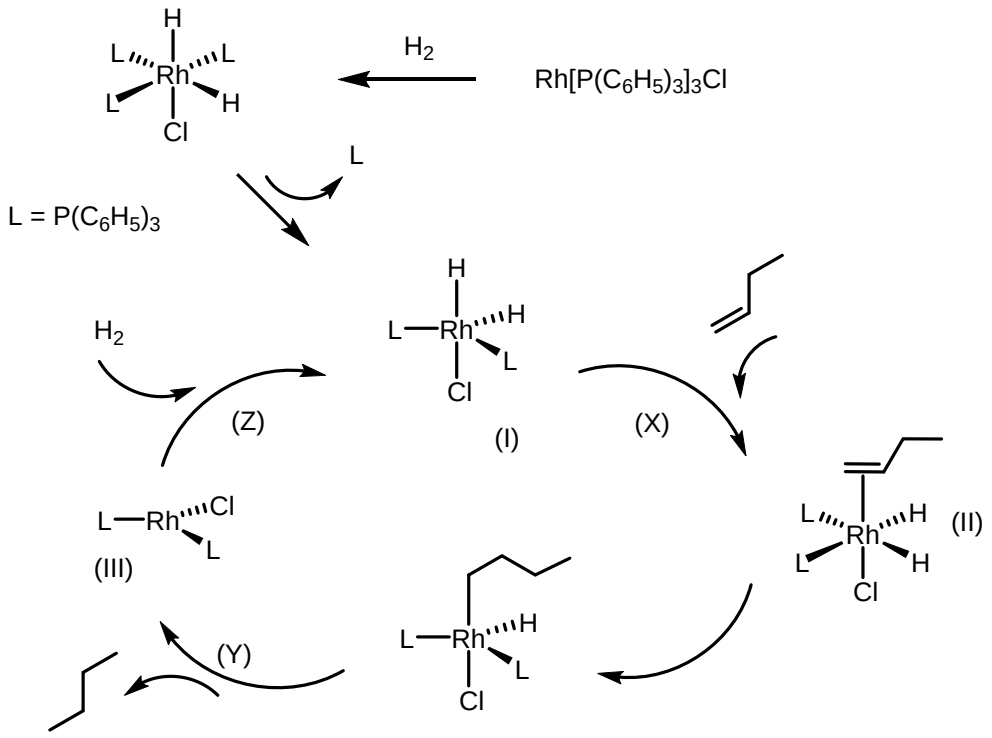
79. Which of the following series of synthetic steps could be used to carry out the transformation shown below?



(**I**) H_2, Pd/C; (**II**) H_3O^+, H_2O; (**III**) $LiC{\equiv}CCH(OMe)_2$; (**IV**) NaH, MeI; (**V**) CrO_3

(A) IV → II → I → III → V (B) V → IV → III → II →I (C) IV → III → I → II → V
(D) III → II → VI → V → I (E) None of the above

80. The scheme describes the catalytic hydrogenation pathway of 1-butene to butane. Which of the following statements below correctly shows the steps?



(A) (X)-oxidative addition, (Y)-reductive elimination, (Z)- ligand association
(B) (X)-ligand association, (Y)-reductive elimination, (Z)-oxidative addition
(C) (X)-reductive elimination, (Y)- oxidative addition, (Z)-ligand association
(D) (X)-reductive elimination, (Y)-ligand association, (Z)-oxidative addition
(E) (X)- ligand association, (Y)- oxidative addition, (Z)-reductive elimination