

高雄醫學大學 104 學年度學士後醫學系招生考試試題

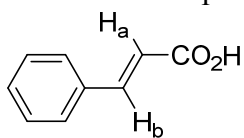
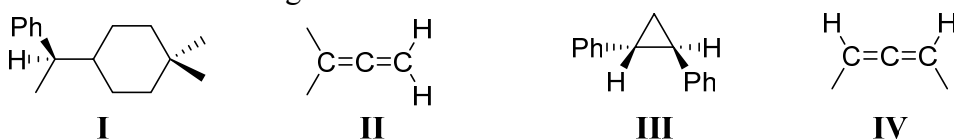

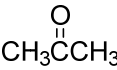
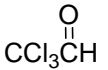
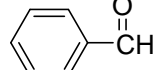
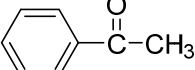
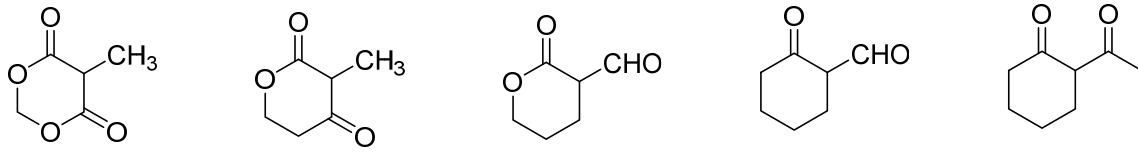
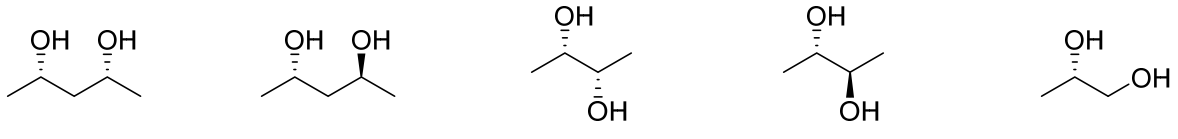
科目:有機化學

考試時間: 80 分鐘

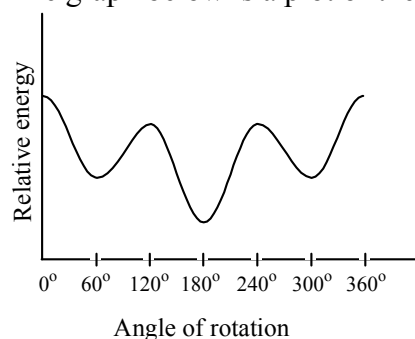
說明:一、選擇題用 2B 鉛筆在「答案卡」上作答,修正時應以橡皮擦擦拭,不得使用修正液(帶),未遵照正確作答方法而致電腦無法判讀者,考生自行負責。
二、試題及答案卡必須繳回,不得攜出試場。

Choose one best answer for the following questions

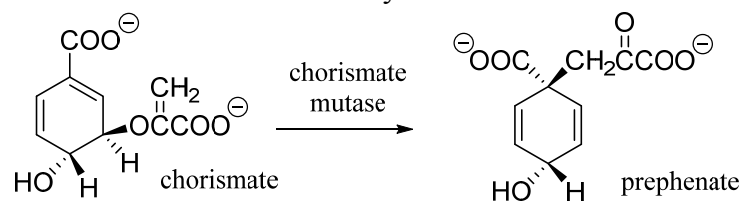
【單選題】每題 1 分,共計 60 分,答錯 1 題倒扣 0.25 分,倒扣至本大題零分為止,未作答,不給分亦不扣分。

- Which of the following reagent(s) could be used to oxidize primary alcohol to aldehyde?
I. Pyridium chlorochromate (PCC) II. 1. (COCl)₂, DMSO; 2. Et₃N III. Dess-Martin periodinane
(A) I (B) II (C) III (D) I and II (E) All of the above
- What is the coupling constant (*J* value) between H_a and H_b in the following compound?

(A) 0~5 Hz (B) 6~12 Hz (C) 11~18 Hz (D) 20~25 Hz (E) None of the above
- Which of the following structures is chiral?

(A) I and III (B) II and IV (C) I, III and IV (D) I and IV (E) III and IV
- Which of the following carbonyl compounds has the **largest** equilibrium constant for the addition of water?
(A)  (B)  (C)  (D)  (E) 
- The Hell-Volhard-Zelinsky reaction involves:
(A) the α-bromination of carboxylic acids (B) the α-bromination of ketones
(C) the bromination of alcohols (D) the oxidation of aldehydes to acids
(E) None of the above
- Which compound has the **lowest** pK_a?

(A) I (B) II (C) III (D) IV (E) V
- What is the **major** product, when 0.10 mol of ICH₂CH₂CH₂CH₂Cl reacts with 0.10 mol of NaOCH₃ in CH₃OH at 40 °C ?
(A) CH₃OCH₂CH₂CH₂CH₂Cl (B) CH₃OCH₂CH₂CH₂CH₂I (C) CH₃OCH₂CH₂CH₂CH₂OCH₃
(D) CH₂=CHCH₂CH₂Cl (E) CH₂=CHCH₂CH₂I
- Which of the following is a **meso** compound?

(A) I and III (B) II and IV (C) I and IV (D) II and III (E) I, IV and V
- Which cycloalkane has the **lowest** heat of combustion per CH₂ group?
(A) Cyclopropane (B) Cyclobutane (C) Cyclopentane (D) Cyclohexane (E) Cycloheptane
- How many alkanes of formula C₇H₁₆ possess a quaternary carbon atom?
(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

11. The graph below is a plot of the relative energies of the various conformations, please predict the expected item?



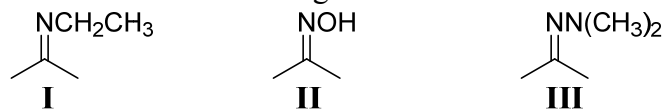
- (A) 2-Chloropropane (B) 1,3-Dichloropropane (C) 2-Methylpropane
 (D) Butane (C1-C2 rotation) (E) Butane (C2-C3 rotation)
12. Chorismate mutase is an enzyme that catalyzes a pericyclic reaction that forms prephenate. What kind of a pericyclic reaction does chorismate mutase catalyze?



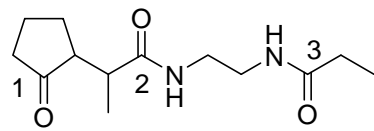
- (A) an ene reaction (B) an electrocyclic reaction (C) a sigmatropic rearrangement
 (D) a cycloaddition reaction (E) None of the above
13. The C₇ compound which gives 3 signals in the broadband proton-decoupled ¹³C spectrum could be:

- (A) Heptane (B) 2-Methylhexane (C) 3,3-Dimethylpentane
 (D) 2,4-Dimethylpentane (E) 2,2,3-Trimethylbutane
14. Select the structure of a compound C₆H₁₄ with a base peak at *m/z* 43.

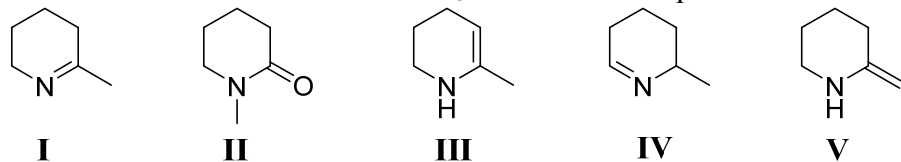
- (A) CH₃CH₂CH₂CH₂CH₂CH₃ (B) (CH₃CH₂)₂CHCH₃ (C) (CH₃)₃CCH₂CH₃
 (D) (CH₃)₂CHCH(CH₃)₂ (E) None of the above
15. What is the **correct** assignment of the names of the functional groups in the following nitrogen-containing compounds?



- (A) I = amide II = amine III = oxime (B) I = imine II = oxime III = hydrazone
 (C) I = amine II = oxime III = hydrazine (D) I = imine II = hydrazone III = amine
 (E) I = hydrazine II = hydrazone III = oxime
16. Which sequence ranks the following carbonyl compounds in order of **increasing** rate of nucleophilic addition?



- (A) 2 < 3 < 1 (B) 3 < 2 < 1 (C) 2 < 1 < 3 (D) 1 < 3 < 2 (E) 1 < 2 < 3
17. When H₂NCH₂CH₂CH₂CH₂COCH₃ is heated in the process of an acid catalyst, a reaction occurs. The **major** product is:



- (A) I (B) II (C) III (D) IV (E) V
18. *p*-Methoxybenzaldehyde can be prepared from anisole using the Gatterman-Koch formylation. What mixture of reagents is necessary for this process?

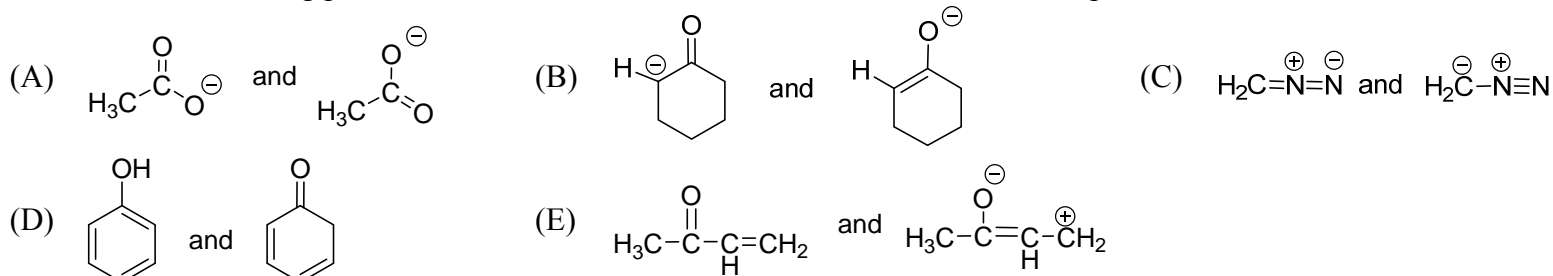
- (A) CO, HCl, AlCl₃, CuCl (B) CO, SO₃, H₂SO₄ (C) CO₂, HCl, AlCl₃
 (D) CO₂, SO₃, H₂SO₄ (E) CO₂, HNO₃, H₂SO₄
19. Which of the following carbonyl compounds may be made from 1,3-dithiane?

I. Methyl vinyl ketone II. 2-Pentanone III. 3,3-Dimethyl-2-butanone IV. 2-Phenylethanal

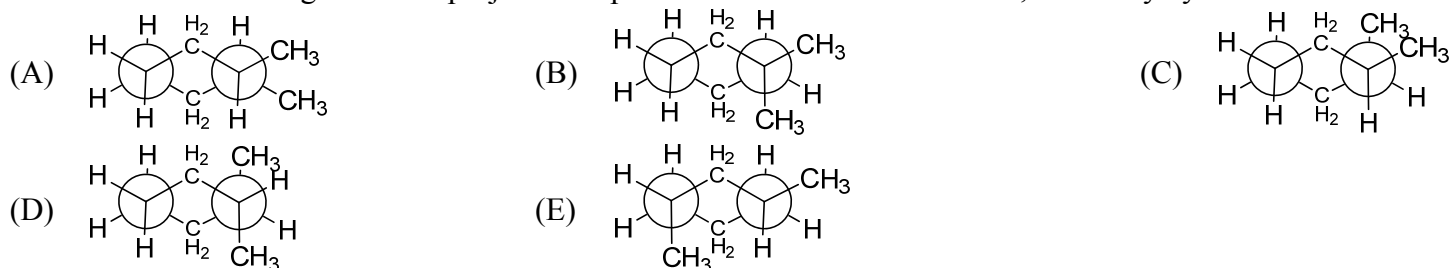
- (A) I and IV (B) II only (C) II and III (D) II and IV (E) III and IV
20. Predict the compound from the spectral data given. C₉H₁₀O₂: ¹³C NMR, δ 18.06 (quartet), 45.40 (doublet), 127.32 (doublet), 127.55 (doublet), 128.61 (doublet), 139.70 (singlet), 180.98 (singlet); IR, broad 3500-2800, 1708 cm⁻¹

- (A) 3-Phenylpropanoic acid (B) 2-Phenylpropanoic acid (C) 2-(4-Methylphenyl)acetic acid
 (D) 2-(3-Methylphenyl)acetic acid (E) 2-(2-Methylphenyl)acetic acid

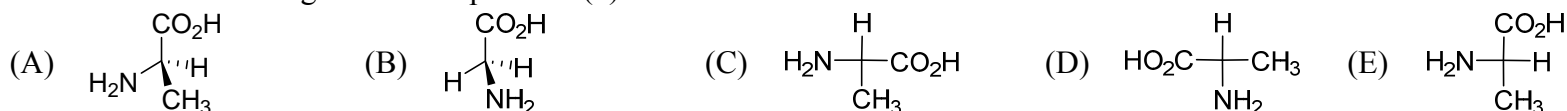
21. Which of the following pairs of structures are **not** resonance forms of the same compounds?



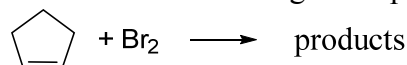
22. Which of the following Newman projection represents the **most** stable *trans*-1,2-dimethylcyclohexane?



23. Which of the following structure represents (*S*)-L-alanine?



24. Which of the following description(s) is(are) **true** for the following reaction?



I: the solution of the products is optically active

II: the products have stereocenters

III: the products are meso compounds

IV: the products are racemic mixture

V: the reaction is enantioselective

(A) V only

(B) I and II

(C) III and IV

(D) II and V

(E) II and IV

25. Disulfide linkages in proteins come from between:

(A) two methionine residues

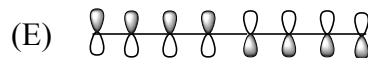
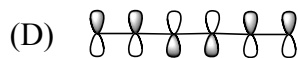
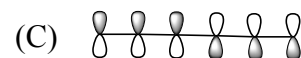
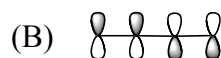
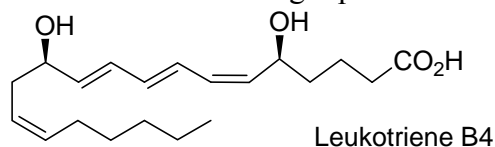
(B) two cysteine residues

(C) a cysteine residue and a methionine residue

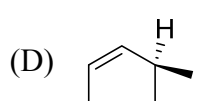
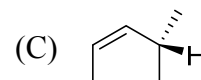
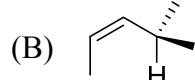
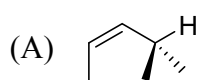
(D) a threonine residue and a cysteine residue

(E) a methionine residue and a threonine residue

26. Which of the following represents the HOMO for the conjugated system in Leukotriene B₄?

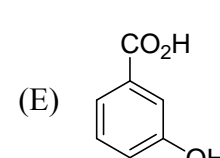
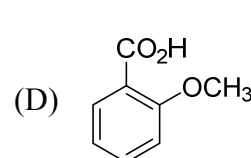
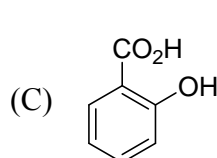
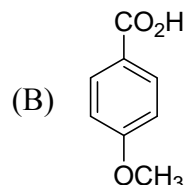
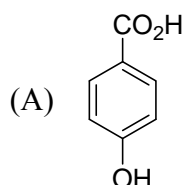


27. Which of the following is the **most** stable conformation for *cis*-4-methyl-2-pentene?

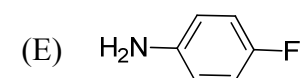
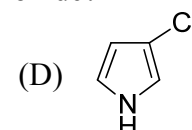
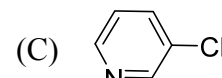
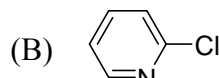
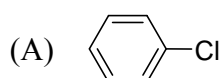


(E) All of the above

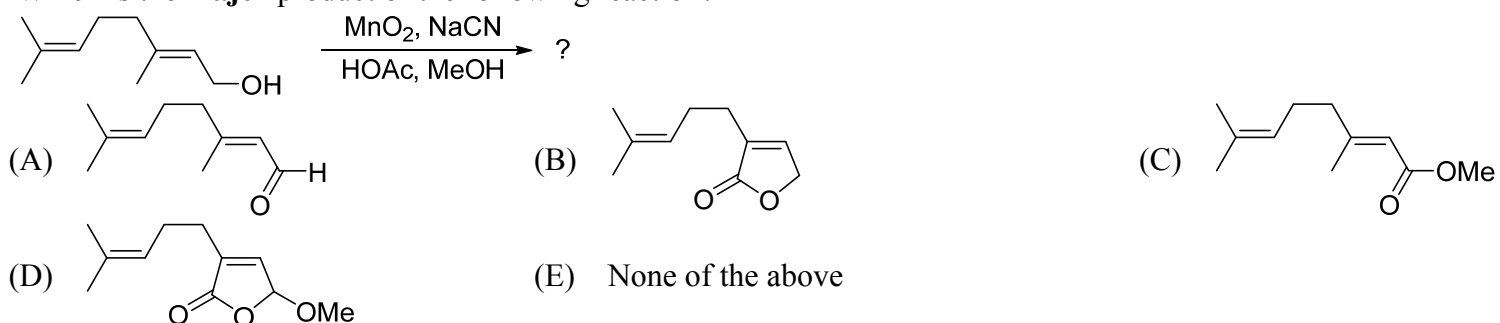
28. Which of the following acids has the **lowest** pK_a value?



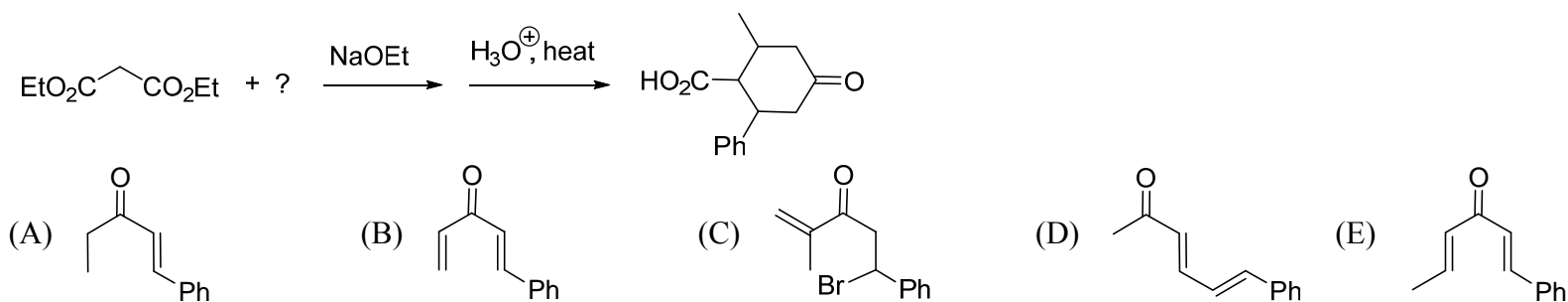
29. Which compound would undergo S_NAr reaction **most** rapidly with sodium methoxide?



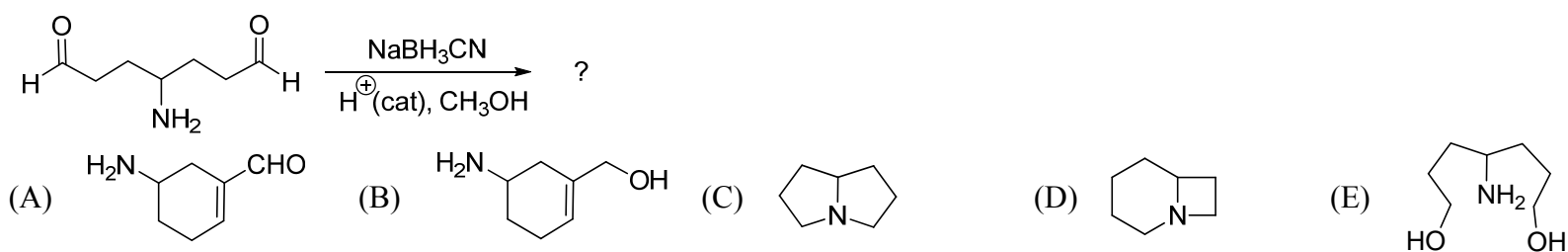
30. Which is the **major** product of the following reaction?



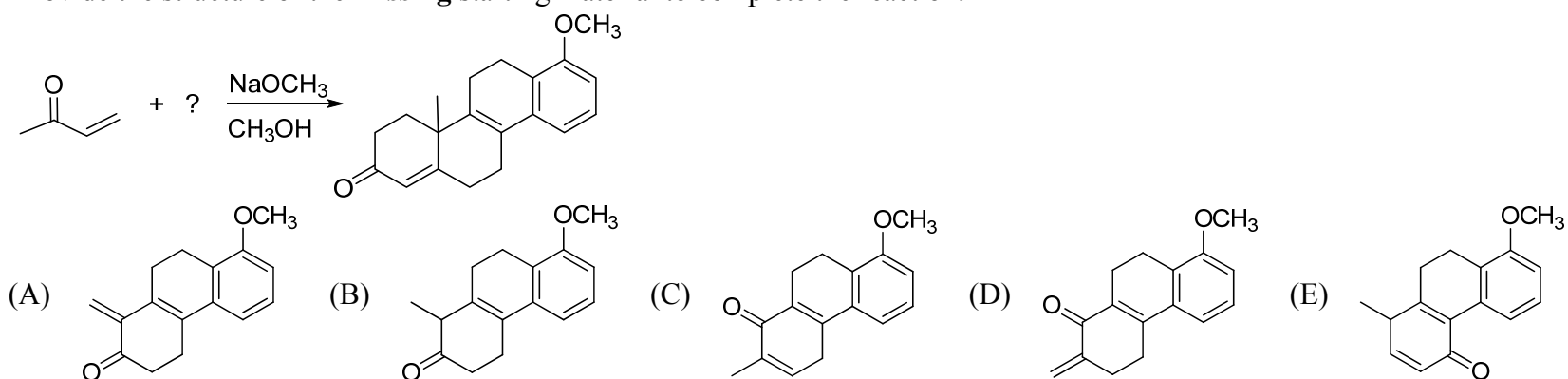
31. Provide the structure of the **missing** starting material to complete the reaction.



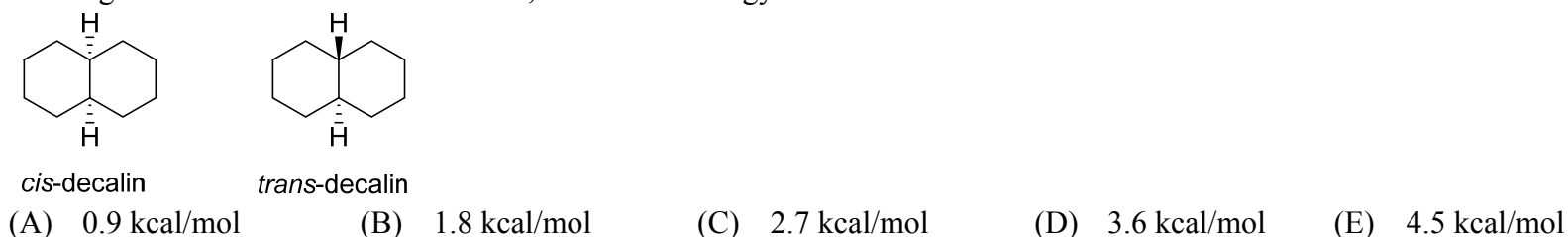
32. Which is the **major** product of the following reaction?



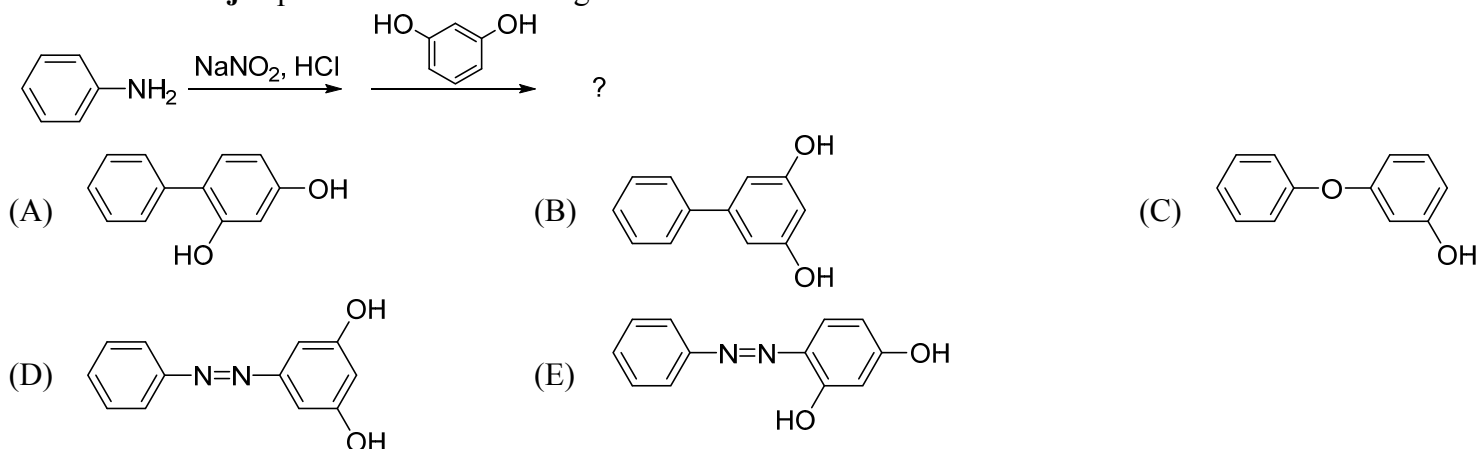
33. Provide the structure of the **missing** starting material to complete the reaction.



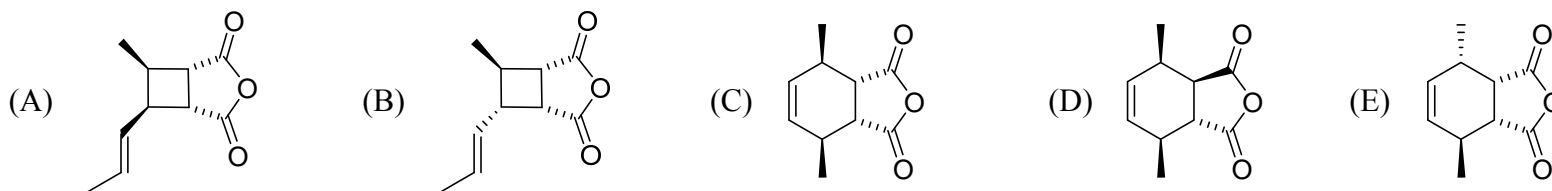
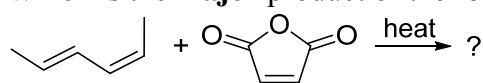
34. If one gauche interaction is 0.9 kcal/mol, what is the energy difference between *cis*-decalin and *trans*-decalin?



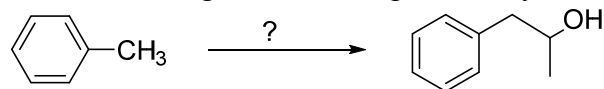
35. Which is the **major** product of the following reaction?



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

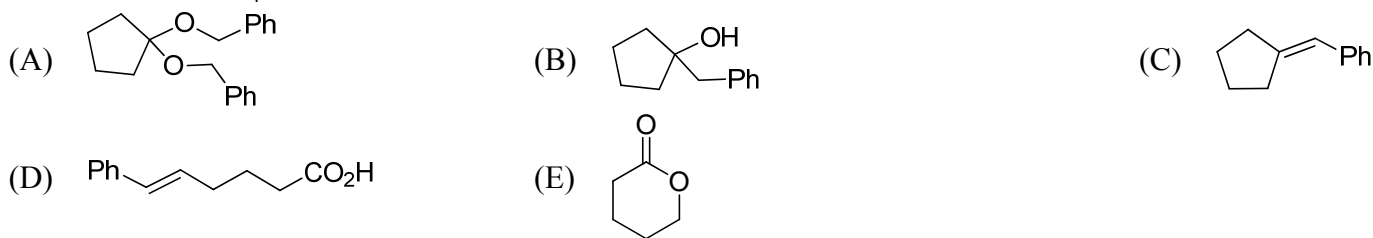
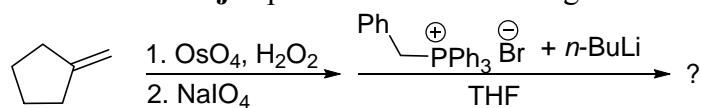


37. Provide the reagents to accomplish the synthesis shown below.

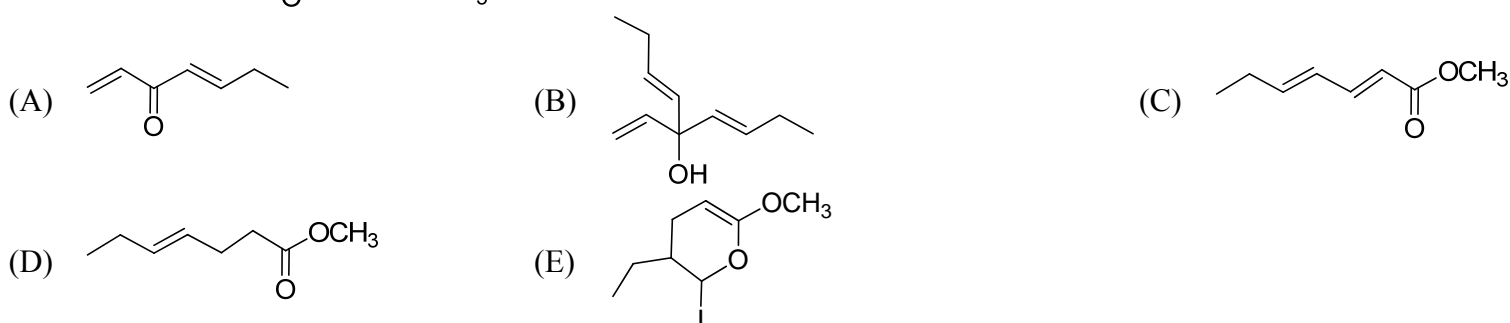
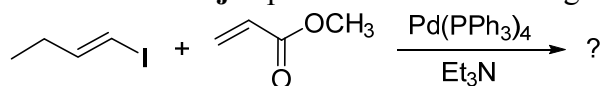


- (A) 1. Br₂, FeBr₃ 2. Mg, THF 3. ethylene oxide, then H₃O⁺
 (B) 1. KMnO₄, HO⁻ 2. EtMgBr, ether 3. H₃O⁺
 (C) 1. Br₂, FeBr₃ 2. Mg, THF 3. CO₂, then H₃O⁺
 (D) 1. Br₂, hν 2. NaCN 3. H₃O⁺, heat
 (E) 1. Br₂, hν 2. Mg, THF 3. CH₃CHO, then H₃O⁺

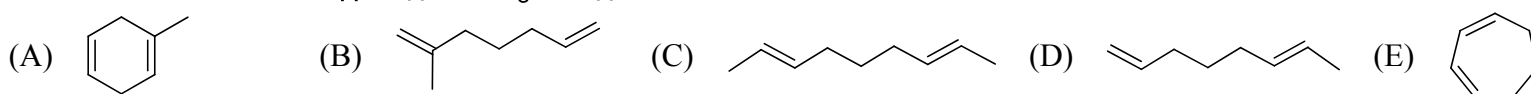
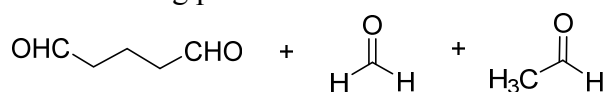
38. Which is the **major** product of the following reaction sequence?



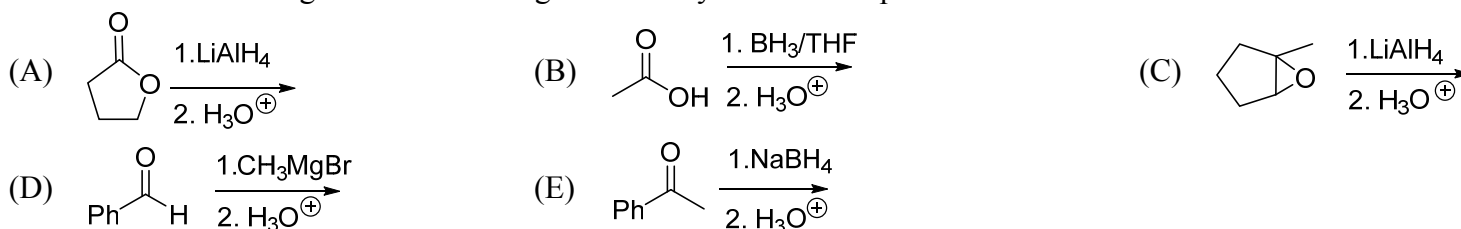
39. Which is the **major** product of the following reaction?



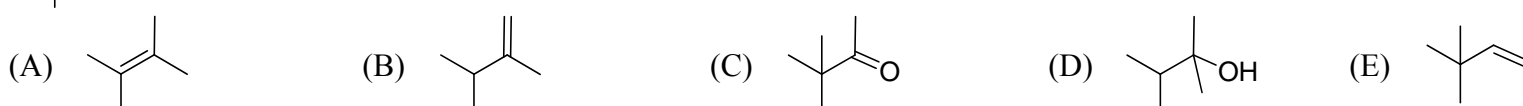
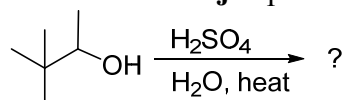
40. The following products were obtained from the oxidative cleavage of a diene. What is the structure of the diene?



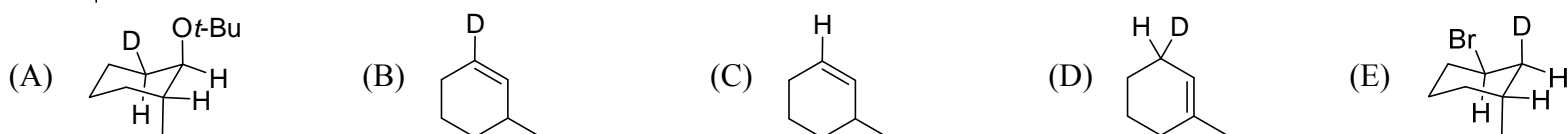
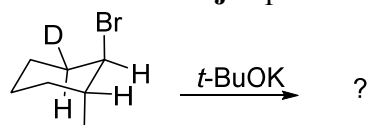
41. Which of the following reactions would give a tertiary alcohol as a product?



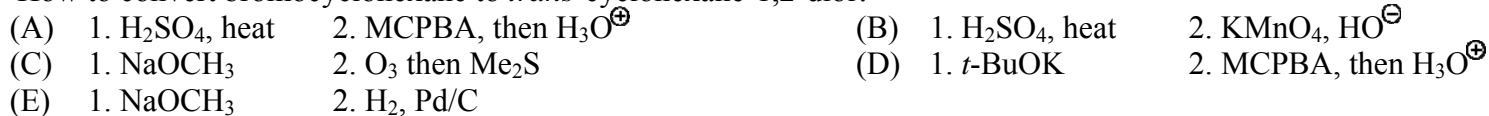
42. Which is the **major** product of the following reaction?



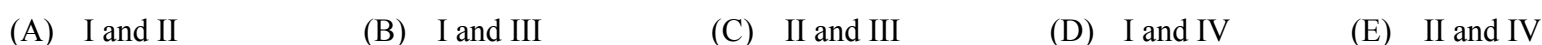
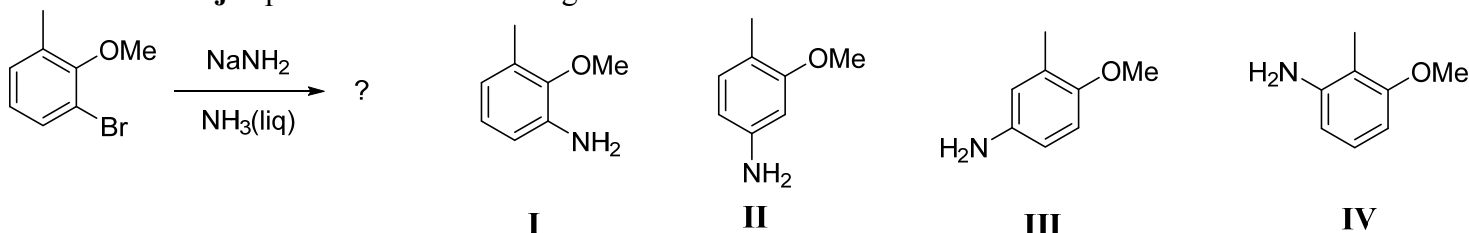
43. Which is the **major** product of the following reaction?



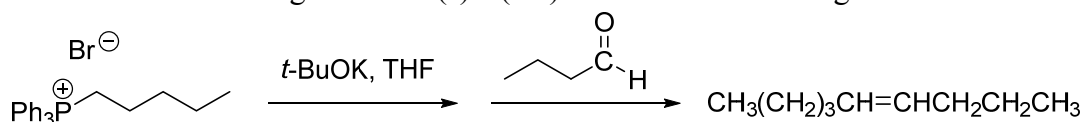
44. How to convert bromocyclohexane to *trans*-cyclohexane-1,2-diol?



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

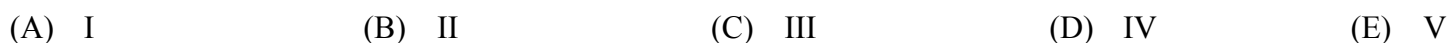
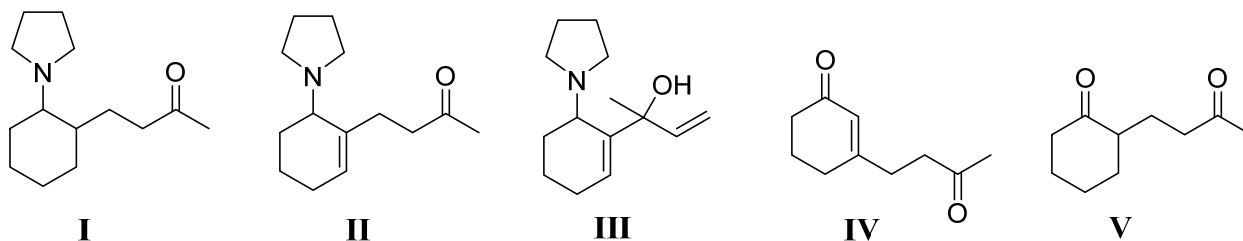
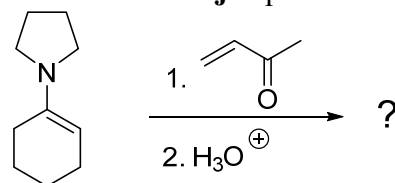


46. Which of the following statement(s) is(are) **true** for the following reaction?

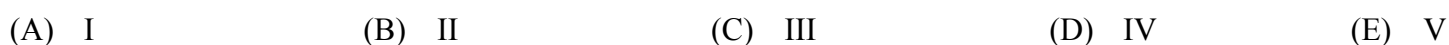
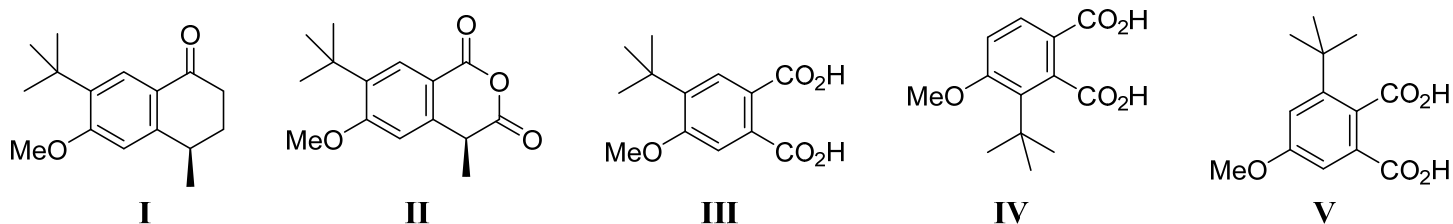
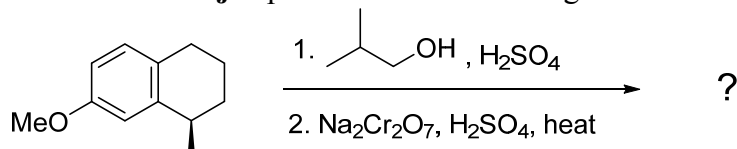


- I. This reaction shows high (*Z*)-alkene selectivity.
 II. When *n*-BuLi and Et₂O were used as the base and solvent, the selectivity decreases.
 III. This reaction is under kinetic-controlled.
- (A) I (B) II (C) III (D) I and III (E) All of the above

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



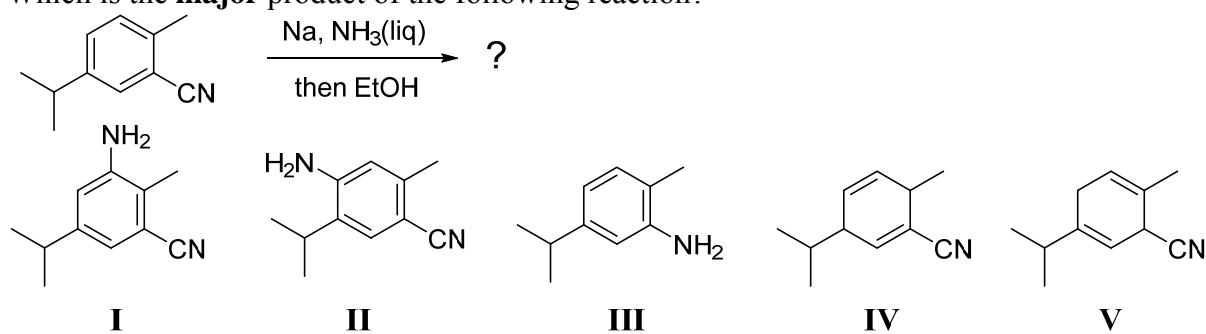
48. Which is the **major** product of the following reaction?



49. Which of the following synthetic procedures would be employed most effectively to transform ethanol into ethyl propyl ether?

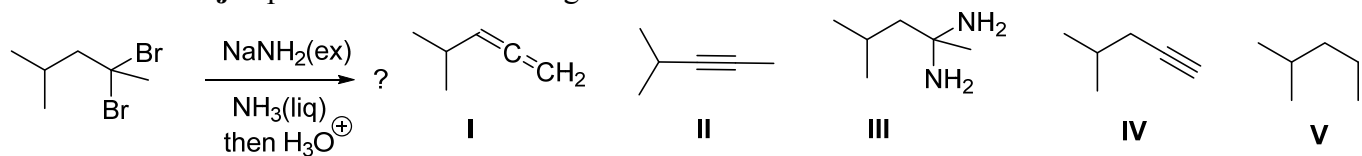
- (A) 1. Ethanol, HBr 2. Mg, ether, then H₃O⁺ 3. NaH, then CH₃CH₂Br
 (B) 1. Ethanol, HBr 2. Mg, ether, then HCHO, then H₃O⁺ 3. NaH, then CH₃CH₂Br
 (C) 1. Ethanol 2. CH₃CH₂CH₂OH 3. H₂SO₄, 140 °C
 (D) 1. Ethanol, NaH 2. HCHO, then H₃O⁺ 3. HBr, then Mg, ether, then CH₃CH₂CH₂Br
 (E) 1. Ethanol 2. H₂SO₄, 180 °C 3. CH₃CH₂CH₂Br

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



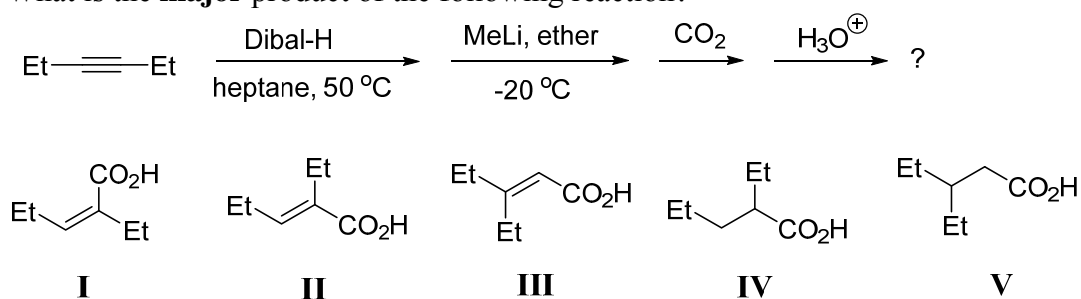
- (A) I (B) II (C) III (D) IV (E) V

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



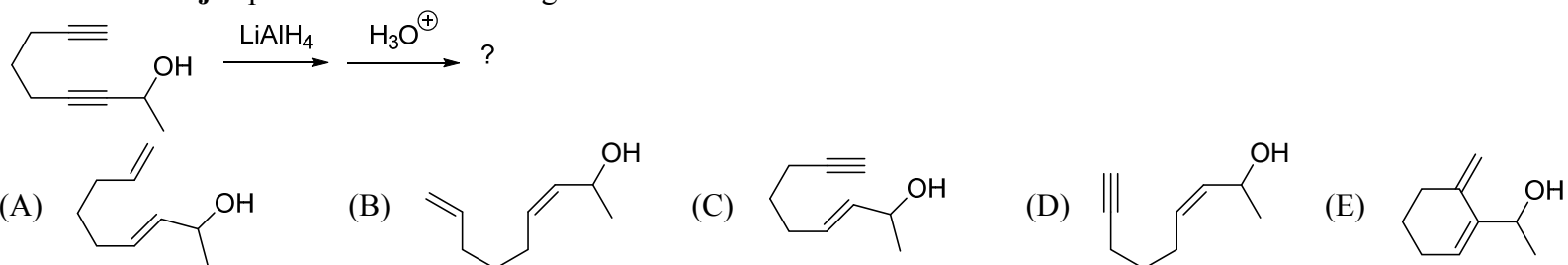
- (A) I (B) II (C) III (D) IV (E) V

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

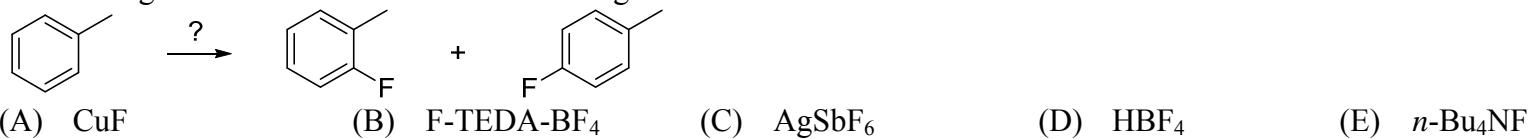


- (A) I (B) II (C) III (D) IV (E) V

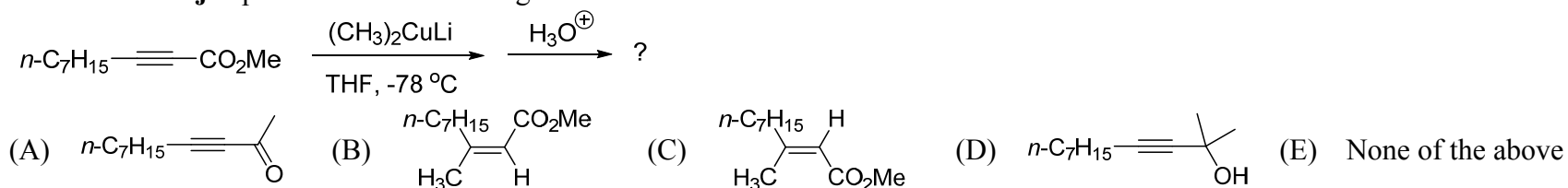
53. What is the **major** product of the following reaction?



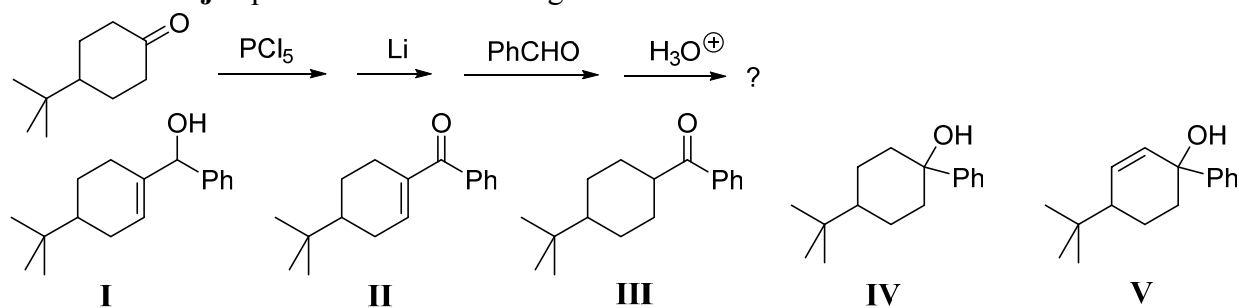
54. Which reagent is **most** suitable for the following transformation?



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

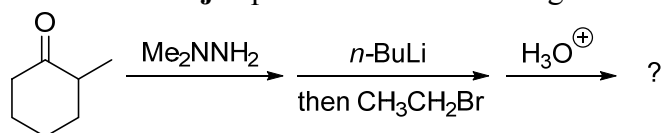


56. What is the **major** product of the following reaction?



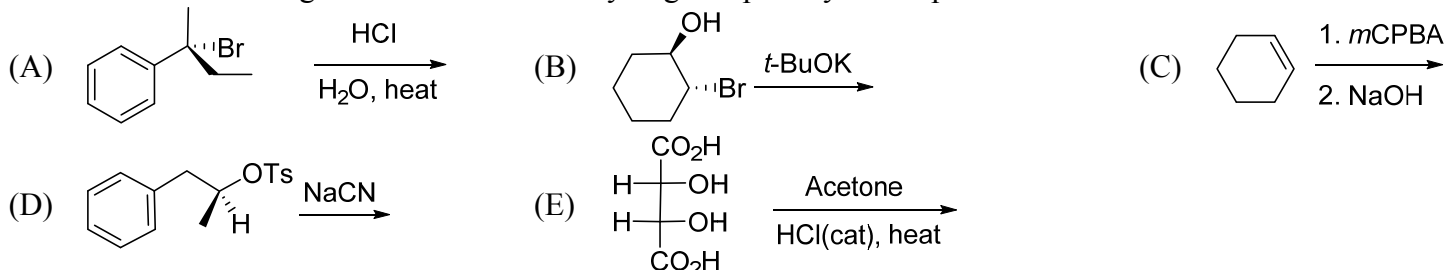
- (A) I (B) II (C) III (D) IV (E) V

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

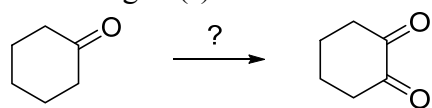


- (A) (B) (C) (D) (E) None of the above

58. Which of the following reactions is **most** likely to give optically active products?

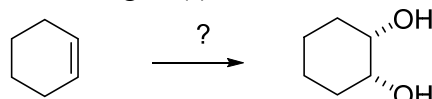


59. What reagent(s) can be used for the following transformation?



- I. KMnO_4 II. SeO_2 III. Br_2, DMSO IV. $\text{NaOCl}, \text{H}_2\text{O}$
 (A) I (B) II (C) III (D) IV (E) II and III

60. What reagent(s) can be used for the following transformation?



- I. OsO_4 II. $\text{CH}_3\text{CO}_3\text{H}, \text{H}_2\text{O}$ III. $\text{I}_2, \text{CH}_3\text{CO}_2\text{Ag}, \text{CH}_3\text{CO}_2\text{Ag}, \text{H}_2\text{O}$
 (A) I (B) II (C) III (D) I and II (E) I and III

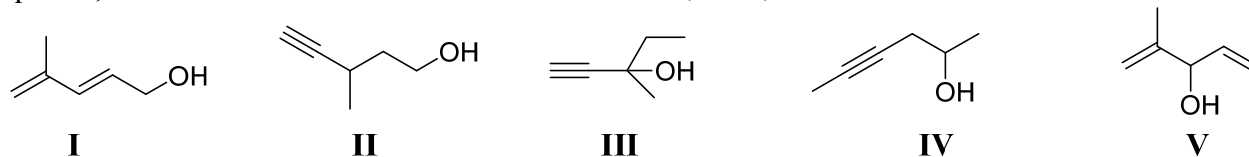
【單選題】 每題 2 分，共計 40 分，答錯 1 題倒扣 0.5 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

61. What sequence of reagents is needed to convert *t*-butylbenzene into 1-bromo-2-(*t*-butyl)benzene?

- I. Dilute $\text{H}_2\text{SO}_4, \text{heat}$ II. $\text{NaNO}_2, \text{HCl}$ III. $\text{Br}_2, \text{FeBr}_3, \text{heat}$ IV. Fuming $\text{H}_2\text{SO}_4, \text{heat}$ V. $\text{HBr}, \text{CuBr}, \text{heat}$
 (A) IV \rightarrow II \rightarrow V (B) I \rightarrow III \rightarrow II (C) II \rightarrow III \rightarrow V (D) III \rightarrow V \rightarrow I (E) IV \rightarrow III \rightarrow I

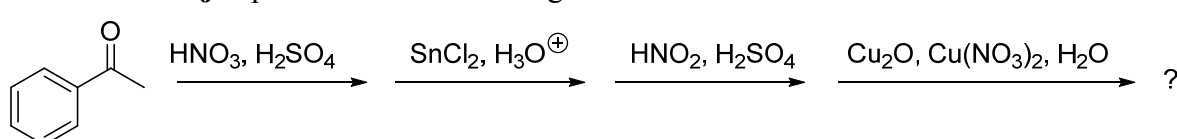
62. Determine the **most** likely structure for a compound ($\text{C}_6\text{H}_{10}\text{O}$) which is found to decolorize bromine in carbon tetrachloride. Its spectral data is as follows:

$^1\text{H-NMR}$		IR
triplet, δ 1.0	singlet, δ 2.4	2200 cm^{-1} (sharp)
singlet, δ 1.4	singlet, δ 3.4	3300 cm^{-1} (sharp)
quartet, δ 1.6		3500 cm^{-1} (broad)



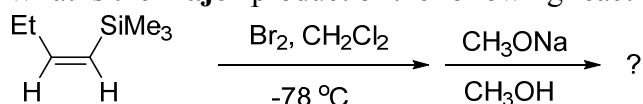
- (A) I (B) II (C) III (D) IV (E) V

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



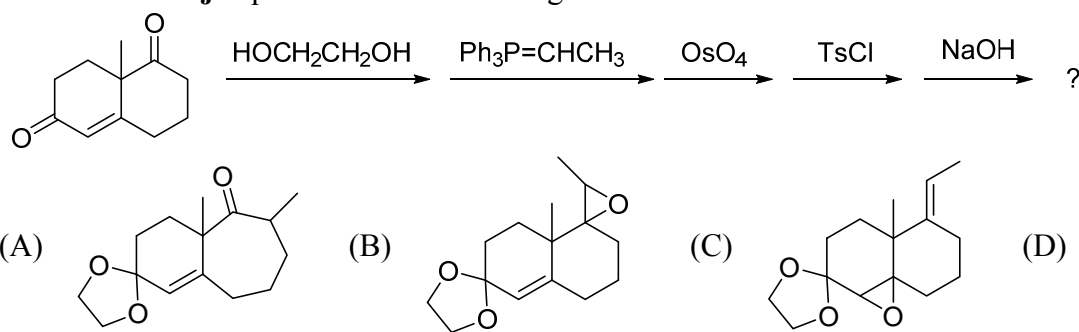
- (A) (B) (C) (D) (E)

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

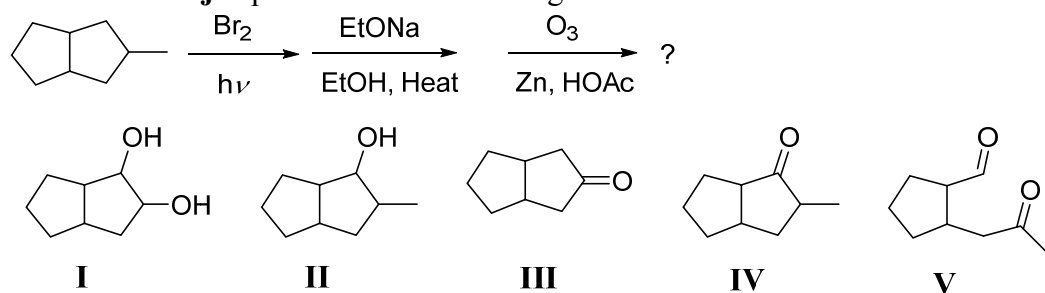


- (A) (B) (C) (D) (E)

65. What is the **major** product of the following reactions?

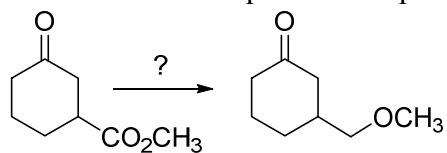


66. What is the **major** product of the following reactions?



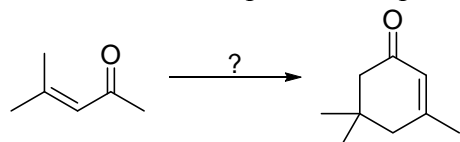
(A) I (B) II (C) III (D) IV (E) V

67. Which reaction sequence is required to accomplish the following transformation?



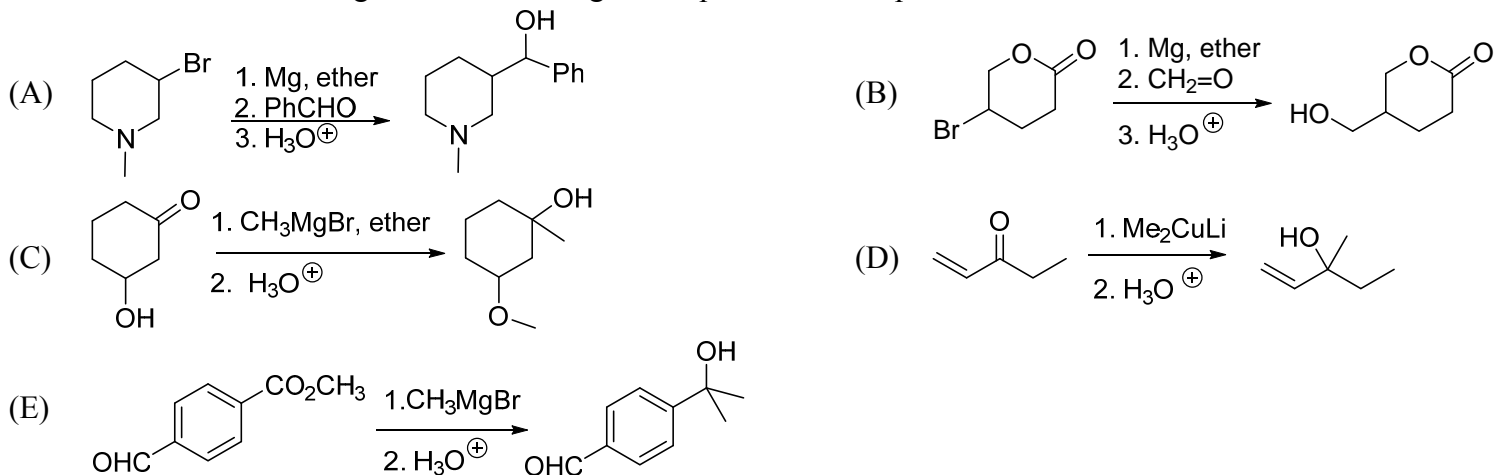
- (A) 1. LiAlH_4 2. H_3O^+ 3. NaH, then CH_3I
 (B) 1. H_2NNH_2 , KOH, 120°C 2. H_2 , Pd/C 3. NaH, then CH_3I
 (C) 1. $\text{HOCH}_2\text{CH}_2\text{OH}$, H_3O^+ 2. LiAlH_4 3. NaH, then CH_3I , then H_3O^+
 (D) 1. $\text{HOCH}_2\text{CH}_2\text{OH}$, H_3O^+ 2. H_2NNH_2 , KOH, 120°C 3. H_2 , Pd/C, H_3O^+
 (E) 1. NaNH_2 , CH_3I 2. LiAlH_4 3. H_2 , Pd/C, H_3O^+

68. Which reaction sequence is required to accomplish the following transformation?

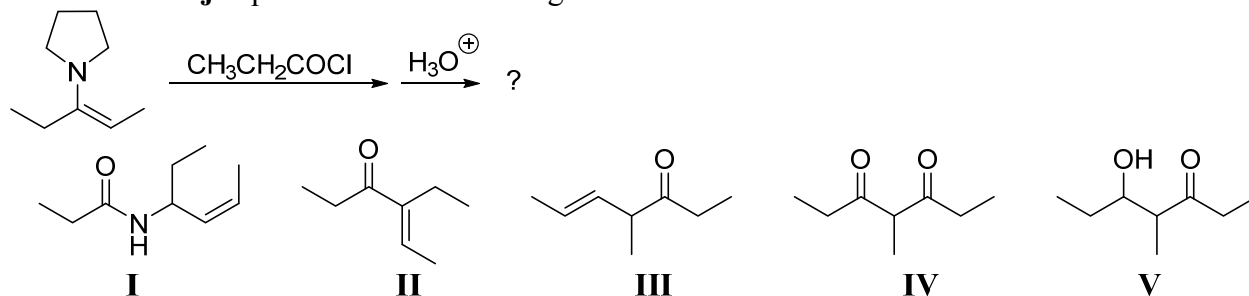


- I. heat II. NaOH, heat, then HCl, H_2O III. NaOH IV. $\text{CH}_3\text{COCH}_2\text{CO}_2\text{Et}$, EtONa
 (A) I \rightarrow II \rightarrow III \rightarrow IV (B) IV \rightarrow II \rightarrow I \rightarrow III (C) III \rightarrow VI \rightarrow II \rightarrow I
 (D) II \rightarrow IV \rightarrow III \rightarrow I (E) None of the above

69. Which one of the following reactions would give the product as it is planned?

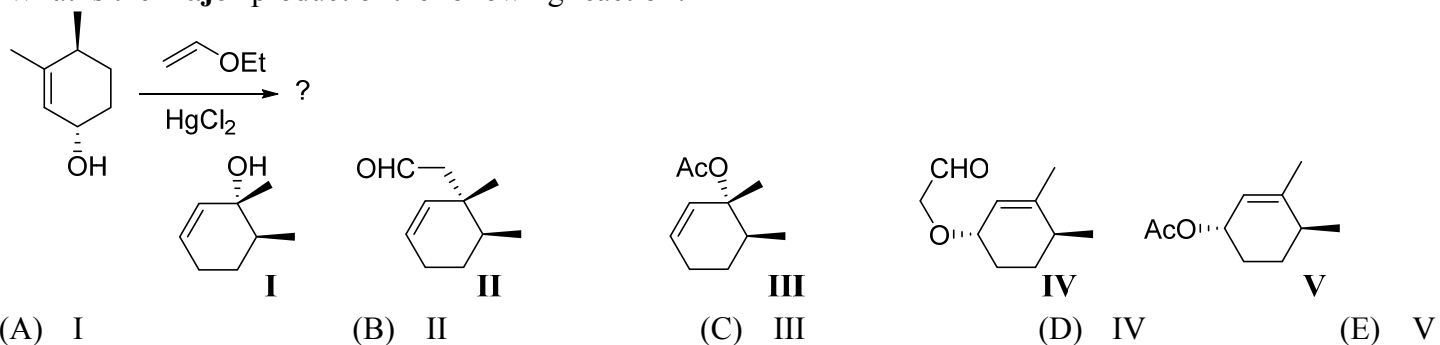


70. What is the **major** product of the following reaction?

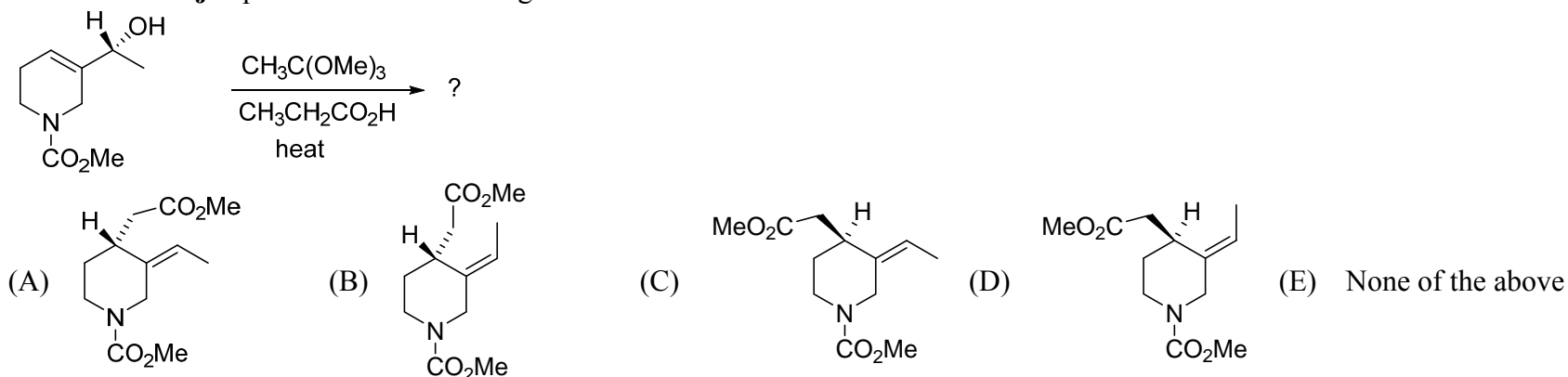


(A) I (B) II (C) III (D) IV (E) V

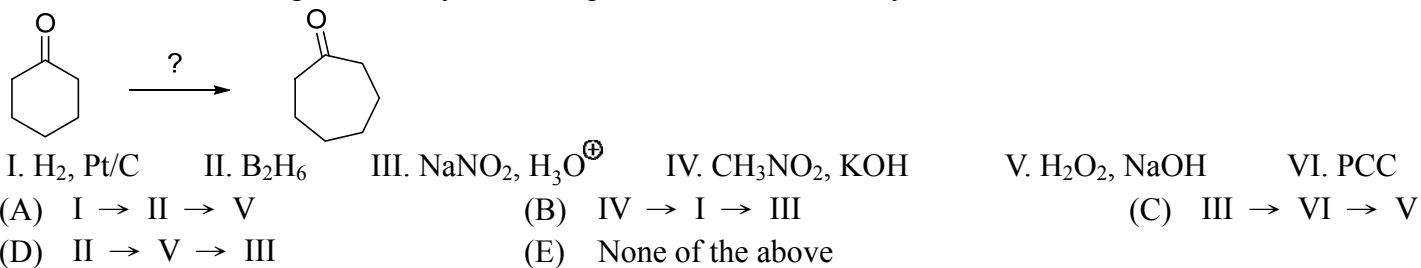
71. What is the **major** product of the following reaction?



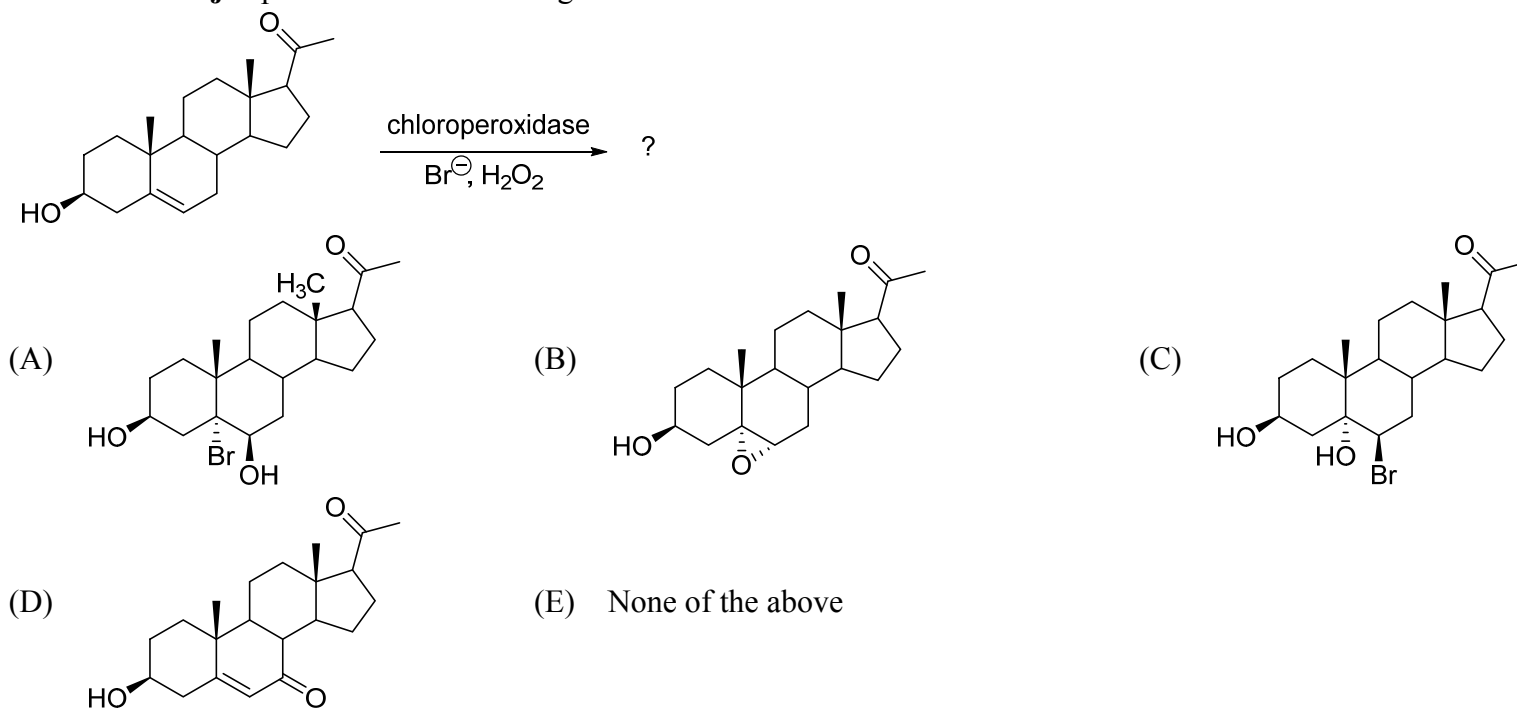
72. What is the **major** product of the following reaction?



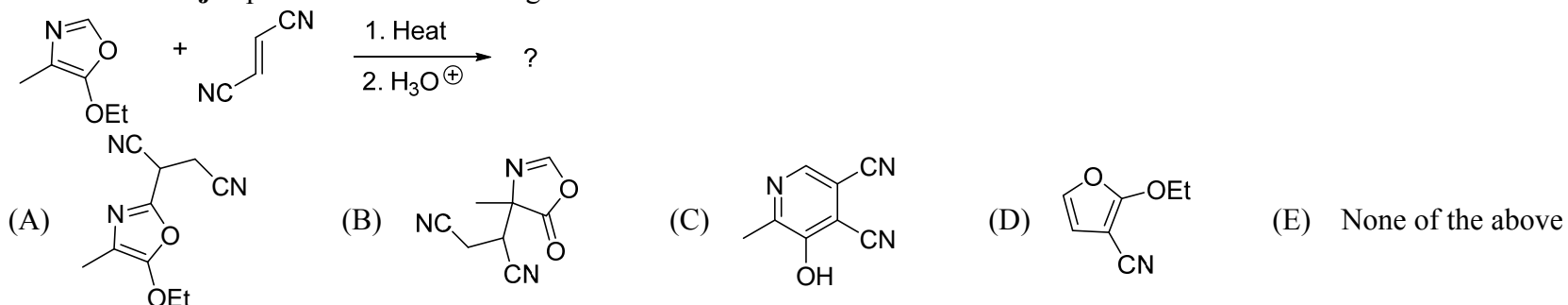
73. Which of the following series of synthetic steps could be used to carry out the transformation shown below?



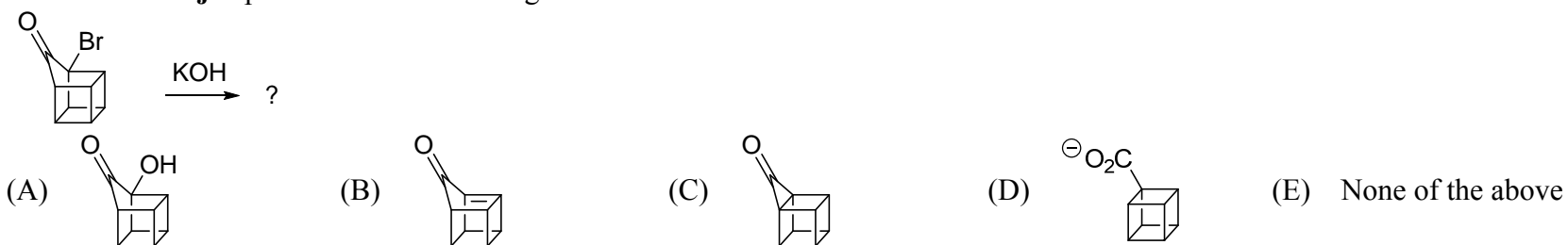
74. What is the **major** product of the following reaction?



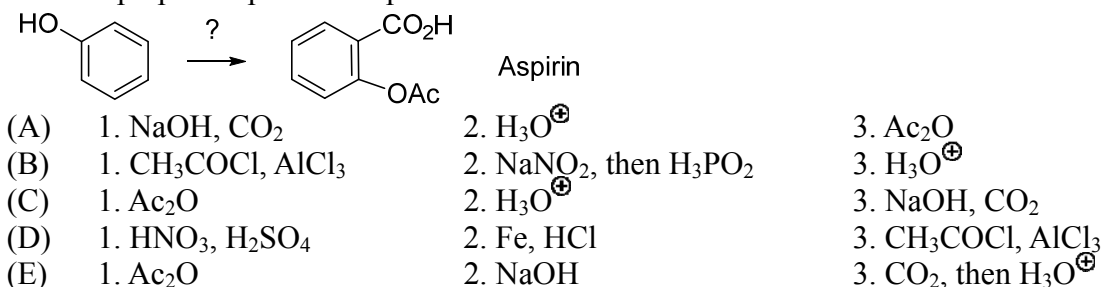
75. What is the **major** product of the following reaction?



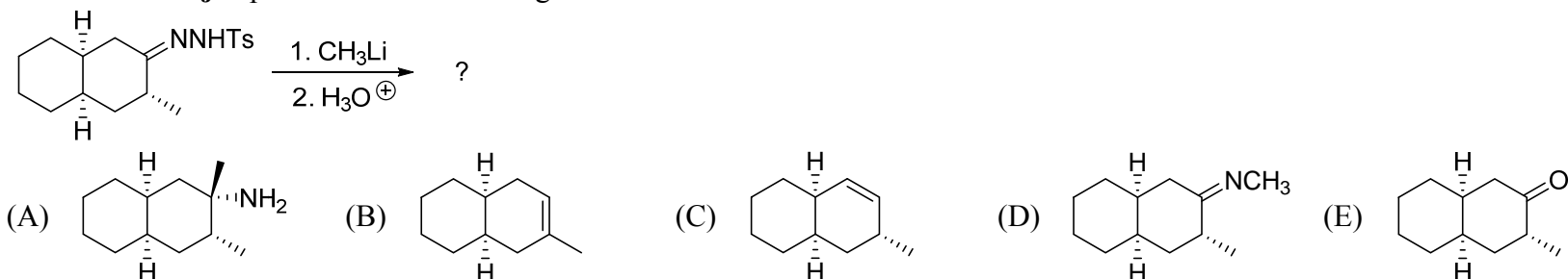
76. What is the **major** product of the following reaction?



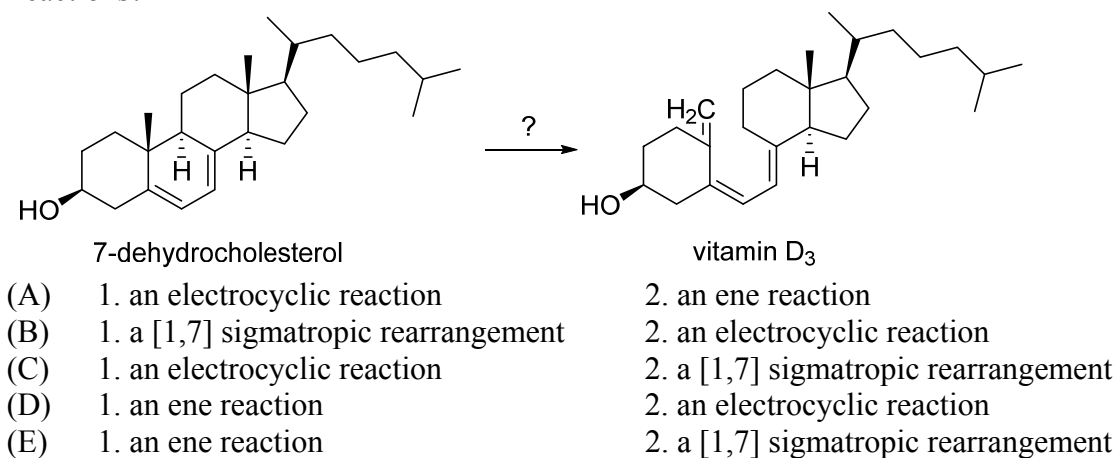
77. How to prepare aspirin from phenol?



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



79. 7-Dehydrocholesterol, a steroid found in skin, is converted into vitamin D₃ by two pericyclic reactions. What are these two reactions?



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

