

111年公務人員普通考試試題

代號:45020
頁次:8-1

類 科：化學工程

科 目：有機化學概要

考試時間：1 小時 30 分

座號：_____

※注意：禁止使用電子計算器。

甲、申論題部分：(50分)

(一)不必抄題，作答時請將試題題號及答案依照順序寫在申論試卷上，於本試題上作答者，不予計分。

(二)請以藍、黑色鋼筆或原子筆在申論試卷上作答。

(三)本科目除專門名詞或數理公式外，應使用本國文字作答。

一、請寫出下列英文名稱的化學結構：(每小題 2 分，共 10 分)

(一) Bromoform

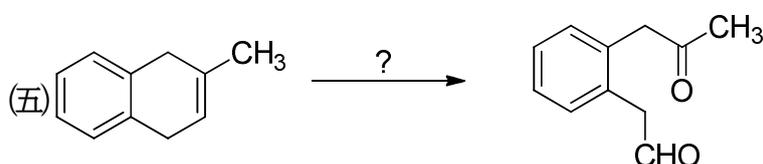
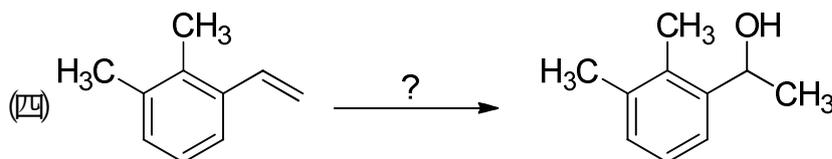
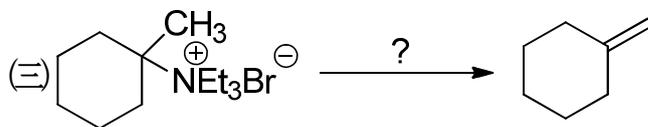
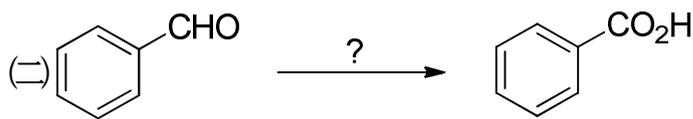
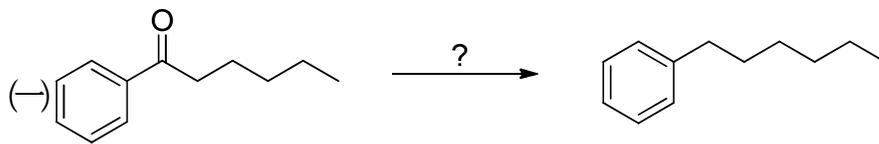
(二) tert-Butyl methyl ether

(三) Glycine

(四) Potassium permanganate

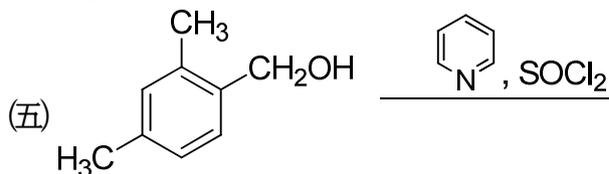
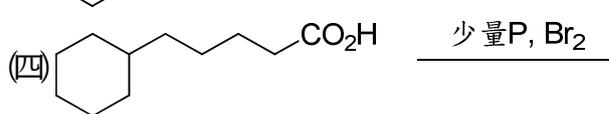
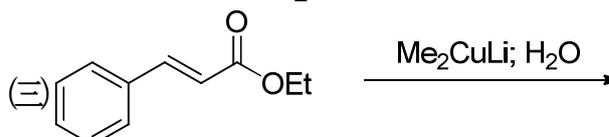
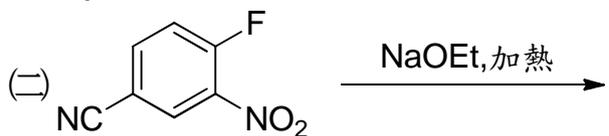
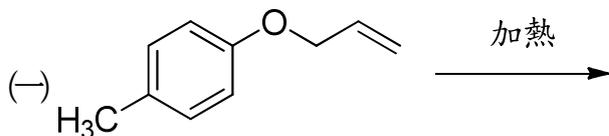
(五) Cycloocta-1,5-diene

二、請寫出下列反應所需的化學試劑：(每小題 2 分，共 10 分)

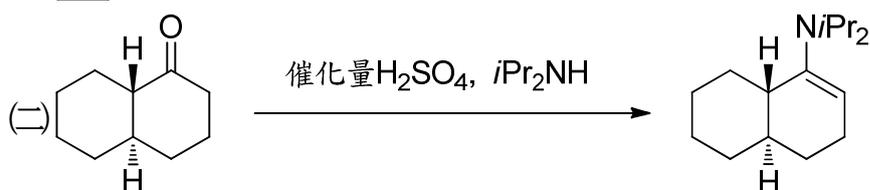
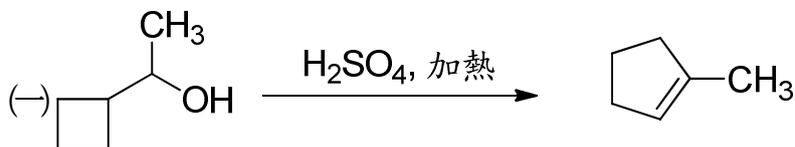


三、請寫出下列反應之主要反應產物：

(請表示正確的立體化學，每小題 2 分，共 10 分)



四、請寫出下列反應之反應機構：(每小題 10 分，共 20 分)



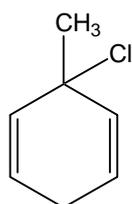
乙、測驗題部分：(50 分)

代號：2450

(一)本測驗試題為單一選擇題，請選出一個正確或最適當的答案。

(二)共 25 題，每題 2 分，須用 2B鉛筆在試卡上依題號清楚劃記，於本試題或申論試卷上作答者，不予計分。

1 下列化合物的國際純化學暨應用化學聯合會 (IUPAC: International Union of Pure and Applied Chemistry) 的命名為何？



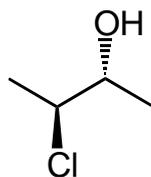
(A) 1-chloro-1-methyl-2,5-cyclohexadiene

(B) 3-chloro-3-methyl-1,4-cyclohexadiene

(C) 6-chloro-6-methyl-1,4-cyclohexadiene

(D) 2-chloro-2-methyl-1,3-cyclohexadiene

2 下列化合物之 IUPAC 系統命名應為何者？



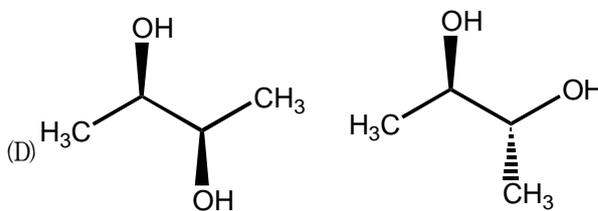
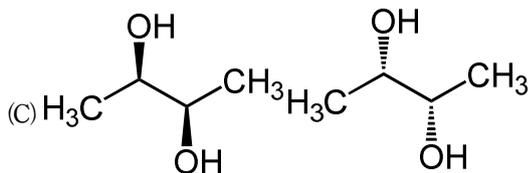
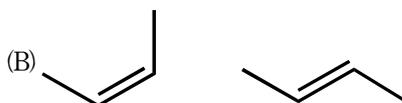
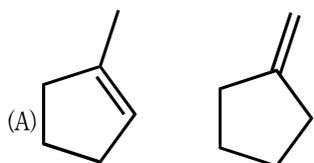
(A) (2R,3S)-3-chlorobutan-2-ol

(B) (2R,3R)-3-chlorobutan-2-ol

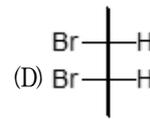
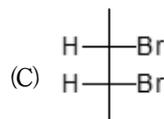
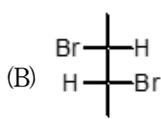
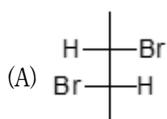
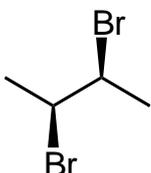
(C) (2S,3S)-3-chlorobutan-2-ol

(D) (2S,3R)-3-chlorobutan-2-ol

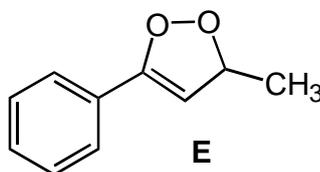
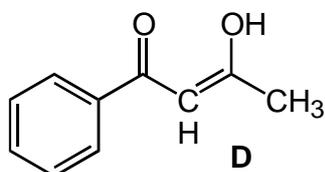
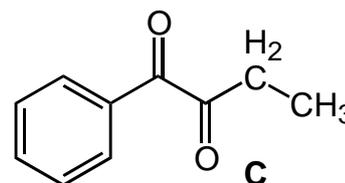
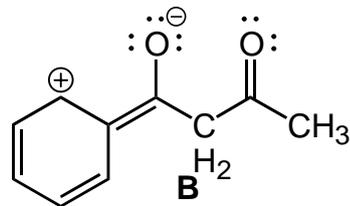
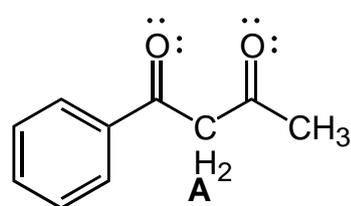
3 下列那一組合可視為構形異構物 (conformational isomers; conformers) ？



4 費歇爾投影式 (Fischer projection) 由赫爾曼·埃米爾·費歇爾於 1891 年提出，是表示單醣鏈形結構、胺基酸等有機化合物結構的一種常用表達方式，下列化合物的正確費歇爾投影式為何？



5 下列五種結構 (A-E)，何種組合彼此為互變異構物 (tautomers) ？



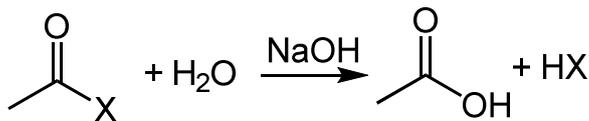
(A) AB

(B) AC

(C) AD

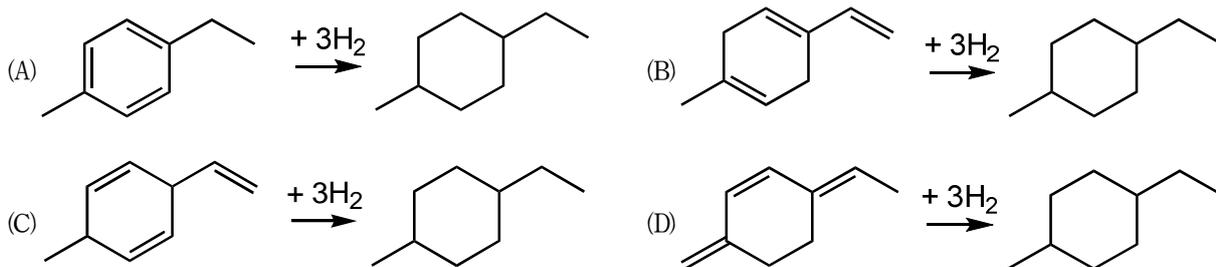
(D) AE

6 就下列水解 (hydrolysis) 反應, X 為何者時, 此反應的速率最快?

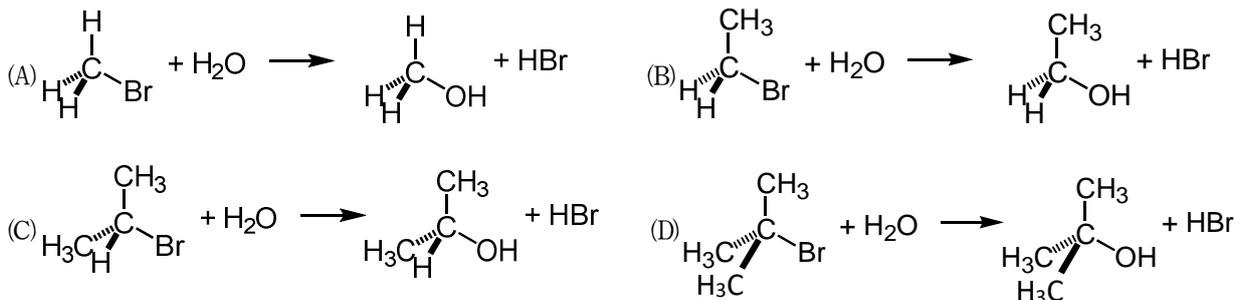


- (A) X = -NH₂ (B) X = -OCH₃ (C) X = -OC₆H₅ (D) X = -OC(=O)CH₃

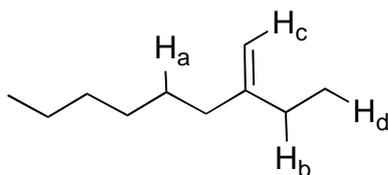
7 下列那一個反應, 完成後會放出最多的熱能?



8 下列何者反應速率最快?

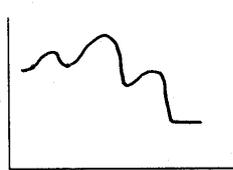
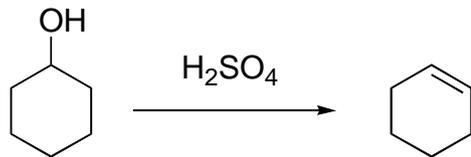


9 預測下列化合物那一個氫 (H_a, H_b, H_c, H_d) 最酸?

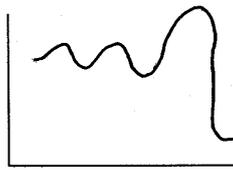


- (A) H_a (B) H_b (C) H_c (D) H_d

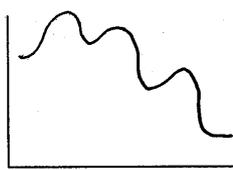
10 請預測下列酸催化反應的能量圖 (energy diagrams) 為何?



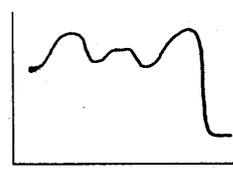
A



B



C



D

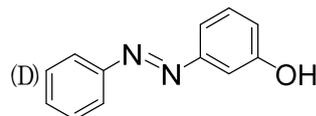
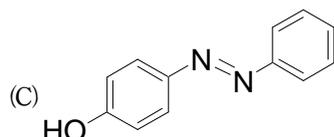
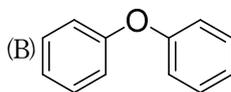
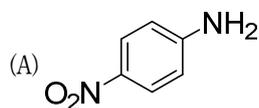
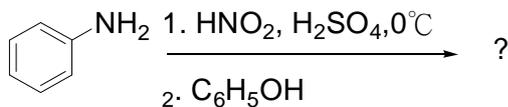
- (A) A

- (B) B

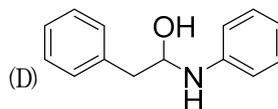
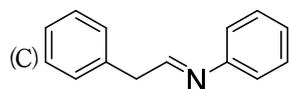
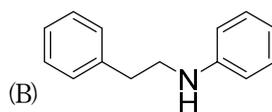
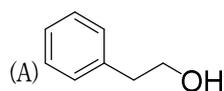
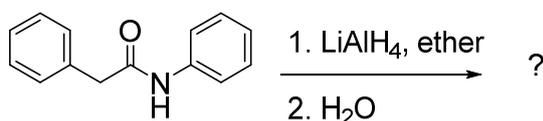
- (C) C

- (D) D

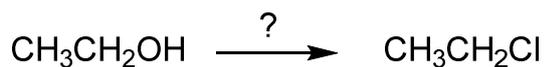
11 下列反應的主要產物為何者？



12 下列反應的主要產物為何者？



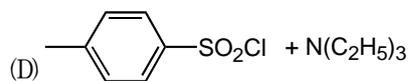
13 下列那一個試劑（反應條件），可以使下列反應有最高的產率？



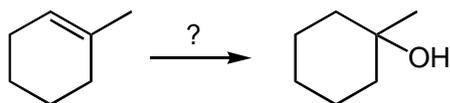
(A) 氯氣 (Cl_2) 與紫外光

(B) 濃鹽酸 ($\text{HCl}_{(\text{aq})}$, 室溫)

(C) SOCl_2 + pyridine (吡啶)



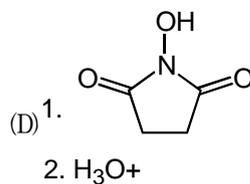
14 下列那一組試劑（反應條件），可以使下列反應有最高的產率？



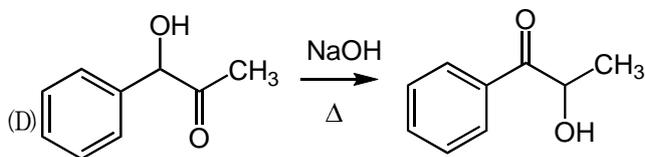
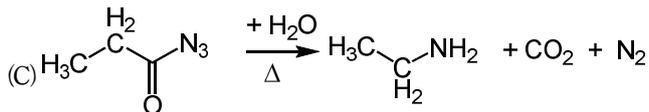
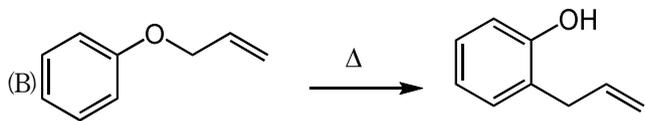
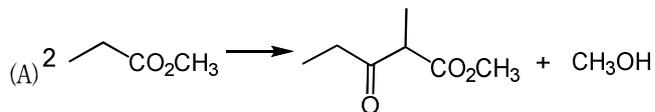
(A) 1. $\text{Hg}(\text{OCOCH}_3)_2, \text{H}_2\text{O}$
2. NaBH_4

(B) 1. BH_3
2. $\text{H}_2\text{O}_2, \text{NaOH}$

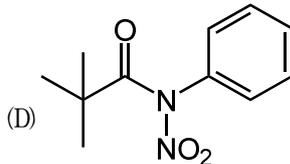
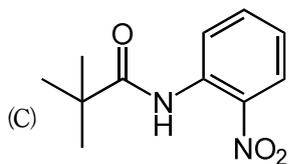
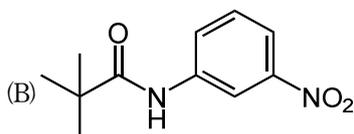
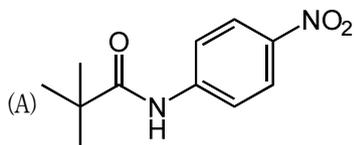
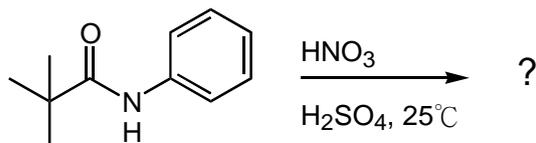
(C) 
1. 
2. $\text{H}_2\text{O}, \text{NaOH}$

(D) 1. 
2. H_3O^+

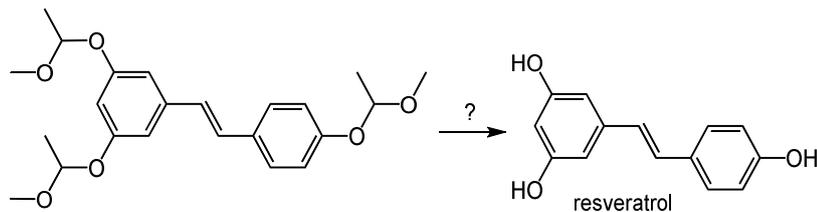
15 下列何者為克來森重排 (Claisen rearrangement) 反應？



16 下列反應的最主要產物為何者？



17 白藜蘆醇 (resveratrol) 可由以下反應式產生。其反應條件應為何者？



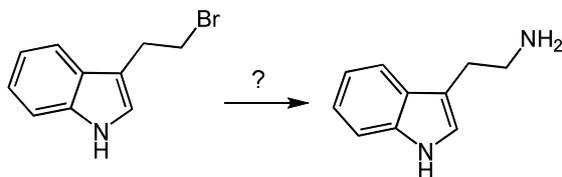
(A) 鹽酸水溶液 (pH = 1)

(B) 氫氧化鈉水溶液 (pH = 12)

(C) 紫外光 (254 nm) 照射 10 小時

(D) CH_3MgBr /四氫呋喃溶液

18 下列何組試劑，最適合應用於下列反應？



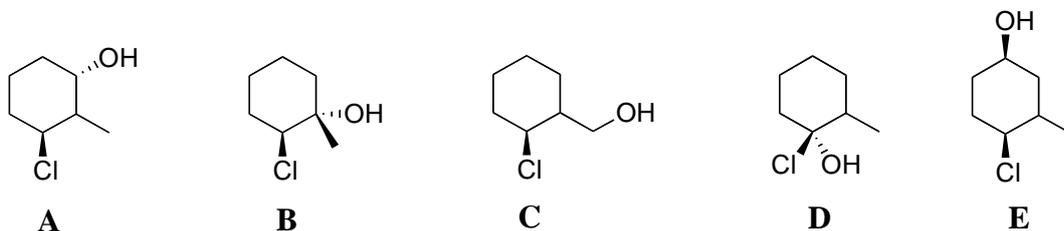
(A) 1. NaCN, CH₃CN
2. H₂, Pd/C, CH₃OH

(B) 1. NaN₃, CH₃CN
2. H₂, Pd/C, CH₃OH

(C) 1. NaNO₃, H₂SO₄
2. H₂, Pd/C, CH₃OH

(D) 1. CH₃NH₂, CH₃CN
2. H₂, Pd/C, CH₃OH

19 (S)-6-chloro-1-methyl-1-cyclohexene 和酸 (H₃O⁺) 反應之後，產生下列那一個產物？



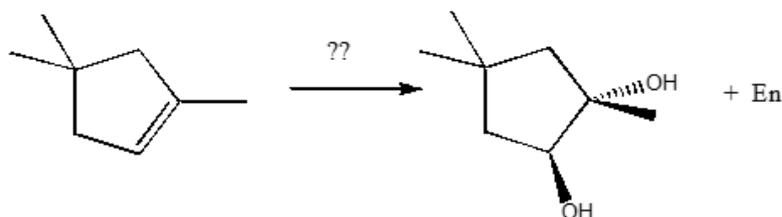
(A) A 和 C

(B) B

(C) C 和 E

(D) D

20 預測下列官能基轉換反應所需要的試劑為何？



(A) 1. OsO₄
2. NaHSO₃, H₂O

(B) 1. Hg(OAc)₂, H₂O
2. NaBH₄

(C) 1. RCO₃H
2. H₃O⁺

(D) H₂SO₄, H₂O

21 氫化鋁鋰是一個複合氫化物，分子式為 LiAlH₄。氫化鋁鋰縮寫為 LAH，是有機合成中非常重要的還原劑，尤其是對於酯、羧酸和醯胺的還原；下面那一個溶劑適合做為使用氫化鋁鋰把酮類 (ketone) 化合物還原 (reduction) 的選擇？

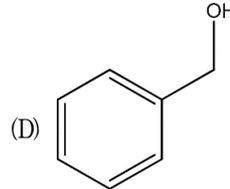
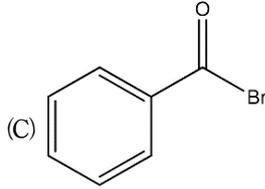
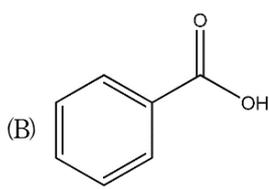
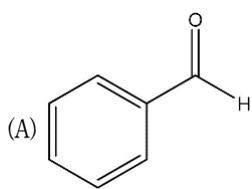
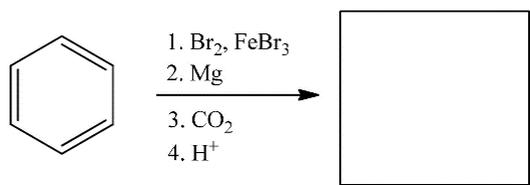
(A) Isopropanol

(B) Water

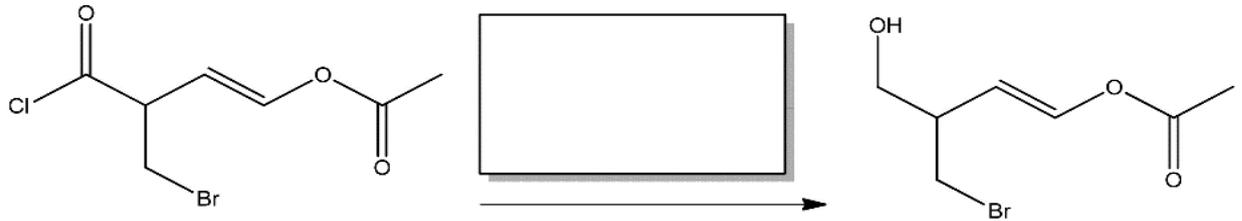
(C) Acetic acid

(D) Diethyl ether

22 下面描述的反應再加入不同的試劑後，最有可能的產物為何？

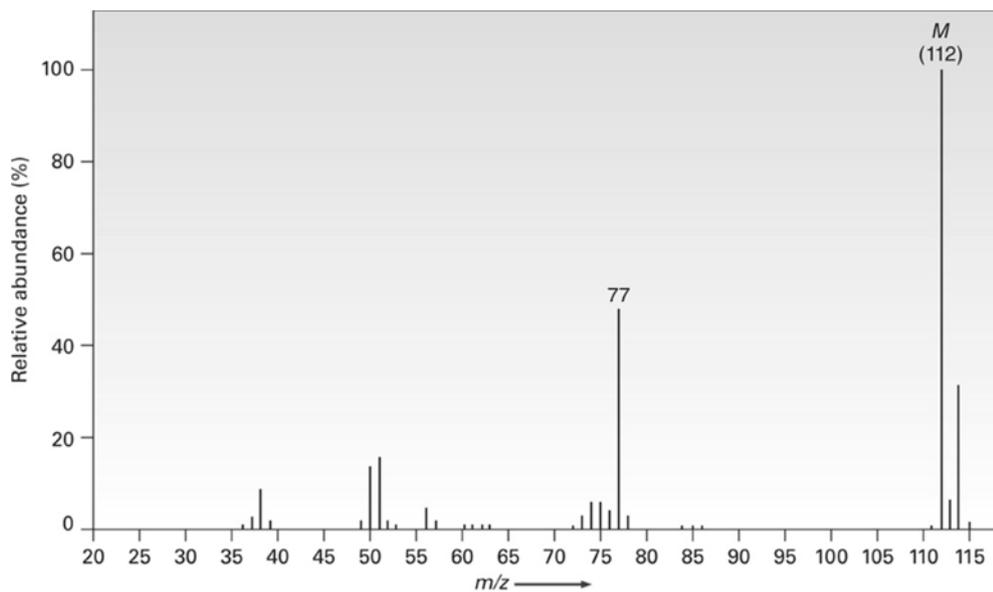


23 預測下列官能基轉換的反應，所需要的有機試劑為何？



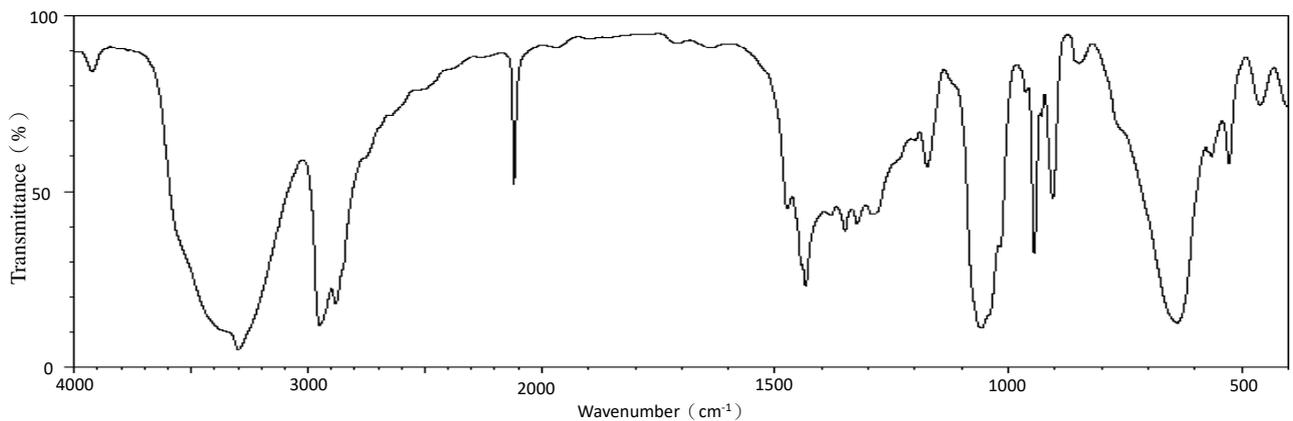
- (A) 1. LiAlH_4
2. $\text{H}_2\text{O}, \text{H}_3\text{O}^+$ (B) NaBH_4
EtOH (C) 1. NaH
2. H^+ (D) $\text{LiAlH}(\text{O}-t\text{-Bu})_3, -78^\circ\text{C}$

24 有一化合物的質譜圖如下：其最有可能的分子式為何者？



- (A) C_8H_{16} (B) $\text{C}_6\text{H}_8\text{O}_2$ (C) $\text{C}_6\text{H}_5\text{Cl}$ (D) $\text{C}_6\text{H}_{12}\text{N}_2$

25 某一個未知化合物的紅外線光譜儀如下，它可能的化學結構為何？



- SDBS: National Institute of Advanced Industrial Science and Technology
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- (A) A (B) B (C) C (D) D