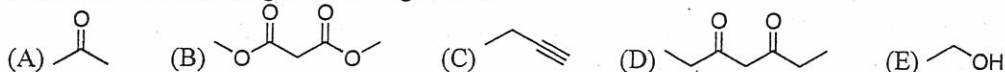
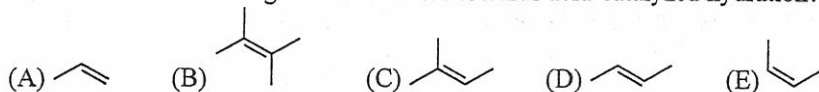


Part I. 單選題. Please select the most appropriate answer for the following questions. There is only one correct answer for each question. 請於試卷內之「選擇題作答區」依序作答。(每題2分, 共20分)

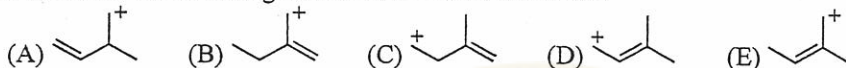
1. Which of the following is the strongest acid?



2. Which of the following is most reactive towards acid-catalyzed hydration?



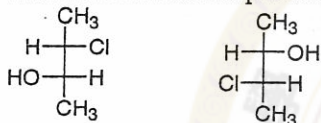
3. Which of the following is the most stable carbocation?



4. Which of the following is the most reactive diene for the Diels-Alder reaction?

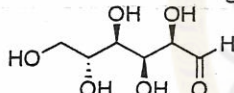


5. What is the relationship between the two structures below?



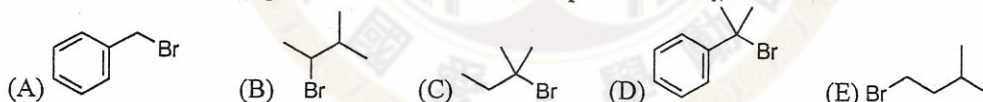
(A) constitutional isomer (B) identical (C) enantiomer (D) diastereomer (E) none of the above

6. Which of the following is the correct designation for the stereogenic centers in this aldose?

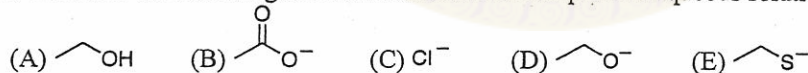


(A) 2R, 3S, 4R, 5R (B) 2S, 3R, 4S, 5S (C) 2R, 3R, 4R, 5S (D) 2R, 3R, 4S, 5R (E) 2S, 3S, 4R, 5S

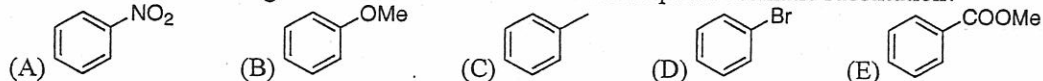
7. Which of the following is the most reactive electrophile for an  $S_N1$  reaction?



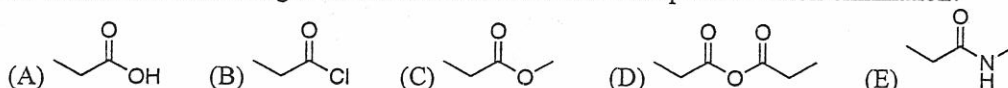
8. Which of the following is the most reactive nucleophile in aqueous solution for an  $S_N2$  reaction?



9. Which of the following is the most reactive towards electrophilic aromatic substitution?



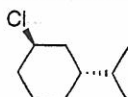
10. Which of the following is the most reactive towards nucleophilic addition-elimination?



Part II. 問答題. Please provide a short answer for the following questions. 請於試卷內之「非選擇題作答區」依題號順序作答。(共14分)

1. Explain why more substituted carbocations are more stable than less substituted carbocations. (4分)

2. Please draw the lowest energy chair conformation for the following compound. (5分)



見背面

3. A compound has the molecular formula of  $C_6H_{12}O_3$ . The IR (infrared) spectrum of the compound shows no absorption beyond  $3000\text{ cm}^{-1}$ , but has multiple absorptions in the region  $2800\text{-}3000\text{ cm}^{-1}$  and a strong sharp absorption at  $1715\text{ cm}^{-1}$  with multiple strong absorptions in the region  $1000\text{-}1200\text{ cm}^{-1}$ . The  $^1\text{H}$  NMR spectrum of the compound consists of  $\delta$  2.08 (singlet, 3H), 2.58 (doublet, 2H), 3.27 (singlet, 6H), and 4.56 ppm (triplet, 1H). Please draw the chemical structure of the compound. (5分)

Part III. 簡答題. Please draw the major product(s) for the following reactions. Please include stereochemistry when necessary. Line angle structures (also known as skeletal structures) are preferred. 請於試卷內之「非選擇題作答區」依題號順序作答。(每題3分, 共66分)

