國立臺北科技大學

九十二學年有機高分子研究所碩士在職專班入學考試

甲組：有機化學試題

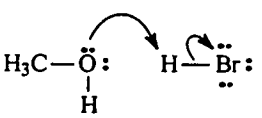
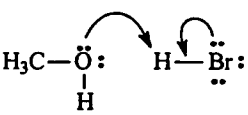
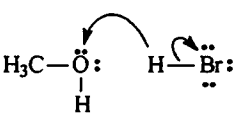
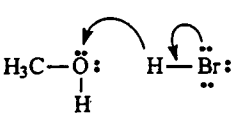
填准考證號碼　　第一頁　共三頁

注意事項：

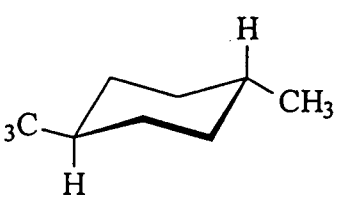
1. 本試題共二大題，選擇題25題，問答題2題，配分共100分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。

(一) 選擇題 (每題3分,答對得3分;答錯倒扣1分;不答不計分,本大題共75分)

1. Which of the following mechanistically depicts the protonation of methanol by hydrogen bromide?

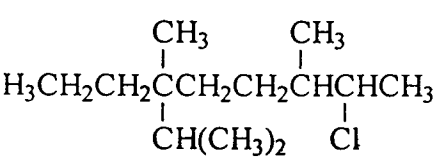
1) 
2) 
3) 
) 

2. What is the IUPAC name of the following compound?



1) *trans*-1,4-dimethylcyclohexane
2) *cis*-1,4-dimethylcyclohexane
3) *trans*-1,3-dimethylcyclohexane
4) *cis*-1,3-dimethylcyclohexane

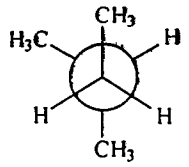
3. What is the IUPAC name of the following compound?



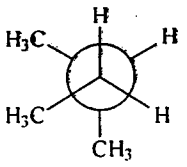
1) 8-chloro-4-isopropyl-4,7-dimethylnonane
2) 2-chloro-6-isopropyl-3,6-dimethylnonane
3) 2-chloro-3,6,7-trimethyl-6-propyloctane
4) 6-*sec*-butyl-2-chloro-3,6-dimethyloctane

注意：背面尚有試題

4. Identify the relationship between the following two Newman projections.



and



1) identical
2) stereoisomers
3) different conformations of the same compound
4) constitutional isomers

5. Rank the following three compounds in order of increasing boiling point

(A) $CH_3CH_2CH_3$ (B) CH_3CH_2OH (C) CH_3OCH_3

1) A<B<C 2) A<C<B 3) B<C<A 4) B<A<C

6. What is the nucleophile in the following substitution reaction?

$(CH_3)_3COH + HBr \longrightarrow (CH_3)_3CBr + H_2O$

1) $(CH_3)_3COH$ 2) $(CH_3)_3C+$ 3) Br^- 4) H^+

7. Rank the following alcohols in order of increasing reaction rate with HBr.

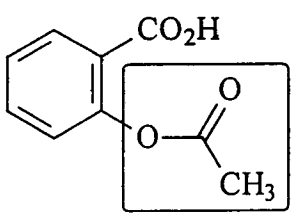
A. $CH_3CH_2CH_2CH_2OH$ B. $(CH_3)_3COH$ C. $CH_3CH_2\underset{\underset{OH}{|}}{C}HCH_3$

1) A<B<C 2) A<C<B 3) B<C<A 4) C<B<A

8. Which of the following is the most stable radical?

1) $CH_3CH_2\underset{\underset{CH_3}{|}}{\dot{C}}CH_3$ 2) $CH_3CH_2\underset{\underset{CH_3}{|}}{C}\dot{C}H_2$ 3) $CH_3\dot{C}H\underset{\underset{CH_3}{|}}{C}CH_3$ 4) $\dot{C}H_2CH_2\underset{\underset{CH_3}{|}}{C}CH_3$

9. Identify the functional group in the boxed area:



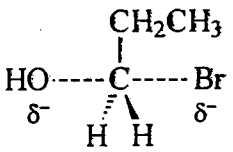
aspirin

1) ester
2) ketone
3) carboxylic acid
4) ether

10. Carbon-carbon double bonds do not freely rotate like carbon-carbon single bonds. Why?

1) The double bond is much stronger and thus more difficult to rotate.
2) Overlap of the two 2p orbitals of the bond would be lost.
3) The shorter bond length of the double bond makes it more difficult for the attached groups to pass each other.
4) Overlap of the sp^2 orbitals of the carbon-carbon bond would be lost.

18. The species shown represents the transition state for the:



1) reaction of 1-propanol with HBr.
2) reaction of 1-bromopropane with OH^-.
3) elimination of HBr from 1-bromopropane.
4) addition of HBr to propene with peroxides.

19. Which of the following describes the C(2) - C(3) sigma bond in the structure below?

$HC{\equiv}C{-}C{\equiv}CH$

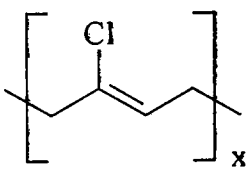
1) sp-sp 2) sp^2-sp^2 3) sp^3-sp^3 4) 2p-2p

20. Which of the following are conjugated dienes?

(A) 1,2-octadiene (B) 1,3-octadiene (C) 2,5-octadiene (D) 1,7-octadiene

1) only A 2) only B 3) A and B 4) B and C

21. Which of the following is the monomer or monomers needed to make the polymer neoprene shown below?



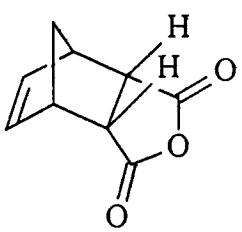
1) $H_2C{=}C(Cl)CH{=}CH_2$

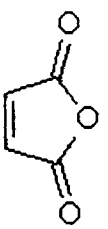
2) $H_2C{=}CHCl$

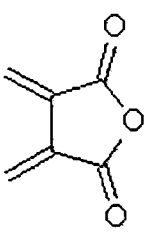
3) $CH_3C(Cl){=}CHCH_3$

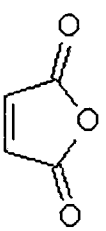
4) $H_2C{=}CH_2$ and $H_2C{=}CHCl$

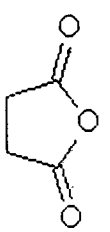
22. Identify the diene and dienophile needed to make the following Diels-Alder adduct.



1) 13-butadiene + 

2) 1,3-butadiene + 

3) 1,3-cyclopentadiene + 

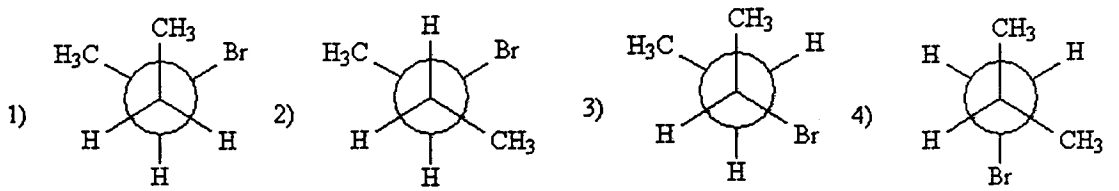
4) 1,3-cyclopentadiene + 

注意：　尚有試題

11. Which of the following expressions is the experimentally observed rate law for an E2 reaction of an alkyl halide?

1) rate = k[RX] 2) rate = k[RX][base] 3) rate = $k[RX]^2$ 4) rate = k[base]

12. In the dehydrohalogenation of 2-bromobutane, which conformation below leads directly to the formation of *cis*-2-butene?



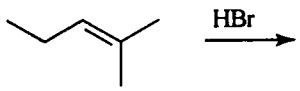
13. Which of the following sets of conditions most favors the E1 mechanism?

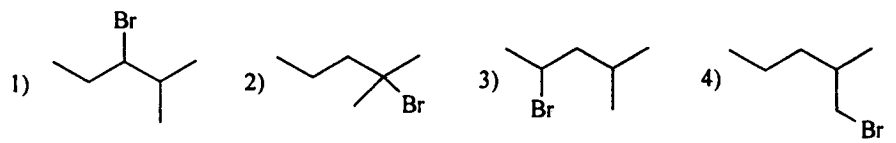
1) When the alkyl halide is tertiary and the base is a weak base.
2) When the alkyl halide is tertiary and the base is a strong base.
3) When the alkyl halide is primary or secondary and the base is a weak base.
4) When the alkyl halide is primary or secondary and the base is a strong base.

14. Which of the following is not a metal catalyst for the hydrogenation of an alkene?

1) Pd 2) Pt 3) Na 4) Ni

15. What is the major product of the following reaction?



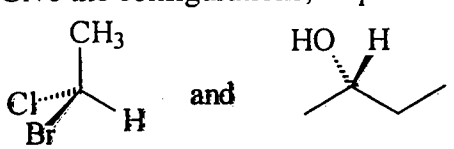


16. How many stereogenic centers are there in the following molecule?

$CH_3\underset{\underset{OH}{|}}{C}HCH_2\underset{\underset{CH_3}{|}}{C}HCH_2CH_2\underset{\underset{CH_3}{|}}{C}HCH_3$

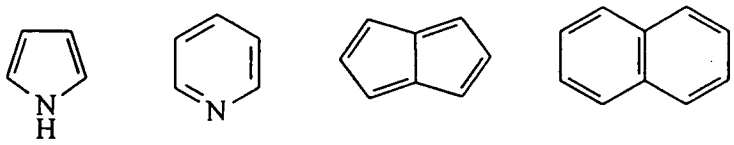
1) one 2) two 3) three 4) none

17. Give the configurations, respectively, of the following two molecules.



1) R and R 2) R and S 3) S and S 4) S and R

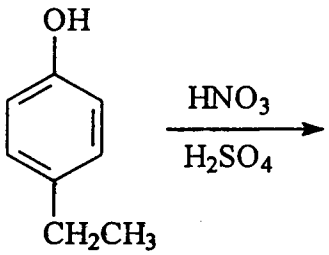
23. Identify the aromatic compounds.



A　　B　　C　　D

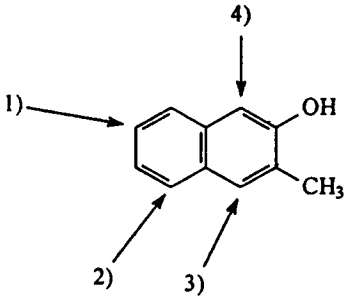
1) A and B　　2) C and D　　3) A, B, and D　　4) all of them

24. What is the major product of the following reaction?



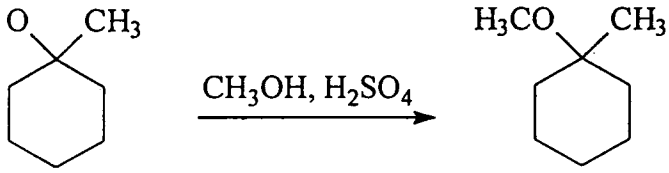
1) 4-ethyl-2-nitrophenol
2) 4-ethyl-3-nitrophenol
3) 1-ethyl-4-nitrobenzene
4) 4-nitrophenol

25. Predict which position of the naphthalene compound below is the most reactive with electrophiles in electrophilic aromatic substitution?



(二) 問答題

1. Propose a mechanism for the following reaction. (10 %)



2. Identify the structure for the compound C_6H_{12} with the following spectra: (15 %)
1H NMR: δ 1.07 (6H, d, J=7 Hz); δ 1.70 (3H, d, J= 1.5 Hz); δ 2.20 (1H, sextet, J= 7 Hz); δ 4.60 (2H, d, J= 1.5 Hz); IR: 1642, 891, 3080 cm^{-1}