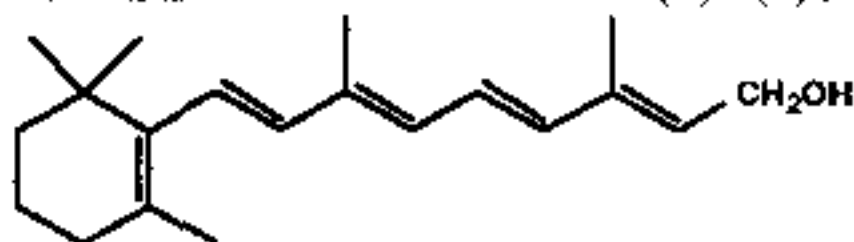


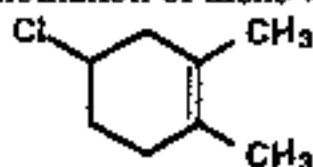
11. How many isoprene units are there in vitamin A? (A) 2 (B) 3 (C) 4 (D) 8



12. Which of the following reagents will add to an alkene in a Markovnikov orientation?
 I H_2 II HBr /peroxides III HCl IV $Hg(OAc)_2/H_2O$
 (A) I, II, III (B) III, IV (C) II, IV (D) II, III, IV
13. Which of the following react with alkenes by a free radical mechanism? I HBr /peroxide
 II BH_3 III $Hg(OAc)_2$ IV $NBS/heat$ (A) I, II (B) II, IV (C) I, IV (D) II, III
14. Which of the following are examples of *syn* addition to alkenes?
 I hydrogenation II hydration III hydrobromination IV hydroboration
 (A) I, II (B) III, IV (C) II, III (D) I, IV
15. What is the order of increasing acidity for the following compounds (weakest first)?
 I $HC\equiv CH$ II NH_3 III CH_3OH IV H_2O
 (A) IV, III, II, I (B) II, IV, III, I (C) I, II, III, IV (D) II, I, III, IV
16. What is the order of increasing stability of the following cations (least stable first)?
 I CH_3^+ II $H_2C=C^+H$ III $CH_3CH_2-C^+H_2$ IV $(CH_3)_2C^+-CH_3$
 (A) I, III, IV, II (B) IV, II, I, III (C) II, I, III, IV (D) I, II, III, IV

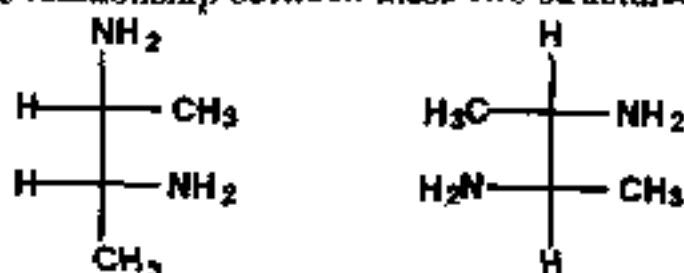
17. Which of the following substituents will activate a diene in a Diels-Alder reaction?
 — CH_3 — CHO — $C\equiv N$ — $C(CH_3)_3$ — OCH_3 — NO_2
 I II III IV V VI
 (A) II, III (B) I, IV, V (C) II, III, VI (D) I, IV

18. Which combination of diene and dienophile will form the following Diels-Alder product?

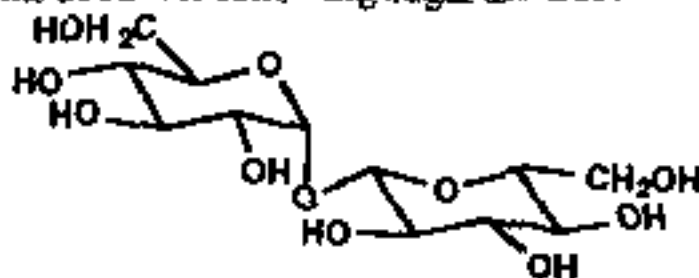


- (A) 2-methyl-1,3-butadiene and 1-chloropropene (B) 2-chloro-1,3-butadiene and *cis*-2-butene
 (C) 1,3-pentadiene and *cis*-2-chloropropene (D) 2,3-dimethyl-1,3-butadiene and vinyl chloride
19. The specific rotation of levorotatory tartaric acid is +15.9 degrees. A mixture of dextrorotatory and levorotatory tartaric acid has a specific rotation of +7.45 degrees. What is the optical purity of the mixture? (A) 75% (B) 50% (C) 33.33% (D) 25%
20. Which peak in the mass spectra could distinguish between 1-butanol and 2-butanol?
 (A) 74 (B) 28 (C) $M - 18$ (D) $M + 2$

21. What is the relationship between these two structures?



- (A) identical structures (B) enantiomers (C) diastereomers (D) constitutional isomers
22. A chiral compound, C_5H_8 , on catalytic hydrogenation yields an achiral compound, C_5H_{10} . What is the original chiral compound? (A) 1-methylcyclobutene (B) 3-methylcyclobutene (C) 1,2-dimethylcyclopropene (D) cyclopentene
23. Which of the following statements apply to an $\text{S}_{\text{N}}2$ reaction?
- I. The reaction is first order in alkyl halide and first order in the nucleophile.
 II. The order of reactivity is methyl $>$ 1° $>$ 2° $>$ 3°.
 III. The reaction is first order in alkyl halide and zero order in the nucleophile.
 IV. Rearrangements are common.
- (A) I, II (B) III, IV (C) I, IV (D) II, IV
24. Compound A gives two signals in the ^{13}C NMR spectrum and a single signal in the ^1H -NMR spectrum. Which of the following is most likely compound A?
 (A) dimethyl ether (B) diethyl ether (C) neopentane (D) methyl acetate
25. What is the wavelength (μm) of an infrared absorption band at a wavenumber of 500 cm^{-1} ?
 (A) 0.2 (B) 2.0 (C) 20 (D) 25
26. How can phenol be distinguished from cyclohexanol?
 (A) solubility in water (B) solubility in hydrochloric acid (C) solubility in sodium bicarbonate (D) solubility in sodium hydroxide
27. Which of the following reactions does not create a C-H bond?
 (A) Cannizzaro (B) Wolff-Kishner (C) Grignard (D) Wittig
28. Which of the statements about the following sugar are true?

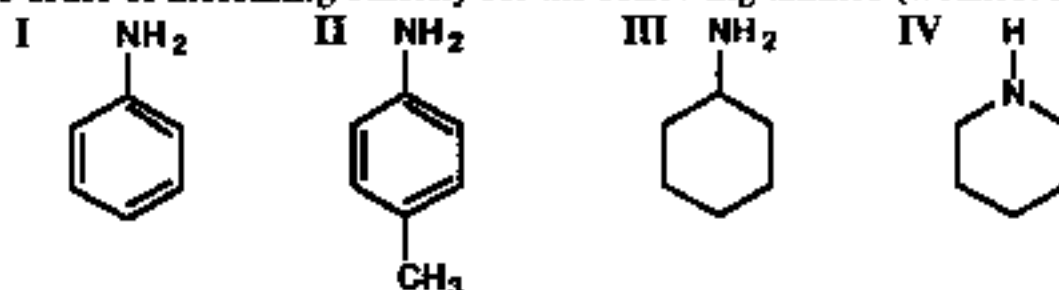


- I. It is a reducing sugar II. It will undergo mutarotation
 III. The linkage is 1,1 IV. It is composed of 2 units of D-glucose
 (A) I, II (B) II, III (C) III, IV (D) I, IV

八十七學年度 輻射生物研究所系(所) _____ 組碩士班研究生入學考試

科目 有機化學 科號 1406 共 5 頁第 4 頁 *請在試卷【答案卷】內作答

29. What is the order of increasing basicity for the following amines (weakest first)?



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

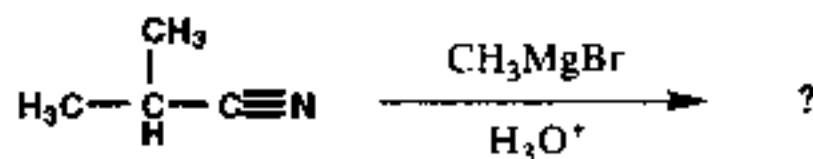
30. What is the structure of the pentapeptide that gave Lys-Leu-Phe on reaction with cyanogen bromide, and gave the fragments Met-Lys, Leu-Phe and Arg on reaction with trypsin?

(A) Arg-Met-Phe-Leu-Lys (B) Lys-Leu-Phe-Arg-Met (C) Arg-Met-Lys-Leu-Phe (D) Met-Arg-Lys-Leu-Phe

II. Propose a structure for each based on its spectroscopic data.

(16%)

1.



MS: $M^+ = 86$

IR: 1715 cm^{-1}

^1H NMR: 1.05 ppm (6H, doublet, $J = 7 \text{ Hz}$); 2.12 ppm (1H, septet, $J = 7 \text{ Hz}$)

^{13}C NMR: 18.2, 27.2, 41.6, 211.2 ppm

2. $\text{C}_4\text{H}_7\text{BrO}$:

^1H NMR: 2.11 ppm (3H, singlet); 3.52 ppm (2H, triplet, $J = 6 \text{ Hz}$);
4.4 ppm (2H, triplet, $J = 6 \text{ Hz}$)

3. $\text{C}_9\text{H}_{11}\text{Br}$:

^1H NMR: 2.15 ppm (2H, quintet, $J = 7 \text{ Hz}$); 2.75 ppm (2H, triplet, $J = 7 \text{ Hz}$);
3.38 ppm (2H, triplet, $J = 7 \text{ Hz}$); 7.22 ppm (5H singlet)

4. An optically active compound $\text{C}_5\text{H}_{10}\text{O}$ with an IR absorption at 1730 cm^{-1} .

八十七學年度輻射生物研究所系(所) _____ 組碩士班研究生入學考試

科目 有機化學 科號 1406 共 5 頁第 5 頁 *請在試卷【答案卷】內作答

III. Predict the major product for each of the following reactions. (24%)

