

八十五學年度 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 3903 共 3 頁第 1 頁 *請在試卷【答案卷】內作答

1. Choose the best answer in the following questions. (20%)
 - a) The Kiliani-Fischer synthesis is used to synthesize:

(A) peptides (B) amino acids (C) osazone (D) aldoses
 - b) Vitamin A (retinol) is:

(A) a carotene (B) a triterpene (C) a sesquiterpene (D) a diterpene
 - c) Chitin is made up of N-acetylglucosamine units linked by _____ glycosidic bonds.

(A) α -1,4' (B) β -1,4' (C) α -1,6' (D) β -1,6'
 - d) The amylose helix forms a blue charge-transfer complex with:

(A) potassium iodide (B) molecular iodine (C) an oxidizer (D) cuprous salts
 - e) A linear polyethylene can be produced using:

(A) Lindlar's catalyst (B) Friedel-Crafts catalysts (C) Ziegler-Natta catalysts (D) phase-transfer catalysts
 - f) Sarin is one of the most toxic nerve gases and its structure contains:

(A) phosphorus and chlorine (B) phosphorus and bromine (C) phosphorus and fluorine (D) phosphorus and iodine
 - g) Guanine forms a base pair, joined by _____ hydrogen bonds, with cytosine.

(A) 1 (B) 2 (C) 3 (D) 4
 - h) The mass spectrum of butyraldehyde shows a base peak at _____ resulting from the McLafferty rearrangement.

(A) m/z 44 (B) m/z 57 (C) m/z 29 (D) m/z 71
 - i) Cephalosporins, a important class of antibiotics, have a β -lactam ring fused to an unsaturated _____-membered ring containing a sulfur atom.

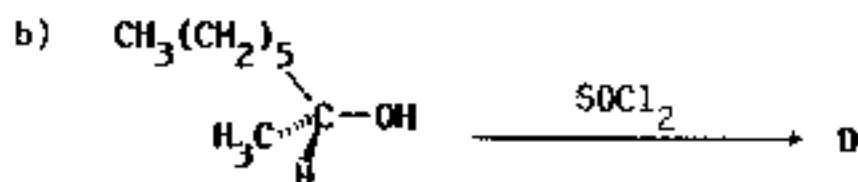
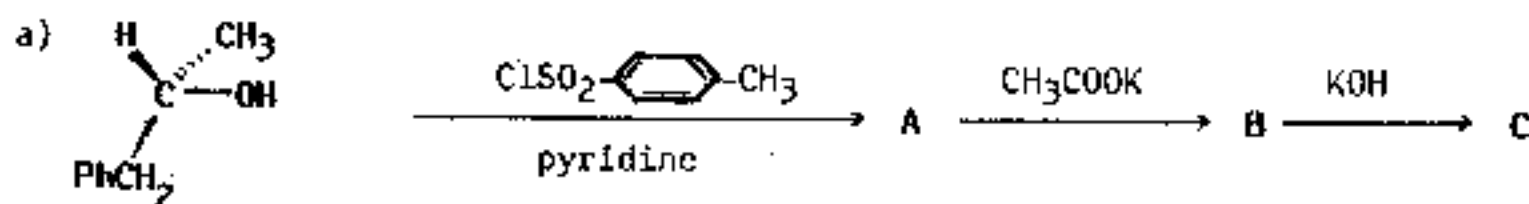
(A) 7 (B) 6 (C) 5 (D) 4
 - j) How many hydrogens are readily exchanged for deuterium in *t*-butyl methyl ketone?

(A) 1 (B) 2 (C) 3 (D) 4
2. Complete the following statements. (10%)
 - a) Nylon 6,6 is made from the reaction of A with B.
 - b) An amino acid, C, which has a secondary amino group, is different from the other standard amino acids.
 - c) From acetaldehyde and benzaldehyde, a crossed aldol condensation with dehydration gives D, a flavoring agent in cinnamon candies.

八十五學年度 藥劑生物研究所系(所) 組碩士班研究生入學考試

科目 有機化學 科號 3903 共 3 頁第 2 頁 *請在試卷【答案卷】內作答

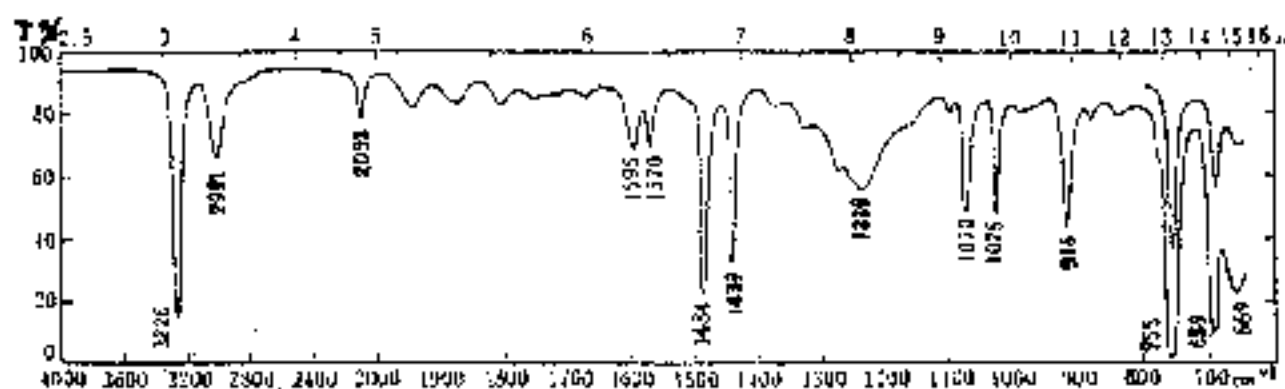
- d) Imine and E are tautomers whose relationship is similar to that of keto and enol forms.
3. How many stereoisomers exist for 1,3-dichloro-2,4-dimethylcyclobutane? Write all the structures. Which are chiral and which are achiral? Identify all planes and points of symmetry in the various structures. (10%)
4. Propose a method for separating a mixture of cyclohexanecarboxylic acid, decane, and tributylamine. (6%)
5. A phenolic acid, $C_9H_8O_3$, exists in two isomeric forms. Both rapidly decolorize permanganate and, on moderate oxidation, yield salicylic and oxalic acids as the only organic products. One isomer easily loses water, when heated, to yield $C_9H_6O_2$. The other fails to dehydrate under the same conditions. Suggest structural formulas for the isomers, and give your reason. (8%)
6. When 1,6-cyclodecanedione is treated with sodium carbonate, the product gives a UV spectrum similar to the UV spectrum of 1-acetyl-2-methylcyclopentene. Propose a structure for the product, and give a mechanism for its formation. (8%)
7. Give the structures of the major products for the following transformations, and specify the stereochemistry clearly if necessary. (8%)



8. An alcohol, $C_5H_{12}O$, shows a daughter ion peak at $m/z = 59$ in its mass spectrum. An isomeric alcohol shows no daughter ion at $m/z = 59$ but does have a peak at $m/z = 45$. Suggest possible structures for each isomer. How could you confirm these structures by proton NMR spectroscopy? by ^{13}C NMR spectroscopy? (10%)
9. An unknown compound shows a molecular ion peak in its mass spectrum at $m/z = 102$. Its proton NMR spectrum shows peaks at δ 2.7 and δ 7.4, with relative areas 1:5. Its IR spectrum is shown below. What is the structure of this unknown, and assign the absorption bands of the IR spectrum. (8%)

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IR spectrum of an unknown compound (Problem 9)

10. Predict the products of the following reactions. (12%)

