國立成功大學

113學年度碩士班招生考試試題

編　號：251

系　所：生物化學暨分子生物學研究所

科　目：有機化學

日　期：0202

節　次：第 2 節

備　註：不可使用計算機

編號： 251

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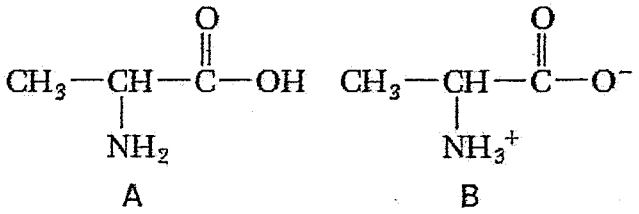
※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

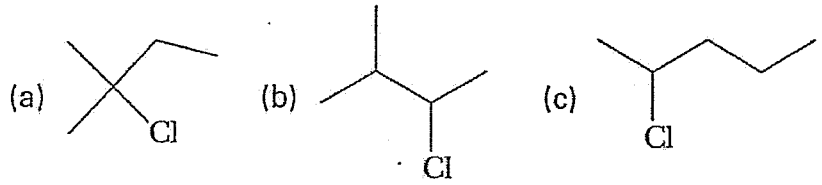
1. Alanine is one of the 20 amino acids (it contains both an amino and a carboxyl group) found in proteins. Is alanine better represented by the structural formula A or B? Explain. (5 points)



2. Draw a structural formula for each compound: (10 points)
   (a) *trans*-2-Methyl-3-hexene
   (b) 2-Methyl-3-hexyne
   (c) 2-Methyl-1-butene
   (d) 3-Ethyl-3-methyl-1-pentyne
   (e) 2,3-Dimethyl-2-butene

3. Please write a correct name for the intended compound: (6 points)
   (a) 1-Methylpropene　　(b) 3-Pentene　　(c) 2-Methylcyclohexene

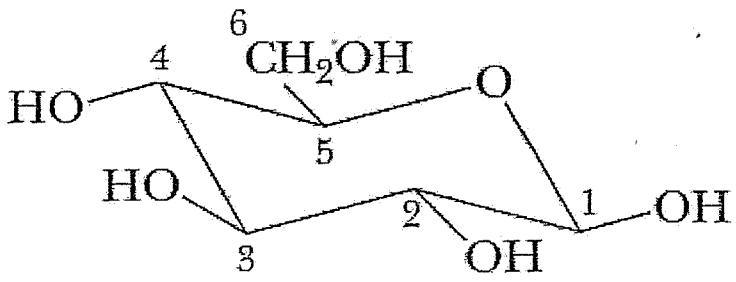
4. Draw the structural formula for an alkene with the molecular formula C5H10 that reacts with HCl to give the indicated chloroalkane as the major product: (9 points)



5. The observed rotation for 100 mL of an aqueous solution containing 1 g of sucrose (ordinary sugar), placed in a 2-decimeter sample tube, is 11.33° at 25°C (using a sodium lamp). Calculate and express the specific rotation of sucrose. (6 points)

6. Draw a structural formula for the form of each amino acid most prevalent at pH 10.0. (6 points)
   A. Leucine
   B. Tyrosine
   C. Aspartic acid

7. This is a stable chair conformation of glucose, a molecule in which all groups on the six-membered ring are equatorial: (8 points)



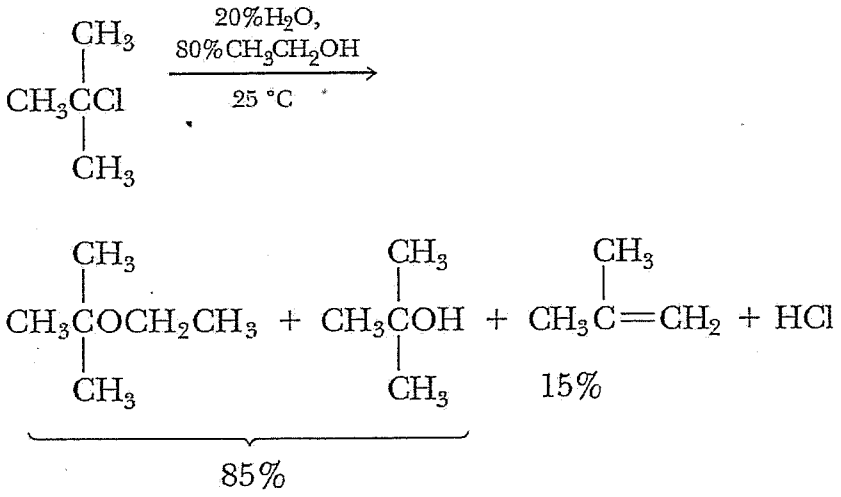
(a) Identify all stereocenters in this molecule.

(b) How many stereoisomers are possible?

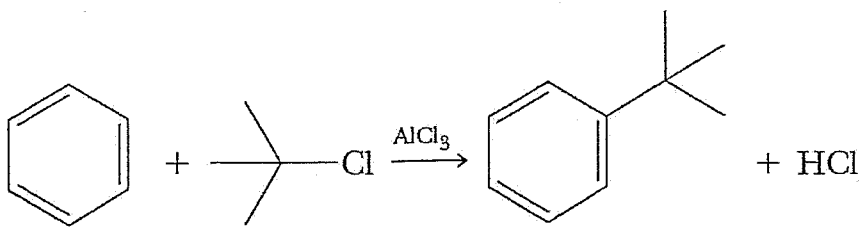
(c) How many pairs of enantiomers are possible?

(d) What is the configuration (R or S) at carbons 1 and 5 in the stereoisomer shown?

8. Propose a mechanism for the formation of the products (but not their relative percentages) in this reaction: (6 points)



9. Write a stepwise mechanism for the following reaction, using curved arrows to show the flow of electrons in each step: (6 points)



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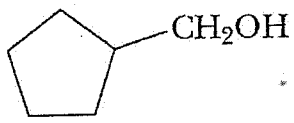
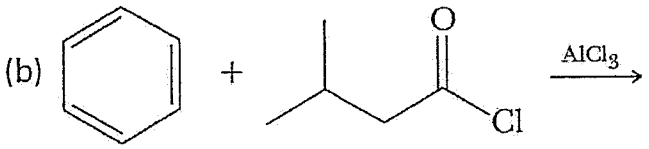
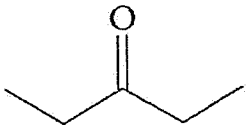
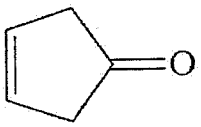
10. Complete these reactions: (6 points)

(a) 

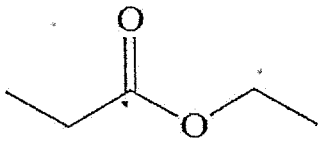
(b) 

11. Draw structural formulas and reaction mechanism for the product formed by treating each compound with **propylmagnesium bromide**, followed by hydrolysis in aqueous acid: (6 points)

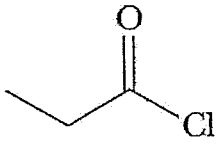
(a) 

(b) 

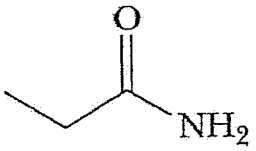
12. Arrange these compounds in order of increasing reactivity toward nucleophilic acyl substitution: (12 points)



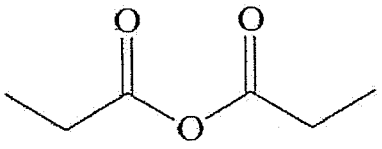
(1)



(2)



(3)



(4)

13. Deduce the amino acid sequence of an undecapeptide (11 amino acids) from the experimental results shown in the following table: (8 points)

Experimental Procedure	Amino Acids Determined from Procedure
Amino Acid Analysis of Undecapeptide	Ala, Arg, Glu, Lys_2, Met, Phe, Ser, Thr, Trp, Val
Edman Degradation	Ala
Trypsin-Catalyzed Hydrolysis	
Fragment E	Ala, Glu, Arg
Fragment F	Thr, Phe, Lys
Fragment G	Lys
Fragment H	Met, Ser, Trp, Val
Chymotrypsin-Catalyzed Hydrolysis	
Fragment I	Ala, Arg, Glu, Phe, Thr
Fragment J	Lys_2, Met, Ser, Trp, Val
Treatment with Cyanogen Bromide	
Fragment K	Ala, Arg, Glu, Lys_2, Met, Phe, Thr, Val
Fragment L	Trp, Ser

14. Describe the differences between mRNA, tRNA, and rRNA. (6 points)