國立中山大學100學年度碩士班招生考試試題

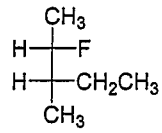
科目：有機化學【海資系碩士班丁組】

1

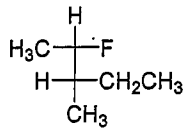
1. Draw the structure of the following compounds. (10%)
   (a) 7-hydroxy-7-methyl-4-octen-2-one
   (b) Bicycle [4.1.0] heptane
   (c) *N*-methylacetamide
   (d) 2-acetyloxybenzoic acid
   (e) (*E*)-3-methyl-2-hexenoic acid

2. Explain the following terms. (15%)
   1) Wittig reaction
   2) Aldol condensation
   3) McLafferty rearrangement
   4) Baeyer-Villiger oxidation
   5) Germinal coupling

3. What are the stereochemical relations (identical, enantiomers, diastereomers) of the following four molecules? Assign absolute configuration at each stereocenter and draw the most stable conformation in Newman projection. (10%)



1



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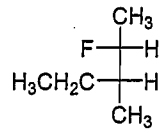

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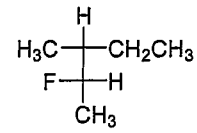
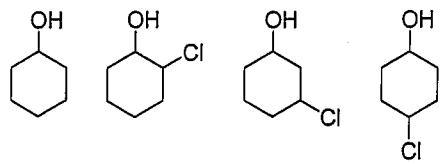
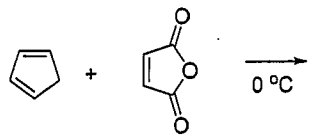


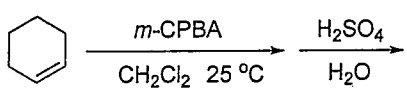
4

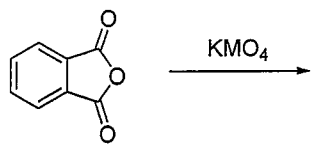
4. Rank the following alcohols in order of increasing acidity. (5%)



5. Predict the main product in each of the following reaction. Be sure to show stereochemistry where it is known. (10%)

(a) 

(b) 

(c) 

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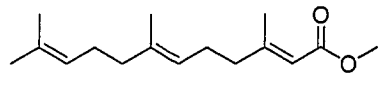
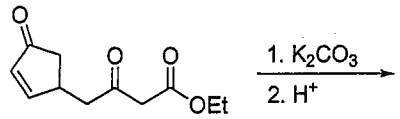
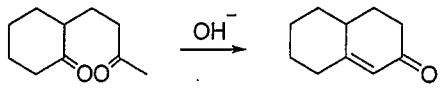
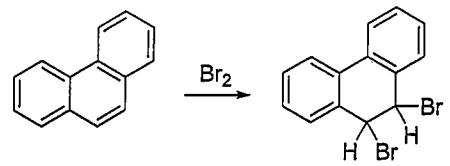
(d) 

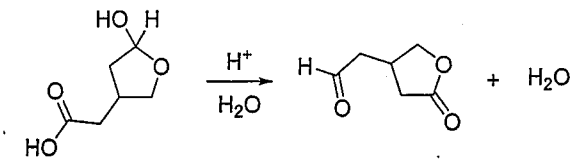
(e) 

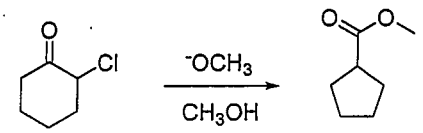
6. Propose a mechanism for each reaction: (20%)

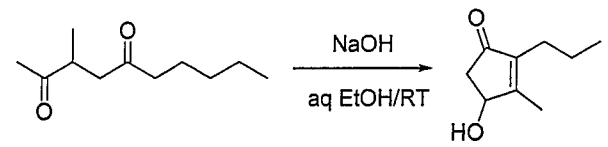
(a) 

(b) 

(mixture of *cis* and *trans*)

(c) 

(d) 

(e) 

7. Draw all the isomers of triphenylcyclopropane. Indicate which are enantiomers. State the appearance of the upfield proton of the NMR spectrum of each (mark protons Ha, Hb, Hc then state eg. one singlet, two singlets,....., one doublet,... one triplet, double doublets) (10%)

8. From each group of three molecules, pick the one whose structure is most consistent with the proton-decoupled ^{13}C-NMR data. Explain your choices (8%)
   (a) $CH_3(CH_2)_4CH_3$, $(CH_3)_3CCH_2CH_3$, $(CH_3)_2CHCH(CH_3)_2$; δ = 19.5 and 33.9
   (b) 1-Chlorobutane, 1-chloropentane, 3-chloropentane; δ = 13.2, 20.0, 34.6, and 44.6
   (c) $ClCH_2CHClCH_2Cl$, $CH_3CCl_2CH_2Cl$, $CH_2{=}CHCH_2Cl$; δ = 45.1, 118.3, and 133.8
   (d) Cyclopentanone, cycleheptanone, cyclononanone; δ = 24.0, 30.0, 43.5, and 214.9

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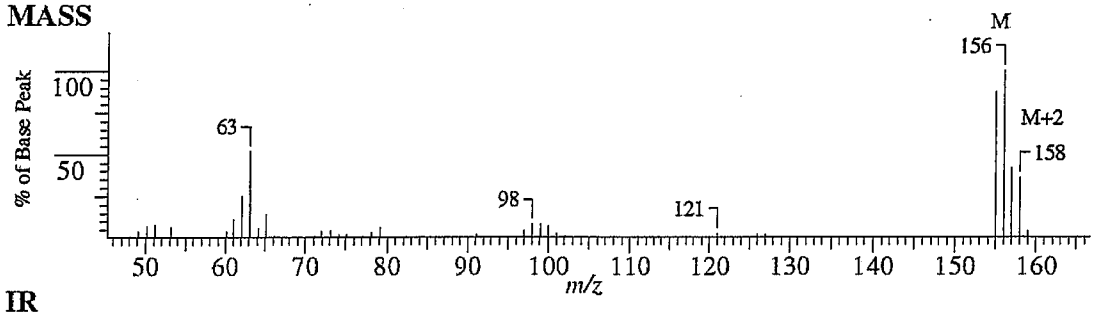
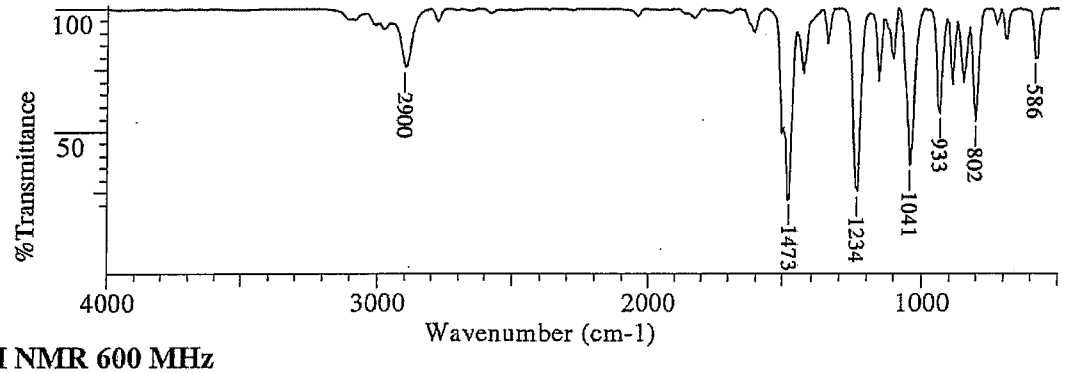
9. Determine the structure which is consistent with the following spectra. (12%)

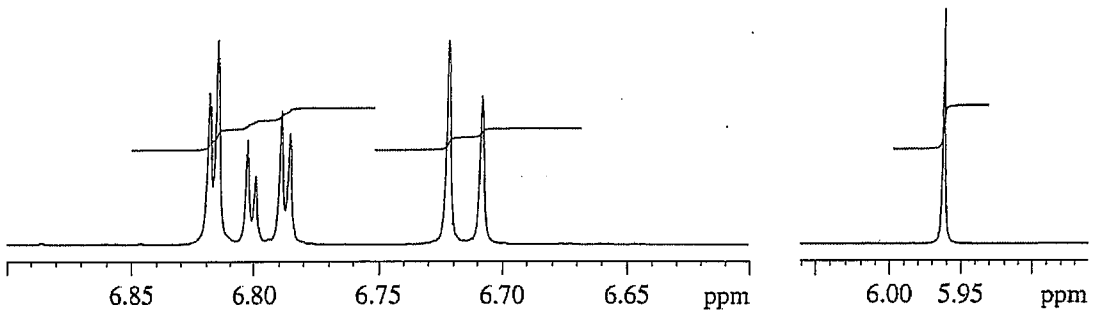
MASS



IR



^{1}H NMR 600 MHz



^{13}C/DEPT NMR 150.9 MHz