國立高雄大學 102 學年度轉學招生考試試題(轉三年級)

科目：有機化學
考試時間：80 分鐘

系所：
應用化學系(無組別)

是否使用計算機：否

本科原始成績：100 分

1. Select a best choice for the following questions: (15, 3 pts each)

i. The formal charge on nitrogen in nitromethane, CH_3NO_2, is __.

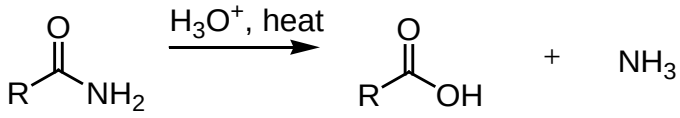
A) -2 B) -1 C) 0 D) +1 E) +2

ii. The relationship between ketones and their corresponding enols is one of:

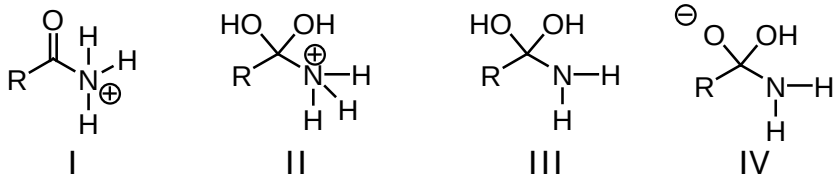
A) allotropes. B) tautomers. C) enantiomers

D) diastereomers. E) cis-trans isomers.

iii. Which of the following are intermediates in the acid hydrolysis of an amide?

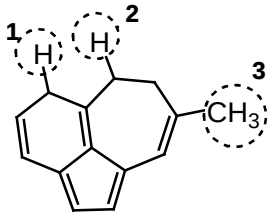


possible intermediates



A) I B) II C) IV D) both I and IV E) both II and III

iv. Which sequence ranks the indicated protons in order of increasing acidity?



A) 3 < 1< 2 B) 2 < 3 < 1

C) 3< 2 < 1 D) 1 < 3 < 2

v. A reaction of an unknown alkene with MCPBA in dichloromethane followed by work-up with H_2O/H^+ yielded, as the major product, a racemic mixture of (2S, 3S) and (2R, 3R)-3-methylpentan-2,3-diol. What is the specific structure of the alkene used in the reaction?

A) (Z)-3-methylpent-2-ene B) (E)-3-methylpent-2-ene

C) 2-methylpent-2-ene D) 2,3-dimethylbut-2-ene

E) none of the above

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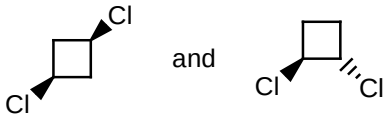
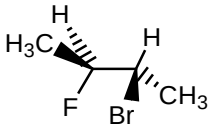
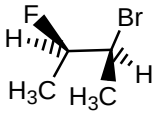
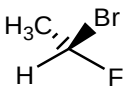
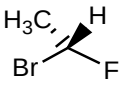
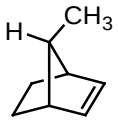
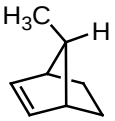
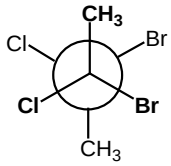
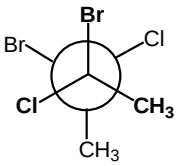
2. Consider the following structural formulas. Star any chiral carbon atoms and label it as (R) or (S) and identify the relationship between them by describing them as representing enatiomers, diastereomers, constitutional isomers, or two molecules of the same compound. (15 points, 3points each)

(a)  and

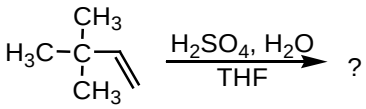
(b)  and 

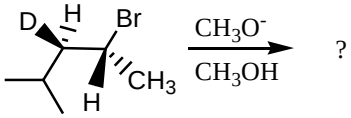
(c)  and 

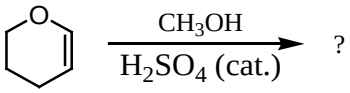
(d)  and 

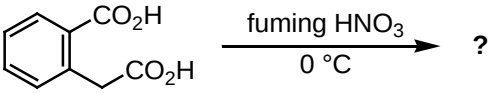
(e)  and 

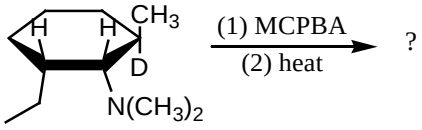
3. Give the structure of the major product, clearly indicate the stereochemistry if necessary. (30 points, 3 points each)

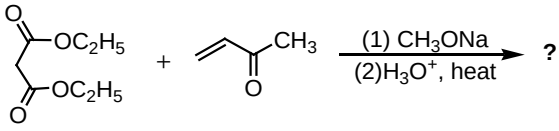
(a) 

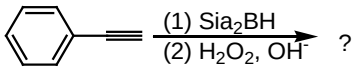
(b) 

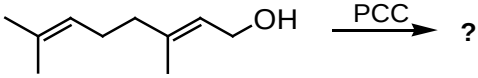
(c) 

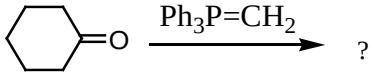
(d) 

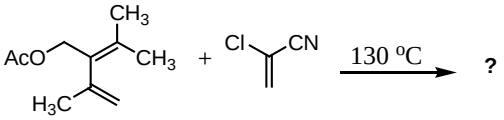
(e) 

(f) 

(g) 

(h) 

(i) 

(j) 

科目：有機化學
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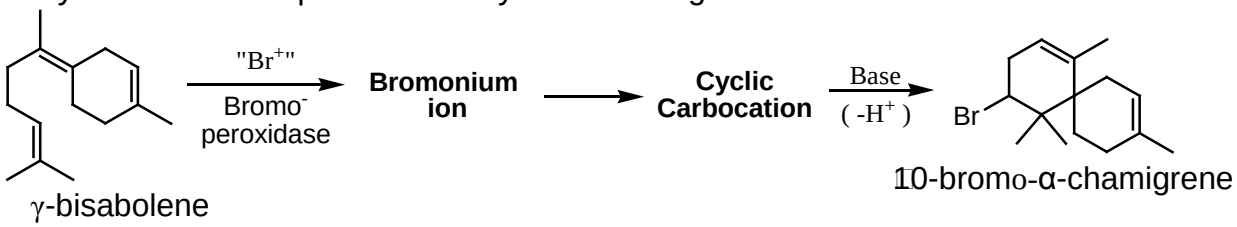
系所：
應用化學系(無組別)

本科原始成績：100 分

是否使用計算機：否

4. 10-bromo-α-chamigrene, a compound isolated from marine algae, is thought to be biosynthesized from γ-bisabolene by the following route:

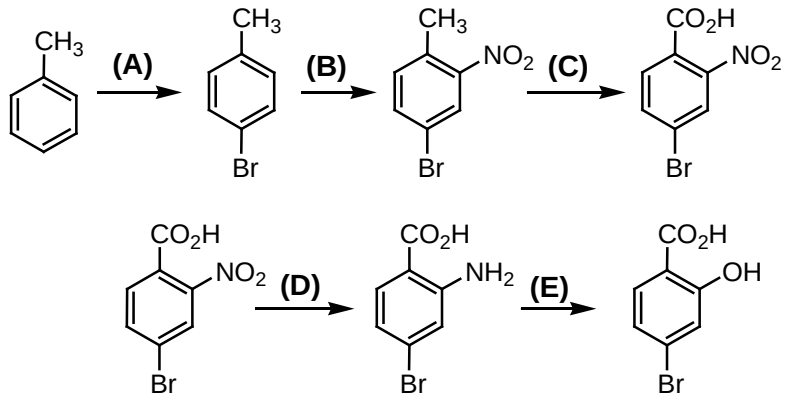


γ-bisabolene

10-bromo-α-chamigrene

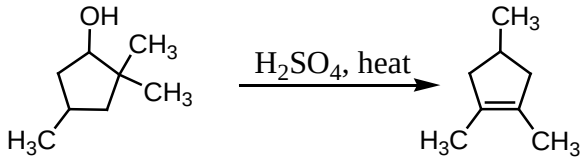
Draw the structure of the intermediate bromonium ion and cyclic carbocation, and propose mechanisms for all three steps. (10 points)

5. Supplied appropriate reagents for the following reactions (15 points, 3 points each)

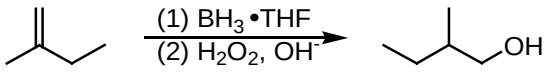


6. Write down step-by-step reaction mechanism for the following reactions(10 points, 5 points each)

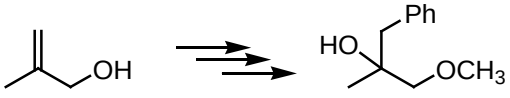
(a)



(b)



7. Show how you would accomplish the following multi-step synthetic conversions. (5 points)



國立高雄大學 102 學年度轉學招生考試試題(轉三年級)

科目：分析化學
考試時間：80 分鐘

系所：
應用化學系(無組別)

是否使用計算機：是

本科原始成績：100 分

注意事項: 計算題須有計算過程，答案如有單位則須寫出該單位，未能遵守上述規定一律扣分處理。

1. (6分) Write each answer with the correct number of significant figures.
   (a) 123.905 – 13.4 = ; (b) 12.34 × 5.6 =
2. (6分) Weak acid HA was dissolved in a solution buffered to pH 6. Find the ratio $[A^-]/[HA]$ in this solution. (p*K*a for HA = 6)
3. (6分) A spectrum has a signal-to-noise ratio of 4/1. How many spectral must be averaged to increase the signal-to-noise ratio to 20/1?
4. (6分) Find the absorbance of a 0.00024 M solution of a substance with a molar absorptivity of 313 M^{-1} cm^{-1} in a cell with a 2.00-cm pathlength.
5. (6分) Find the weight percent of 12 M HCl. The density of the reagent is 1.19 g/mL.
6. (6分) K_b for $(CH_3)_2NH$ is 5.9×10^{-4}. Find K_a for $(CH_3)_2NH_2^+$.
7. (6分) Explain an aqueous solution that containing 25 vol% methanol (C_2H_5OH) is a homogeneous material or a heterogeneous material.
8. (6分) Describe the difference between partition chromatography and adsorption chromatography.
9. (6分) Describe the difference between qualitative and quantitative analysis
10. (6分) Describe the difference between end point and equivalence point in titration method.
11. (6分) Describe the difference between Faradaic current and non-Faradaic current.
12. (6分) Desribe the differences between fluorescence and phosphorescence?
13. (8分) A solute with a partition coefficient of 3.0 is extracted from 10 mL of phase 1 into phase 2. What volume of phase 2 is needed to extract 90% of the solute in one extraction?
14. (10分) A solution containing 0.04 M X (analyte) and 0.02 M S (standard) gave peak areas of A_X = 360 and A_S = 240. To analyze the unknown, 10.0 mL of 0.50 M S were added to 10.0 mL of unknown, and the mixture was diluted to 50.0 mL. This mixture gave peak areas of A_X = 900 and A_S = 1200. Find the concentration of X in the unknown.
15. (10分) Describe what is van Deemter equation.