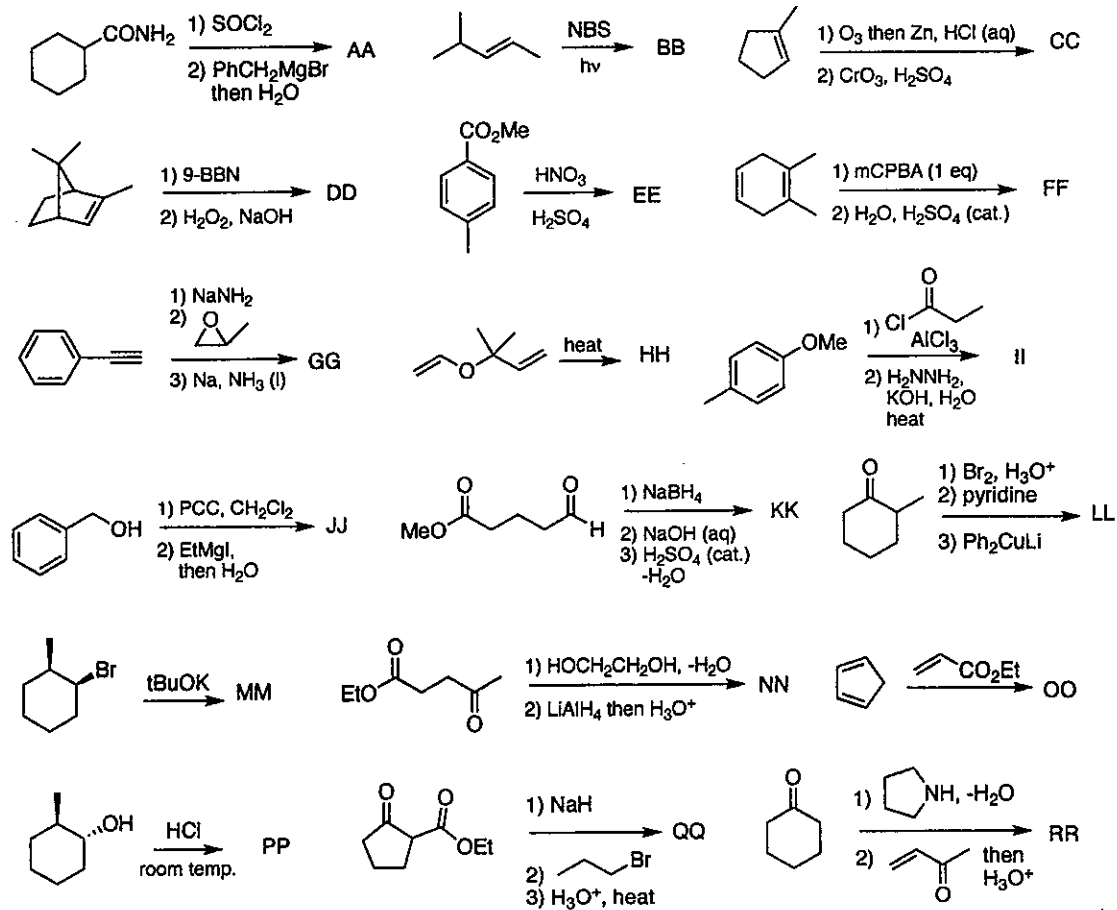
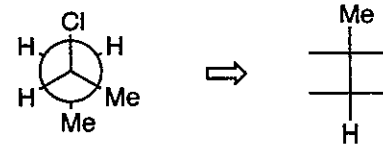


Part A Organic Chemistry ※ 注意：請於試卷內之「非選擇題作答區」依序作答，並應註明作答之大題及小題題號。

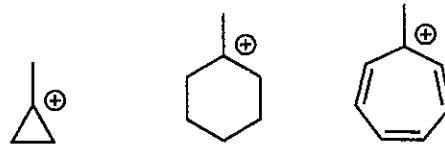
1. Predict the major product structure including the stereochemistry of the following reactions. (36%)



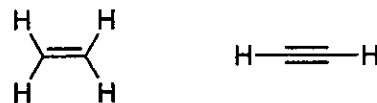
2. Given the Newman project below, complete the Fischer projection as indicated, identify the chirality center and give the absolute configuration. (3%)



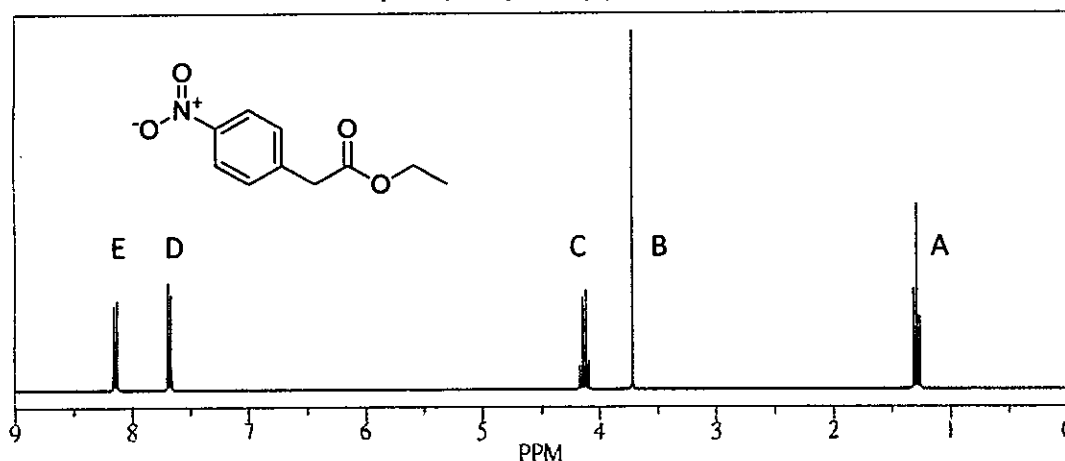
3. Compare the relative stability of the carbocations shown below and give your explanations. (3%)



4. Compare the relative acidity of the compounds shown below and give your explanations. (3%)



5. Assign peaks A to E respectively to protons of the compound shown below and briefly explain your reasons about the chemical shift and spin-spin splitting patterns. (5%)



Part B Inorganic Chemistry ※ 注意：請於試卷內之「非選擇題作答區」依序作答，並應註明作答之大題及小題題號。

1~6 Multiple Choice Questions: (30%; 1 point per choice; -0.5 per mistake)

Mark your answers as: (a) O (b) X (c) O (d) X (e) O

- Which of the following species have "square planar" geometry?
 - SiF₄
 - SF₄
 - XeF₄
 - IF₄⁺
 - PdCl₄²⁻
- Which of the following lattices have two lattice points per unit cell?
 - primitive tetragonal
 - body-centered cubic
 - face-centered orthorhombic
 - end-centered cubic
 - primitive triclinic
- The color of which of the following species are due to "charge-transfer"?
 - Mn²⁺(aq)
 - KMnO₄
 - [Cu(NH₃)₄]²⁺
 - Fe₃O₄
 - KFeFe(CN)₆
- Which of the following statements are CORRECT?
 - The basicity toward gas phase H⁺ is NH₃ < CH₃NH₂ < (CH₃)₂NH < (CH₃)₃N
 - The basicity in water is NH₃ < CH₃NH₂ < (CH₃)₂NH < (CH₃)₃N
 - The 10Dq value is CrO₄⁴⁻ > MnO₄³⁻ > FeO₄²⁻
 - The 10Dq value is OsO₄²⁻ > RuO₄²⁻ > FeO₄²⁻
 - The oxidizing power is ReO₄²⁻ > TcO₄⁻ > MnO₄⁻
- Which of the following species are non-polar?
 - PF₃(CH₃)₂
 - CF₃⁺
 - NF₃
 - ICl₃
 - ClO₃⁺
- Which of the following term symbols can be found on free gas Ti²⁺ ion?
 - ¹S
 - ³G
 - ¹P
 - ³F
 - ¹D

Problems:

- For a hypothetical linear (Na)₅ molecule,
 - Draw pictures of the molecular orbitals by linear combinations of Na 3s orbitals, and arrange these molecular orbitals in order of increasing energy from bottom to top.
 - What is the bond order of each Na-Na bond in the linear (Na)₅ molecule?
(10%)
- Find the term symbols for the following electron configuration in tetrahedral crystal field, using the descending of symmetry if necessary. (10%)
 - t₂¹e¹
 - t₂²

題號： 61

國立臺灣大學 111 學年度碩士班招生考試試題

科目： 有機無機

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Character Table

T_d	E	$8C_3$	$3C_2$	$6S_4$	$6\sigma_d$	
A_1	1	1	1	1	1	$x^2 + y^2 + z^2$
A_2	1	1	1	-1	-1	
E	2	-1	2	0	0	$(2z^2 - x^2 - y^2, \sqrt{3}(x^2 - y^2))$
T_1	3	0	-1	1	-1	(R_x, R_y, R_z)
T_2	3	0	-1	-1	1	(x, y, z) (xy, xz, yz)

Correlation table

O_h	C_{4v}	C_{2v}
A_{1g}	A_1	A_1
A_{2g}	B_1	A_2
E_g	$A_1 + B_1$	$A_1 + A_2$
T_{1g}	$A_2 + E$	$A_2 + B_1 + B_2$
T_{2g}	$B_2 + E$	$A_1 + B_1 + B_2$
A_{1u}	A_2	A_2
A_{2u}	B_2	A_1
E_u	$A_2 + B_2$	$A_1 + A_2$
T_{1u}	$A_1 + E$	$A_1 + B_1 + B_2$
T_{2u}	$B_1 + E$	$A_2 + B_1 + B_2$

試題隨卷繳回